THE UNIVERSITY OF HULL

Management Accounting and the Implications of Supply Chain Management Practices: An Empirical Study

Being a Thesis submitted for the Degree of

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by

Noriza Mohd Jamal

B.Sc (Accounting), Queen's University of Belfast
M.A. (Accounting and Finance), Lancaster University

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Abstract

There have been calls for more research into how changes in supply chain management practices (SCMPs) affect management accounting practices (MAPs) and in turn affect performance. While the linkages between SCMPs, MAPs and performance may seem intuitive, to date there has been limited empirical research testing these relationships. The objective of the research is therefore to test a number of hypotheses regarding the association between these variables and firm performance based on the contingency theory framework.

Data were collected through a postal survey of senior accounting executives from the Consumer and Industrial Products Sectors under Malaysian publicly listed firms. The relationships between SCMPs, MAPs, supply chain performance (SCPERF) and overall firm performance (OPERF) were analysed using Partial Least Squares (PLS) path modelling in two conceptual models via PLS-Graph Beta Version 3. To supplement the questionnaire survey, semi-structured interviews were used to gather the experiences and views of selected companies as means to triangulate the research study.

It was found that SCMPs are directly related to both MAPs and SCPERF, that MAPs are directly related to SCPERF, and that SCPERF was directly related to overall firm performance (OPERF). Although SCMPs and MAPs were not directly related to OPERF, they were related to OPERF indirectly. MAPs were categorized into stages of their evolution as postulated by the International Federation of Accountants (IFAC). The most sophisticated MAPs, however, have a positive direct and indirect association with OPERF. Supply chain performance (SCPERF) is found to be an important mediator linking SCMPs and MAPs to OPERF. The survey findings which are re-affirmed by the interviews are consistent with the contingency theory approach.

This research adds to the existing body of research by developing a framework for linking a firm's SCM practices to its management accounting practices, supply chain performance and overall firm performance. These findings provide management with strategically important insights that strategic supplier partnership, customer relationships, information management and internal supply chain activities are primary factors in SCM that will influence MAPs and supply chain performance. Managers can thus use MA information to effectively create an efficient SCM environment that will lead to improved SCPERF, which will in turn enhance overall firm performance. Areas where future research may prove fruitful are also discussed.

Keywords: Management accounting, Supply chain management practices, Supply chain performance, Firm performance, Contingency theory

Dedications

To my dear husband, mom and dad,
"*For your heartfelt show of support, unconditional love and prayers... I can't thank all of you enough.*"

To my beloved children, Shafiq, Syahmin and Syahindah,
"*I am truly blessed with all my great kids.*"

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS / FREQUENTLY USED TERMS

ABC	Activity-Based Costing
CDFC	Cost Determination and Financial Control
CM	Conceptual Model
CP	Competitive Position
CR	Customer Relationship
CS	Customer Satisfaction
CV	Creation of Value through Effective Resource Use
FLEX	Supply Chain Flexibility
IFAC	International Federation of Accountants
ILP	Internal Lean Practices
IM	Information Management
INT	Supply Chain Integration
IOCM	Inter-Organizational Cost Management
IPC	Information for Management Planning and Control
IS	Information Sharing
IQ	Information Quality
MA	Management Accounting
MS	Market Share
MAPs	Management Accounting Practices
MCS	Management Control Systems
OPERF	Overall Firm Performance
PLS	Partial Least Squares
PMS	Profit Margin on Sales
POS	Postponement
PQ	Product Quality
RESC	Customer Responsiveness
ROI	Return on Investment
RWR	Reduction of Waste of Resources in Business Processes
SCM	Supply Chain Management
SCMPs	Supply Chain Management Practices
SCR	Strategic Customer Relationship
SEM	Structural Equation Modelling
SSP	Strategic Supplier Partnership
SCPERF	Supply Chain Performance
SUP	Supplier Performance
TCR	Total Cost Reduction

PUBLICATIONS

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1 INTRODUCTION

1.1 Motivation and background

With increasing competition from globalization and progressive market liberalization, many firms have been experiencing significant change in their organizational designs, competitive environments and information technologies. The intense competition in the business world has encouraged many companies to become global operations. Irrespective of their size or sector, organizations are becoming extensively involved in strategic alliances, networks and virtual relationships (Kulmala *et al*., 2002; Li *et al*., 2005). This has given rise to increased challenges associated with getting a product and service to the right place at the right time at the lowest cost. Many business organizations have now begun to realize that it is not enough to improve efficiencies within an organization, but their whole supply chain has to be made competitive (Li *et al*., 2006; Gunasekaran *et al*., 2008).

A key challenge to supply chain networks is for enterprises to evolve from their traditional practices to a supply chain network that will combine many components and entities such as production, fulfilment, replenishment, demand management, product development and customer engagement to form an integrated supply chain (Grant *et al*., 2006; Ballou, 2007). An integrated supply chain has a clear competitive advantage for companies.

The new environmental and technological changes have also affected, in turn, the world of management accounting systems and the procedures used to collect and process data and disseminate information for decision making (Kaplan, 1998; Chenhall, 2003; Gupta and Gunasekaran, 2005). Specifically, management accountants should continually monitor and assess rapidly changing production technologies, changing environments and manufacturing practices (Spicer, 1992; Burns and Vaivio, 2001; Chenhall, 2007). There have been calls for research into the use of management accounting systems under such changing circumstances (Bromwich, 1990; Bromwich and Bhimani, 1994) and specifically how changes in supply chain management affect the use of management accounting systems (Agbejule and Burrowes, 2007). Considerable changes in the area of supply chain management as well as in management accounting practices over the past three decades have heightened the need for research in this area.

During this time, numerous innovative management accounting techniques have been developed across a range of industries. Notable contributions include activity-based techniques, strategic management accounting, the balanced scorecard, target costing and value chain analysis (Innes and Mitchell, 1995; Kaplan and Norton, 1996; Kaplan and Atkinson, 1998; Guilding *et al.*, 2000; Hopper *et al.*, 2007). The modern techniques have affected the whole process of management accounting, namely, planning, controlling, decision making and communication. Management accounting focus has shifted from a ‘simple’ or ‘naive’ role of cost determination and financial control, to a ‘sophisticated’ role of creating value through improved deployment of resources (Ittner and Larcker, 2001; Tillema, 2005; Abdel-Kader and Luther, 2008). It has been argued that these modern management accounting techniques have been designed not only to support modern technologies and new management processes, such as total quality management and just-in-time production systems, but also to meet the challenge of global competition (Spicer, 1992; Abdel-Kader and Luther, 2008).

The increased interest in cooperation among firms is noticeable in several managerial disciplines. In the management accounting literature, increased attention is given to the question of what role management accounting information plays within these relationships (Dekker and Van Goor, 2000; Ramos, 2004). The implications for management accounting systems of global competition and operations are increasingly important as organizations become involved in networks and the boundaries between what is internal and external become blurred.

Consequently, the management accounting discipline and its practices must evolve, if it wants to retain its relevance in the changed world. It has to become more proactive in responding to the rapidly changing market and business environment (Spicer, 1992; Chenhall, 2003; Gupta and Gunasekaran, 2005). It is a major challenge for management accountants to understand the forces driving these changes, the variety of practices being developed and how management accounting may contribute to the effective management of inter-organizational supply chains. The answer to this question is to some extent still uncertain.

Ittner and Larcker (2001) and Chenhall (2003) advocate that studying the role of novel management accounting practices within contemporary settings is necessary to ensure that management accounting research is relevant. Motivation for conducting this study in a Malaysian context derives from prior evidence suggesting that successful transition economies are often associated with the application of relatively advanced business practices (Anderson and Lanen, 1999; O'Connor *et al.*, 2004); although these broad claims are not specific to Malaysia. The focus on this research into supply chain management and management accounting was motivated by the works of academic researchers who consider it to be crucial to successful performance in inter-firm relationships (Berry *et al*., 1997; Dekker and Van Goor, 2000; Dekker, 2003; Chen *et al*., 2004; Askarany *et al*., 2010) and the paucity of empirical accounting research that examines the implications of supply chain management for management accounting in such relationships.

1.2 Problem statement

Until recently supply chain management (SCM) has had only a relatively modest impact on management accounting research despite its importance in other disciplines and its rapid proliferation in organizational practice (Berry *et al*., 1997; Dekker and Van Goor, 2000; Ramos, 2004). However, success in the constitution and maintenance of long term collaborations in the supply chain can benefit from information provided by management accounting techniques (Dekker and Van Goor, 2000; Mouritsen *et al*., 2001; Tomkins, 2001; Ellram, 2002; Dekker, 2003; Håkkansson and Lind, 2006). Hence, this research will further explore the impact of SCM on management accounting practices and the combined implications for firm performance.

1.2.1 Management accounting in SCM

Contributions in the management accounting literature have focused on the forms and functions of cost and accounting controls in an inter-organizational setting. A number of specific cost and management accounting techniques have been suggested including value chain analysis and activity-based costing (Dekker and Van Goor, 2000; Lin *et al*., 2001; Dekker, 2003; Wisner, 2003; Askarany *et al*., 2010), target costing and inter-organizational cost management (Carr and Ng, 1995; Mouritsen *et al*., 2001; Ellram, 2002; 2006; Cooper and Slagmulder, 2004) as well as open book accounting (Seal *et al*., 1999; Kajüter and Kulmala, 2005). It is argued that SCM has several implications for management accounting (Berry *et al*., 1997; Kulmala *et al*., 2002).

The efficacy of management accounting as part of the management process is faced with serious challenges in the era of globalization in which low costs, operating efficiency and customer satisfaction are the focus (Innes and Mitchell, 1995; Kaplan and Norton, 1996; Scapens, 1999; Burns and Vaivio, 2001; Gupta and Gunasekaran, 2005). Traditional performance and cost measures are no longer suitable for developing and managing enterprises in the so-called new environment. It appears that traditional management accounting techniques are nowadays being used together with so-called ‘advanced’ accounting techniques such as activity-based costing (ABC), target costing, product life cycle costing, just-in-time (JIT) inventory, total quality management (TQM), value chain analysis, the balanced score-card approach to performance measures and others (Innes and Mitchell, 1995; Chenhall and Langfield-Smith, 1998a; Anderson and Lanen, 1999; Joshi, 2001; Luther and Longden, 2001; Waweru *et al*., 2004; Islam and Kantor, 2005; Abdel-Kader and Luther, 2008).

Traditional management accounting is said to fail to recognize the potential for exploiting linkages with the firm’s suppliers and customers. It has been argued that traditional management accounting systems do not readily support SCM perspectives. According to Seal *et al*. (1999), the implications of SCM initiatives for management accounting and for management accountants both support that criticism and show how management accounting is changing in response to the challenges. The contribution of management accounting to SCM may depend on its ability to develop costing and performance measurement technologies that can be understood and respected by non-accountants who currently predominate in the field of supply chain (Seal *et al*., 1999).

As producers, suppliers and assemblers become increasingly integrated, it remains to be considered how management accounting is or can be designed and used to assist in the formulation, implementation and realization of strategies for achieving competitive advantage. Management accounting techniques should demonstrate degrees of the following orientations: environmental (outward-looking) and long term (forward looking) and not internal and backward looking (Cadez and Guilding, 2008). Forward-looking business organizations today are dynamic as they collaborate with suppliers, customers and even with competitors, and share information and knowledge with the aim of creating an integrated supply chain to compete in the industry (Koh *et al*., 2007).

Supply chain developments demand the introduction of new management accounting techniques alongside traditional reporting systems. Supply chain developments also require the contribution of ideas from management accounting and management accountants, both internal to the firms and in inter-firm relationships (Kulmala *et al*., 2002; Ramos, 2004). According to Cullen and Metcalf (2006), one of the areas where management accounting expertise can help SCM is using management accounting tools at different stages of developing supply chain relationships such as life-cycle costing, open-book accounting, target costing and quality costing. The opportunities for management accountants are therefore significant in the area of supply-chain accounting and logistics (Dekker and Van Goor, 2000).

1.2.2 SCM and firm performance

The objectives of SCM are to optimize performance in meeting agreed customer service requirements and minimizing costs whilst optimizing the use of all resources throughout the entire supply chain. SCM has been defined to recognize explicitly the strategic nature of coordination between trading partners and to explain its dual purpose: to improve the performance of an individual organization and to improve the performance of the whole supply chain (Koh *et al.*, 2007; Fynes *et al.*, 2008). SCM has also been considered as the most popular operations strategy for improving firm competitiveness in this century (Wisner, 2003; Li *et al.*, 2006; Gunasekaran *et al.*, 2008).

SCM and related strategies are crucially important to the success of particularly manufacturing firms. This is because the cost and quality of goods and services sold are directly related the cost and quality of goods and services purchased. Components of SCM are also found to have considerable effects on firm performance (Chow *et al*., 2008). Performance for supply chain firms is measured not only financially (using profitability measures), but also non-financially such as by customer satisfaction and product quality (Li *et al*., 2006; Koh *et al*., 2007; Fynes *et al.*, 2008). Types of performance measures are identified as necessary components in any supply chain performance measurement system, including resources, output and flexibility (Beamon, 1999; Gunasekaran *et al*., 2001; Wisner, 2003).

1.2.3 Management accounting sophistication[1] and contingency perspective

Management literature and business consultants try to convince organizations that they should introduce recently-developed, sophisticated management accounting techniques. The successful use of sophisticated accounting techniques may also be related to more general characteristics of organizations and their environments; that is, the appropriateness of using sophisticated techniques may depend on the circumstances in which these techniques are being used. The sophistication of a firm's management accounting practices (MAPs) is located by reference to four stages derived from the International Federation of Accountants' (IFAC)[2] 1998 statement on *Management Accounting Concepts.*

The focus in the first stage was on cost determination and financial control, through the use of budgeting and cost accounting technologies; while in the second stage, the focus had shifted to the provision of information for management planning and control. Management accounting was said to evolve to its third stage when attention was focused on the reduction of waste in resources used in business processes. Stage four was recognized when attention had shifted to the generation or creation of value through the use of technologies which examine the drivers of customer value, shareholder value and organizational innovation. The first stage represents a lack of sophistication and the fourth stage is the highest level of sophistication (Abdel-Kader and Luther, 2006a; 2008).

[1] *Sophistication* refers to the capability of management accounting systems to provide a broad spectrum of information relevant for planning, controlling and decision-making all in the aim of creating or enhancing value (Abdel-Kader and Luther, 2008; Tillema, 2005; Gerdin, 2005).

[2] IFAC is the global organization for the accountancy profession. It works with its 157 member organizations and associates in 122 countries to protect the public interest by encouraging high quality practices by the world's accountants (IFAC, 2008).

IFAC is recognized to have a strong claim to formally 'speak for' management accounting and its framework of evolution is seen to be useful in studies aiming to answer the extent of the practices advocated by academics, textbooks and professional institutes actually applied in organizations (Abdel-Kader and Luther, 2006a). The framework is also useful to identify the stage of management accounting evolution of particular organizations, industries or countries. The model is intrinsically interesting and has the potential for replication in other contexts and in comparative cross-national, inter-industry or longitudinal studies (Abdel-Kader and Luther, 2006a; 2008).

As firms adapt to environmental, technological and management developments, it is argued that firms must design a management accounting system and adopt some of the sophisticated techniques. The appropriateness of using sophisticated techniques depends on the circumstances in which these techniques are being used. This gives rise to the need to adopt a contingency theory perspective (Gerdin, 2005; Tillema, 2005; Abdel-Kader and Luther, 2008). The fundamental tenet of contingency theory holds that company performance is a product of an appropriate fit between the structure (MAPs) and the context (contingency factors). MAPs evolve partly in response to the environmental contingencies (supply chain environment) confronted by individual firms. Although the role of management accounting in SCM has received increasing attention in the last few years, these relationships are still far from being clearly determined.

1.3 Research aims and research questions

It has been argued that a relationship exists between SCM and management accounting and between these two organizational practices and supply chain and firm performance

(Berry *et al*., 1997; Dekker and Van Goor, 2000; Cooper and Slagmulder, 2004; Ramos, 2004). This research study has two aims. The first aim is to empirically test a framework identifying the relationships among SCM practices, MAPs, supply chain performance and firm performance. This study will specifically examine these relationships as contingent variables that impact on MAPs and performance. Additionally, this study will also expand the current SCM theoretical framework by integrating new constructs from another field (that is, MAPs). It is of interest to study the integration of MAPs and SCM by incorporating new constructs representing management accounting practices into the SCM model (Li *et al*, 2006; Koh *et al*., 2007).

The second aim is to explore whether MAPs vary with levels of SCM practices. In particular, investigation whether sophistication levels of MAPs are significantly influenced by SCM practices will be made. Extending the initial study of Abdel Kader and Luther (2006a; 2008), Gerdin (2005), Dekker and Van Goor (2000) and Tillema (2005) on the sophistication level of MAPs, this second aim applies the IFAC's model of the management accounting stages of evolution. Additionally, the second aim is to examine the fit between SCM practices and MAPs in achieving a higher firm performance level using a contingency theory framework. Hence, the research questions (RQs) addressed by the study are as follows:

RQ1: What is the extent of supply chain management practices in large firms?

RQ2: What is the extent of management accounting practices in large firms?

RQ3: Are supply chain management practices directly positively related to management accounting practices?

RQ4: Are supply chain management practices directly positively related to supply chain performance and firm performance?

RQ5: Are management accounting practices directly positively related to supply chain performance and firm performance?

RQ6: Is supply chain performance directly positively related to firm performance?

To achieve the above aims, this study has five specific research objectives (ROs):

RO1: To examine the extent to which firms have adopted supply chain management and management accounting practices.

RO2: To investigate whether management accounting practices are associated with supply chain management practices.

RO3: To investigate whether supply chain management practices enhance supply chain performance and overall firm performance.

RO4: To investigate whether management accounting practices enhance supply chain performance and overall firm performance.

RO5: To investigate whether supply chain performance is associated with overall firm performance.

1.4 Background of the research setting: Malaysia

Developing countries, including Malaysia, faced with the problem of improving their economic and social status have looked to the industrial sector to play the role of an engine for such development. This desire to achieve economic development through the contributions from large industrial sectors should therefore stimulate research interest in their supply chain activities and management accounting systems, which have been

suggested as one success factor in companies. However, contributions in the ongoing debate on the effectiveness of management accounting practices have attracted very little attention in these countries. As noted by researchers (Reid and Smith, 2000; Haldma and Lääts, 2002; Ajibolade *et al.*, 2010) studies of management accounting systems have been dominated by studies of large companies in the developed countries.
Over the past five years, Malaysia has steadily increased its global competitiveness; ranked in the top ten for both labour market efficiency and cost effectiveness for doing business among Asian countries. This has allowed Malaysia to overcome relatively lower levels of employee education and below-average basic infrastructure. Within Malaysia, and many other countries, the manufacturing sector is the largest business sector. The Malaysian manufacturing sector contributed 48.1% to gross domestic product (GDP), 85.2% to total export and over 30% to total employment (http://www.malaysian-economy.com/ accessed on 21/12/2008). The Malaysian manufacturing sector provides the sectoral context for this research.

1.5 Outline of the thesis

This thesis is divided into nine chapters, as shown in Figure 1.1. The following sections provide a brief synopsis of each of the chapters contained in this study.

Chapter 2 – Literature review

The chapter begins with a review of the practices of SCM; the contingent variables in this study. This chapter examines the concepts of SCM, the scope of SCM practices and their impact on firm performance. The chapter specifically outlines six SCM dimensions, namely, strategic supplier partnership, customer relationship, information sharing and quality, internal lean practices and postponement. Chapter 2 also reviews the previous academic literature pertaining to the management accounting development models based on the IFAC framework, management accounting techniques in inter-organizational contexts and past research on MAPs in developed countries. This chapter reviews the theoretical background literature on SCM practices, MAPs and firm performance in order to form the theoretical basis for this research as presented in the following chapters.

Chapter 3 – Hypothesis development and research models

Chapter 3 begins with the contingency theory perspective of management accounting in an attempt to provide a theoretical underpinning for contingency factors affecting its practice. This chapter also presents an overall framework that depicts the relationships between the constructs and the development of research hypotheses. These are rationalised with reference to previous academic literature in both supply chain management and management accounting. The theoretical framework is based on a contingency theory perspective and two conceptual models are proposed.

Chapter 4 – Research methodology

This chapter outlines the research methods and data collection approaches pursued for this study. Employing a positivist paradigm, data for this research was collected using a mailed questionnaire survey to senior accounting executives / senior managers of large companies and supplemented by selected interviews. A discussion of the merits and limitations of the use of survey instruments follows, including an analysis of acceptable response rates in management accounting survey research, followed by the reasons why the triangulation method was employed. The measurement instruments for the constructs in the proposed models are adopted with modification from earlier studies.

The chapter then describes the data collection phase of the research study. Evaluation of the data's freedom from bias is reported, as this determines the validity of the results generated. Finally, as an alternative to Structural Equation Modelling, Partial Least Squares path modelling was deemed the most appropriate statistical methodology for this study; both of these concepts are then discussed.

Chapter 5 – Descriptive analysis

This chapter provides descriptive analysis about the sample and the measures used. It presents the profile of respondents and the participating companies and the state of supply chain management practices and management accounting practices in the sector under research.

Chapter 6 – Validation of the measurement model

The chapter explains the process through which the validation of the measurement model as per the requirements of the PLS statistical methodology was satisfied. The instrument was tested using rigorous statistical tests including convergent validity and discriminant validity.

Chapter 7 – Assessment of conceptual models

Within this chapter each of the conceptual models is assessed pursuant to the rigors of PLS testing to determine whether the proposed hypotheses are statistically supported or not. Additional statistical testing which had not been previously hypothesised is also performed in this chapter; these tests examine emergent issues and were dictated by the statistical results generated.

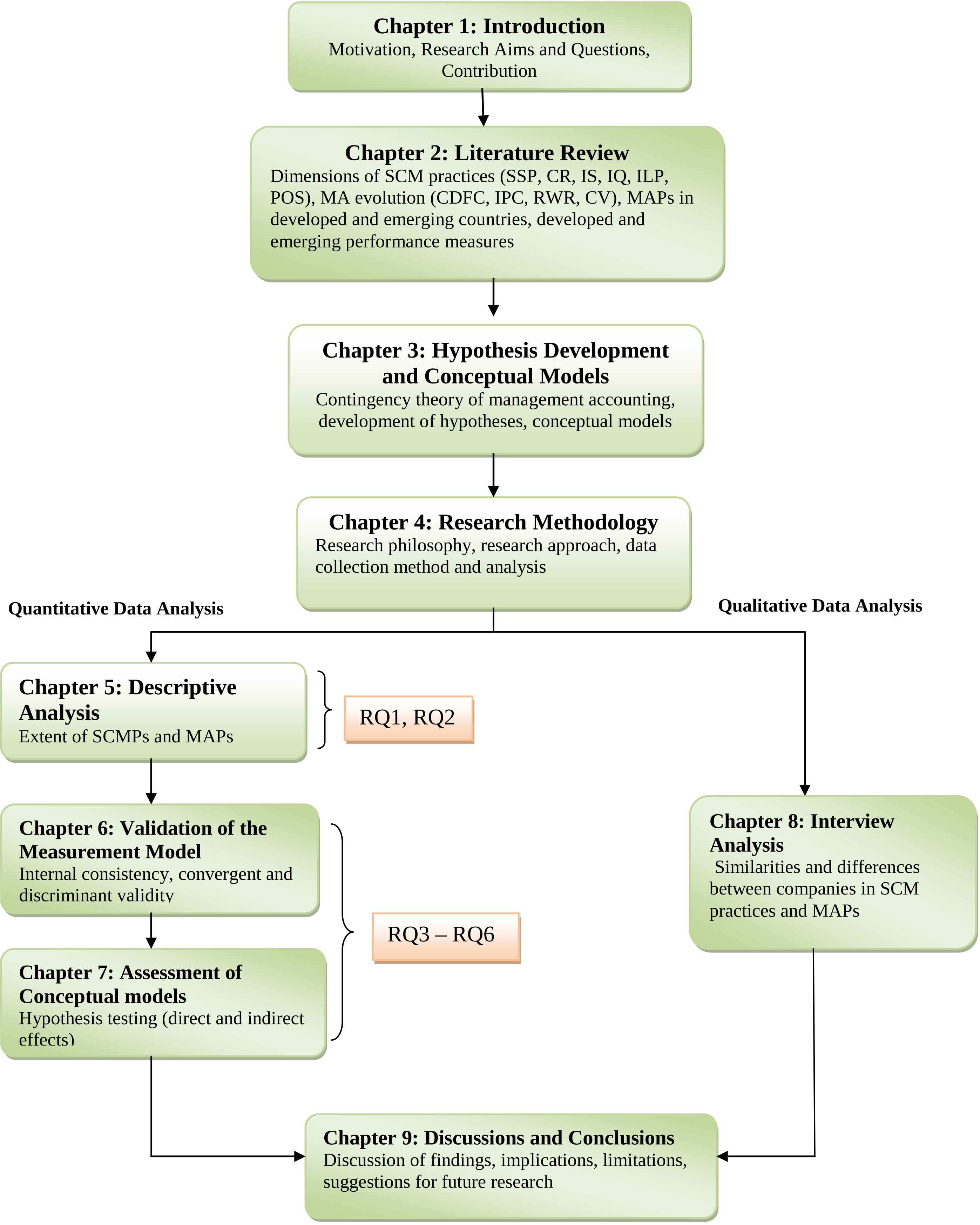
Chapter 8 – Interview analysis

This chapter describes the findings from selected semi-structured interviews with six companies to secure a deeper understanding and richer description of the nature of SCM practices and MAPs. The interview questions examine whether, and in what way, managers perceive the level of SCM practices influence management accounting practices, specifically the sophistication level of management accounting. Comparisons across organizational context were sought. The focus of these interviews was to gather the experiences and views of selected companies. The chapter analyses similarities and differences between the firms in terms of the practice of supply chain management, management accounting practices (MAPs), their relationships and the impact of SCM on MAPs and performance.

Chapter 9 – Discussions and conclusions

This chapter discusses the results obtained from both quantitative data and qualitative data analysis, particularly assessing each of the conceptual models and accompanying hypotheses outlined in Chapter 3 and links the findings to the relevant academic literature. The chapter finally outlines the conclusions that can be drawn from the results of this study, including the findings from semi structured interviews. The chapter concludes with some limitations of this study and outlines potential avenues for future research in this area.

Figure 1.1: Organization of the thesis



2 LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the relevant supply chain management and management accounting literature. Within this review, it is argued that supply chain management (SCM) has several implications for management accounting. Some evidence from the literature suggests that the change in the level of SCM practices has not been accompanied by related changes in the utilisation of management accounting practices. Management accounting information, on the other hand, may be used to build collaborative networks as new information and information technologies enable closer ties between firms that are independently owned but operationally linked. Thus, an opportunity might arise to integrate these two widely accepted fields in today's modern business world. For this purpose, this chapter provides the basic source for the development of SCM and management accounting variables. Research hypotheses will be developed in the following chapter.

2.2 Supply chain management

The concept of supply chain management (SCM) encompasses planning, designing, purchasing, production, inventory control, storage handling, distribution, logistics and quality (Grant *et al.*, 2006). SCM is considered as one of the most popular operations strategies for improving organizational competitiveness in the twenty-first century (Wisner, 2003; Min and Mentzer, 2004; Burgess *et al.*, 2006). SCM has developed into a major conceptual approach inside management and business administration (Seuring, 2008). The concept began to attract interest in the mid-1990s. In the 1980s, the issues of inter-organizational cost management (IOCM) had been given insufficient consideration.

In 1990s, however, this was given a great deal of attention, focusing on the integration of suppliers and customers to achieve an integrated value chain with the help of information technologies and systems (Narasimhan and Jayaram, 1998; Croom *et al*., 2000; Mentzer *et al*., 2001; Gunasekaran *et al*., 2008).

The term supply chain management is not used consistently within the literature (Mabert and Venkataramanan, 1998). Burgess *et al*. (2006) systematically review literature on SCM and claim that there appears to be little consensus on the definition of the term. In the 1990s, literature viewed SCM from a purchasing and supply perspective or as a synonym of supplier management (Lamming, 1996; Tan *et al*., 1998; 1999) and many organizations still tend to consider SCM as being the same as integrated logistics management (Alvarado and Kotzab, 2001), a transportation and logistics perspective (Christopher *et al*., 1998). Traditionally, both upstream and downstream portions of the supply chain may have behaved as disconnected activities that receive random flows of information over time. However from the 2000s, SCM was viewed with a more holistic approach probably attributable to the increase in global competition and cooperation between firms (Mentzer *et al*., 2001; Cigolini *et al*., 2004; Min and Mentzer, 2004; Burgess *et al*., 2006; Ballou, 2007).

According to Ballou (2007), a supply chain is defined as a set of relationships among suppliers, manufacturers, distributors, and retailers that facilitates the transformation of raw materials into final products. Although the supply chain is composed of a number of business components, the chain itself is viewed as a single entity. The supply chain concept is theorized from the formation of a value chain network consisting of individual functional entities committed to providing resources and information to achieve the objectives of efficient management of suppliers as well as the flow of parts. These functions of entities are broadly defined as three or more organizationally distinct handlers of products where products include physical goods, services and information (Koh *et al*., 2007). Chen and Paulraj (2004) illustrate the basic supply chain relationship as shown in Figure 2.1. A typical supply chain is a network of materials, information, and services processing links with the characteristics of supply, transformation and demand.

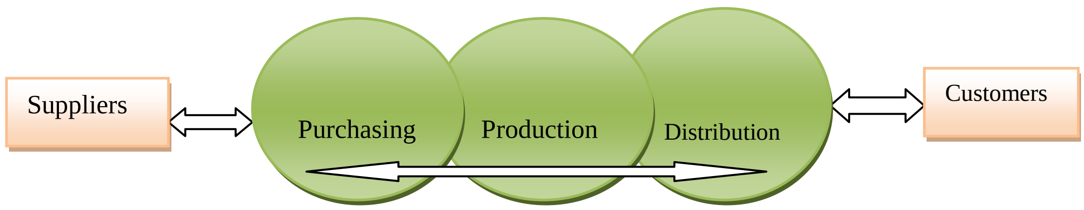


Figure 2.1: Basic supply chain relationship

Source: Chen and Paulraj (2004), p.120.

According to Christopher (2005), the concept of SCM is in fact an extension of the logic of logistics. Lambert and Cooper (2000) have also differentiated between logistics and SCM. Logistics is a planning orientation and framework that seeks to create a single plan for the flow of product and information through a business. Logistics management involves main activities like purchasing and procurement, inventory management, materials management, transportation management, warehousing, materials handling, packaging and reverse logistics, management of logistics costs (Grant *et al*., 2006). In other words, logistics management is primarily concerned with optimizing flows within the organization, whilst SCM recognizes that internal integration by itself is not sufficient (Grant *et al*., 2006). That is, logistics management is about optimizing the flows within the firm whereas SCM seeks to achieve trust and coordination between processes of all firms in the supply chain. Successful SCM, therefore, requires a change from managing individual functions to integrating activities into key supply chain processes.

SCM builds upon this logistics framework and seeks to achieve linkage and co-ordination between the processes of other entities in the pipeline: suppliers, customers and the organization itself. The focus of SCM is on co-operation and trust and the recognition that, properly managed, the 'whole can be greater than the sum of its parts'. SCM is therefore a concept that involves the coordination of operations from the supplier of raw materials at one end of the supply chain all the way to the consumer at the other end. Thus, supply chain value comprises the collective value of many firms' value chains.

Harland (1996) provides a framework differentiating among four levels of analysis in SCM; the internal supply chain, the dyadic relationship, the external supply chain and the supply network. The four main interpretations of the term 'SCM' outlined by Harland are as follows:

1. The internal supply chain that integrates business functions involved in the flow of materials and information from inbound to outbound ends of the business.
2. The management of dyadic or two party relationships with immediate suppliers.
3. The management of a chain of businesses including a supplier, a supplier's suppliers, a customer and a customer's customers.
4. The management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers.

The Council of Supply Chain Management Professionals (CSCMP), one of the leading professional organizations for logistics personnel, defines SCM thus,

> *"Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly it also includes coordination and collaboration with channel partners which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies."* (http:cscmp.org/aboutcscmp/definitions.asp, accessed on 26/11/2008)

As defined by the CSCMP, SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion and all logistics management activities as well as coordination and collaboration with channel partners. In other words, SCM includes a set of approaches and practices to effectively integrate suppliers, manufacturers, distributors and customers for improving the long term performance of the individual firms and the supply chain as a whole.

As all the concepts of SCM discussed above are consistent with the definition given by the CSCMP; throughout this text, the CSCMP definition of SCM is used. This definition includes the flow of materials and services in both the manufacturing and service sectors. The service sectors include retailers and wholesalers as logistics is not confined to manufacturing operations alone.

2.3 Supply chain management practices

As section 2.2 explained, broadly speaking the concept of SCM has been proposed and summarised as a holistic approach to managing operations within collaborative inter-organization networks. To improve the performance of the whole supply chain, a set of intra and inter-organization practices are implemented. The literature portrays SCM practices from a variety of different perspectives with a common goal of ultimately improving firm performance (see e.g. Tan *et al*., 1999; Wisner, 2003; Gunasekaran *et* *al*., 2004; Kim, 2006; Li *et al*., 2006; Koh *et al*., 2007; Chow *et al*., 2008). Literature is also replete with reports of firms that developed and adopted practices like strategic supplier-buyer relationships, strategic customer relations practices, information sharing, and internal supply chain activities. A thorough review of SCM practices literature was undertaken to support this research (see Table 2.1).

Table 2.1: Literature on dimensions of SCM practices

Dimensions of SCM practices	**Authors**
Supplier partnership / strategic supplier partnerships / supplier management / strategic purchasing	Donlon, 1996; Monczka *et al*., 1998; Tan *et al*., 1998; Wisner, 2003; Chen and Paulraj, 2004; Chen *et al*., 2004; Li *et al*., 2005; 2006; Koh *et al*. 2007; Chow *et al*., 2008; Fynes *et al*., 2008
Customer relationship / Customer service management	Tan *et al*., 1998; Tan *et al*. 2002; Wisner, 2003; Min and Mentzer, 2004; Li *et al*. 2005; 2006; Fynes *et al*., 2005; Koh *et al*., 2007; Chow *et al*., 2008
Information sharing / Information network	Balsmeier and Voisin, 1996; Donlon, 1996; Mentzer *et al*., 2001; Tan, 2001; Tan *et al*., 2002; Min and Mentzer, 2004; Li *et al*., 2005; 2006; Fynes *et al*., 2005, Kim, 2006; Chow *et al*., 2008
Internal Lean Practices / JIT Capability /	Womack and Jones, 1996; Taylor, 1999; McIvor, 2001; Tan *et al*., 2002; Zhu and Sarkis, 2004; Li *et al*., 2005; 2006; Kim, 2006; Koh *et al*., 2007
Postponement	Van Hoek *et al*., 1999; Waller *et al*., 2000; Van Hoek, 2001; Li *et al*., 2005; 2006; Boone *et al*., 2007; García-Dastugue and Lambert, 2007
Cross-functional teams / Cooperation / Integrated behaviour / supply chain integration /	Mentzer *et al*., 2001; Tan *et al*., 2002; Min and Mentzer, 2004
Logistics integration / Process integration / Continuous Process Flow / Logistics infrastructure	Chen and Paulraj, 2004; Min and Mentzer, 2004; Kim, 2006
Outsourcing	Donlon, 1996; Koh *et al*., 2007
Other dimensions:	
Risk and reward sharing	Mentzer *et al*., 2001; Min and Mentzer, 2004
Geographical proximity	Tan *et al*., 2002; Kim, 2006
Supply chain leadership / Formalization of supply chain organization	Min and Mentzer, 2004; Kim, 2006
Quality	Tan *et al*., 1998
Agreed vision and goals	Min and Mentzer, 2004
Tier position	Fynes *et al*., 2008

Source: Author

SCM practices are thus the set of activities undertaken by an organization to promote effective management of its supply chain. Moreover, various value-adding processes from material purchasing, production and assembly, to distribution and customer order delivery are integrated and synchronized to achieve the common goal of enhancing customer satisfaction (Chan and Qi, 2003). In this regard, the paradigm of modern business management has witnessed a significant change from competing as solely autonomous entities to competing as integrated supply chains (Lambert *et al*., 1998).

Traditionally, practitioners and researchers have limited their analyses and scope to individual stages within the larger chain, but have recently identified a need for a more integrated approach to manufacturing system design. Consequently, the supply chain framework has emerged as an important component of this new, integrated approach (Harland *et al*., 2004; Christopher, 2005; Grant *et al.*, 2006). An integrated supply chain has a clear advantage for the competitiveness of the individual companies, while SCM is a strategy that integrates the various organizations' objectives in order to increase the efficiency of the entire supply chain (Mentzer *et al*., 2001; Cigolini *et al*., 2004; Min and Mentzer, 2004; Burgess *et al*., 2006; Ballou, 2007).

This study employs six dimensions of SCM practices which include strategic supplier partnership (SSP), customer relationship (CR), information sharing (IS), information quality (IQ) , internal lean practices (ILP) and postponement (POS). The six constructs cover upstream (strategic supplier partnership) and downstream (customer relationship) sides of a supply chain, information flows across the supply chain (information sharing and information quality) and internal supply chain processes (internal lean practices and postponement). These six dimensions have also been empirically developed and validated by Li *et al.* (2005). It should be pointed out that even though the above dimensions capture the major aspects of SCM practices, they cannot be considered comprehensive. As shown in Table 2.1, other factors such as cross-functional teams (Mentzer *et al*., 2001), agreed vision and goals and supply chain leadership (Min and Mentzer, 2004), geographical proximity (Tan *et al*., 2002; Kim, 2006), logistics integration (Chen and Paulraj, 2004; Min and Mentzer, 2004) are also identified in the literature. The six dimensions used in this study will now be discussed in more detail.

2.3.1 Strategic supplier partnership

This dimension is defined as the long term relationship between the organization and its suppliers (Li *et al*., 2006). This relationship has many labels in the literature including integrated purchasing strategy, supplier integration, buyer-supplier partnership, strategic supplier alliances and SCM (Monczka *et al*., 1998; Tan *et al*., 1998).

A strategic partnership emphasizes direct, long-term association and encourages mutual planning and problem-solving efforts (Morgan and Monczka, 1996; Monczka *et al*., 1998; Gunasekaran *et al*., 2001; Chen *et al*., 2004). Further, according to Wisner (2003), many firms have successfully reduced their supply bases in order to form a smaller set of highly competent suppliers to achieve improvements in purchased product quality and timing. Thus, more and more businesses are striving to develop long term strategic partnerships with a few competent suppliers and collaborate with them in product development, inventory control and outsourcing. Much of the recent literature on SCM focuses on attempts to form alliances with suppliers to manage the purchasing and supply function (Wisner, 2003; Mahama, 2006; Lee *et al*., 2007) including supplier evaluation practice (Tan *et al*., 2002).

The objective of strategic supplier partnership is to promote shared benefits among the parties and ongoing participation in one or more key strategic areas such as technology, products and markets (Li *et al*., 2006). Improved linkages with suppliers are necessary because controlling uncertainty in customer demand, manufacturing processes and supplier performance is critical to effective SCM (Grant *et al.*, 2006). This enables organizations to work more effectively with a few important suppliers who are willing to share responsibility for the success of their products. For example suppliers participating in the early stage of product design may offer more cost effective design choices, help select the best components and technologies and help in the design assessment (Balsmeier and Viosin, 1996; Stuart, 1997).

Involving suppliers early on in product design efforts allows manufacturers to develop alternative conceptual solutions, select the best and most affordable components, materials and technologies, and receive help in design assessment (McGinnis and Vallopra, 1999; Wisner, 2003; Lee *et al*., 2007). According to Tan *et al*. (1998), working cooperatively with suppliers can move beyond mere cost reduction into the domain of manufacturing efficiency. More importantly, manufacturers have also utilized the knowledge and resources of key suppliers to support new product development efforts (Morgan and Monczka, 1996). This is also supported by Gunasekaran *et al.* (2004) who claim that the supplier partnership could reduce uncertainty and enhance control of supply and distribution channels.

By developing strategic supplier partnership it is possible to work more effectively with a few important suppliers who are willing to share responsibility for and in the success of the product. Strategically aligned companies can work closely together and eliminate wasted time and effort rather than simply shifting the burden to some other link in the supply chain.

2.3.2 Customer relationship

SCM demands that organizations look beyond their own boundaries and consider linkages with not only suppliers but also customers along the value chain. The importance of customer orientation in the supply chain framework has consistently been supported by numerous academic writings (Gunasekaran *et al*., 2004; Min and Mentzer, 2004; Christopher, 2005; Jeong and Hong, 2007). Since the customer is the ultimate judge of supply chain performance, effective and timely responses to ever-changing customer tastes and preferences have become essential components for successful business performance (Lee *et al*., 2007). As customers remain the primary focus of the SCM process, increasingly firms are required to become more customer oriented through their supply chains. The growth of mass customization and personalized service is leading to an era in which relationship management with customers is becoming crucial for corporate survival (Wisner, 2003; Li *et al*., 2006). To succeed, businesses have to respond to the challenge of satisfying the demand of customers for products of a high quality, but low price. It is the end customer that drives the economics of the entire supply chain, the strategic position of the chain and the firms within it are then strengthened (Cooper and Slagmulder, 1998).

The dimension of customer relationship comprises the entire array of practices that are employed for the purpose of managing and handling customer complaints, establishing long-term relationships with customers and improving customer satisfaction (Min and Mentzer, 2004; Li *et al*., 2006). Firms should be responsive to customers' unique and rapidly changing needs (Gunasekaran *et al*., 2008) for instance by implementing customer relationship strategies (Wisner, 2003) and new operation technologies in response to the challenges and demands of the twenty-first century. Operational strategies in SCM should be designed and managed around customer needs. Good relationships with supply chain members including customers are needed for successful implementation of SCM programmes. A close customer relationship allows an organization to differentiate its products from competitors, sustain customer loyalty and extend the value it provides to its customers (Tan *et al*., 1998).

According to Ellram *et al*. (1996) integrating supply chain logistics functions such as using transportation partners should also be implemented to speed the delivery process and improve customer service. Transportation and other outbound logistics functions focus not only on a number of strategically important supply chain management issues such as JIT and customized delivery, warehouse and facility location, customized product / service issues, but also on customer relationship management (Lambert *et al*., 1998; Chow *et al*., 2008).

Additionally, one of the links in the supply chain is distribution, which is the closest link to customer demand. Products and services must be available when the customer wants and needs them. Producers must be able to source materials, produce goods and deliver the right products to the right markets on time. This means that distribution networks need to accept shorter lead times, deliver across the globe and provide flexible product options (Cloud, 2000).

2.3.3 Level of information sharing

Information sharing is at the core of collaborative, supply chains based business. This dimension of SCM practice refers to the extent to which critical and proprietary information is communicated between trading partners (Monckza *et al*., 1998; Li *et al*., 2005). According to Mentzer *et al*. (2001), shared information can vary from strategic to tactical in nature, for instance, from information about logistics activities to general market and customer information. The key to a fully integrated supply chain is making available undistorted and up-to-date data at every point within the supply chain (Balsmeier and Voisin, 1996).

The shift toward cooperation among supply chain members has implied the early involvement of not only major suppliers in product development but also means a more comprehensive sharing of information. At the ultimate level of integration, all member links in the supply chain are continuously supplied with information in real time. Therefore, effective SCM is not possible without Information Technology (IT) systems designed to provide readily accessible information to all supply chain participants (Min and Mentzer, 2004). Advances in information technology have changed modern business practice, making collaborative supply chain management possible (Fawcett *et al*., 2007).

Many researchers have emphasized the importance of information sharing in SCM practices (see e.g. Balsmeier and Voisin, 1996; Mentzer *et al*., 2001; Tan *et al.,* 2002; Fynes *et al.*, 2005; Fawcett *et al.*, 2007; Chow *et al*., 2008). It allows a firm to outsource much of its inventory planning to suppliers who become responsible for monitoring inventory levels, planning replenishment and suggesting new ideas to improve throughout. This typically occurs when information that is critical to one firm is possessed by another firm further up or down the supply chain. Consequently, two or more firms then create relationships that share organizational resources including information that helps to improve the efficiency of the inter-firm activities. By taking and sharing the data available with other parties within the supply chain, information can be used as a source of competitive advantage (Li *et al*., 2005), and the capability of the channel as a whole to react faster and more effectively to developments in the market will be increased (Fawcett *et al*., 2007). Thus, the flow of information and the ability to analyse that information is a key driver in today's supply chain challenges.

2.3.4 Quality of information sharing

Information sharing in SCM has two aspects: quantity (amount of information shared) and quality. Both aspects are important for the practices of SCM and have been treated as independent constructs in previous SCM studies (Monczka *et al*., 1998; Li *et al*., 2005; 2006). Quality of information sharing includes such aspects as the accuracy, timeliness, adequacy and credibility of information exchanged (Li *et al*., 2005). Achieving good supplier and customer integration means that information must be processed with accuracy and timeliness (Grant *et al*., 2006). This is because the response systems (e.g. the customer response system) require frequent responses to fluctuations in customer demand.

While information sharing is important, the significance of its impact on SCM depends on what information is shared, when and how it is shared, and with whom. Divergent interests and opportunistic behaviour of supply chain partners and informational asymmetries across supply chain affect the quality of information. Ensuring the quality of the shared information becomes the critical aspect of effective SCM as there is a built-in reluctance within organizations to giving away more than minimal information (Tomkins, 2001). Information disclosure is perceived as a loss of power (Monczka *et al*., 1998; Li *et al*., 2006).

2.3.5 Internal Lean Practices

Internal lean practices (ILP) are the practices of eliminating waste and non-value added activities in a manufacturing system (Womack and Jones, 1996; McIvor, 2001). The term ‘lean’ refers to a system that uses less input to produce at a mass production speed while offering more variety to the end customer (Li *et al*., 2005). Lean practices are therefore represented by low inventory, small lot sizes and Just-in-time delivery (Taylor, 1999; Zhu and Sarkis, 2004; Li *et al*., 2005). The practices are characterized by reduced set-up times, small lot sizes, pull production, short lead times from suppliers, streamlining ordering, receiving and other paperwork and continuous quality improvement (Womack and Jones, 1996; Li *et al.*, 2005). As elimination of waste is the fundamental idea within the lean system, manufacturing companies have accomplished massive productivity gains from the implementation of this system (Koh *et al*., 2007).

According to Cooper and Slagmulder (1999), the principles in ILP include specifying activities that create value from customers’ point of view; implementing just-in time production systems and continuously removing non-value added activities. To do these, it is very important to identify all steps necessary in designing, ordering and producing the product across the whole value stream in order to highlight non value-adding waste.

In general, SCM seeks improved participant performance through elimination of waste and better use of internal and external supplier capabilities and technologies (Morgan and Monczka, 1996). Lean practices have become a very important aspect of effective SCM, promising not only cost savings and better productivity but also productive working partner relationships along the supply chain (Taylor, 1999; McIvor, 2001; Li *et al*., 2005).

2.3.6 Postponement

Postponement refers to the practice of delaying one or more operations to a later point in the supply chain, thus delaying the point of product differentiation until customer orders are received (Beamon, 1998; Waller *et al*., 2000; Van Hoek, 2001). It allows a company to be flexible in developing different versions of the product as needed, to meet changing customer needs, and to differentiate a product or to modify a demand function (Waller *et al*., 2000; Li *et al*., 2005). Postponement was described as an analytical tool that could be used to determine the most efficient manner to make products available to the end customer. The practice can be extended further upstream in the supply chain to suppliers of components and raw materials, or downstream in the delaying of transportation costs, warehousing and storage resulting in significant savings inventory and transportation costs (Van Hoek *et al*., 1999).

The term postponement has evolved in two streams: manufacturing postponement and geographic or logistics postponement (or time-based postponement). Manufacturing postponement is the delay of changes in the form and identity of products and it is implemented by redesigning the products and manufacturing processes. Geographic or logistics postponement is delaying in time the movement of product forward in the supply chain (García-Dastugue and Lambert, 2007). According to Waller *et al.* (2000), the idea of postponement was first recommended in 1950 by Alderson, who argued that manufacturers should add options or make differentiating changes to the product close to the time of purchase by the end use customer with the aim of offering high product customization without incurring immense costs.

There are numerous potential benefits to be realized from postponement, one of the most compelling of which is the reduction in the value and amount of held inventory, resulting in lower holding costs (Beamon, 1998). It also allows an organization to be flexible in developing different versions of the product in order to meet changing customer preferences (Waller *et al*., 2000). It is recognized that by offering product options to customers, a company would be able to meet customer needs more closely (Van Hoek, 2001; Li *et al*., 2005; Boone *et al*., 2007). However, issues associated with postponing are the potential of losing customers or the impact postponement has on various costs (Graman and Magazine, 2006). Generally, the adoption of postponement may be appropriate in the following conditions: innovative products, high specialization and wide range and high demand uncertainty (Van Hoek *et al*., 1999).

2.4 Management accounting

The terms management accounting, management accounting systems (MAS), management control systems (MCS), and organizational controls are sometimes used interchangeably (Chenhall, 2003). Management accounting refers to a collection of practices such as product costing or budgeting, while MAS refers to the systematic use of management accounting to achieve some goals. MCS is a broader term that encompasses MAS and also includes other types of controls, while organizational controls is used to refer to controls built into activities and processes such as just-in-time management and quality control (Chenhall, 2003). Throughout this research, the term management accounting practices (MAPs) will be used (Anderson and Lanen, 1999; Joshi, 2001; Haldma and Lääts, 2002; Abdel-Kader and Luther, 2006b; 2008; Wu *et al*., 2007). MAPs in this research cover both techniques and processes within organizations and relationships between different organizations.

The term 'sophistication' in management accounting has been used to refer to the capability of management accounting systems to provide a broad spectrum of information relevant for planning, controlling and decision-making all in the aim of creating or enhancing value (Tillema, 2005; Abdel-Kader and Luther, 2008). Other terms used to describe increase in management accounting sophistication are management accounting 'innovation' (Bjørnenak and Olson, 1999) and 'emerging' management accounting techniques (Ittner and Larcker, 2001).

2.4.1 The development of management accounting

Accounting has always been used for decision-making, resource allocation and operational control (Atkinson *et al*., 2007; Drury, 2008). The rapid industrialization in the late nineteenth century saw accounting information becoming the managerial tool of choice for operational control (Gupta and Gunasekaran, 2005). The field has made rapid progress since World War II and become a multidisciplinary management tool comprising a series of practical techniques such as standard costing, budgeting, cost-volume profit analysis, internal transfer pricing, variance analysis, responsibility accounting, performance evaluation and others (Atkinson *et al*., 2007; Drury, 2008).

Management accounting plays a fairly active part in business management in the industrialized world (Scapens, 1994; Kaplan, 1998).

The external financial reporting aspects of accounting information systems, however, became dominant and overshadowed its managerial role in the early twentieth century (Johnson and Kaplan, 1987). Johnson and Kaplan (1987) argued the crisis in management accounting occurred because practitioners have generally failed to keep pace with the significant changes taking place in the manufacturing and competitive environment. They made the poor state of affairs of management accounting known as early as in 1987 with their book, *Relevance Lost*. The management accounting information, driven by the procedures and cycle of the organization's financial reporting system was regarded as too late, too aggregated, and too distorted to be relevant for managers' planning and control decisions. Management accounting systems also fail to provide accurate product costs. Management accounting researchers know little about how these changes in the manufacturing competitive environment are actually affecting MAPs (Spicer, 1992).

During the last two decades, the evolution of alternative sources of relevant information, globalization, technology and competitive forces led to a systematic shift and greater emphasis on the role of accounting information as an increasingly important tool for management control (Kaplan and Atkinson, 1998; Chenhall, 2003; 2007; Drury, 2008). Hence, if the development of management accounting systems trails behind the demands of management, the systems will eventually lag behind the operations of the organization, because their development is responsive to the demands of management and the environment (Drury, 2008).

Considerable changes have taken place in the management accounting practices of firms over the course of the past few decades. From its traditional emphasis on financially oriented cost and control information, management accounting has evolved to encompass a more strategic approach that emphasises the identification, measurement and management of the key financial and operational drivers of shareholder value and customer value (IFAC, 1998; Ittner and Larcker, 2001).

As an integral part of the management process, management accounting distinctively adds value by continuously probing whether resources are used effectively by people and organizations in creating value for customers, shareholders or other stakeholders. The information provided by the management accounting process is considered as a primary informational source for decision making and control (Atkinson *et al*., 2007) by assisting managers at various levels inside an organization to effectively make strategic, operational and financial decisions (Garrison and Noreen, 2000; Horngren *et al*., 2000). It has always been charged with the responsibility to provide more accurate and relevant cost and other information to managers for making decisions (Hopper *et al*., 2007).

The growing level of global competition throughout the 1990s intensified the challenges for managers who need to consider more effective ways of achieving competitive advantage and improving firm performance (Baines and Langfield-Smith, 2003). One of the ways is through the adoption of articulated strategies, and innovative management accounting systems (Ittner and Larcker, 2001; Smith, 2000). For an organization to survive in the competitive, ever-changing environment, it must put in place sound management accounting practices. Numerous writers have discussed the broad set of MAPs based on their purpose: costing, budgeting, performance evaluation, information for decision making and strategic analysis (see e.g. Chenhall and Langfield-Smith, 1998a; Anderson and Lanen, 1999; Joshi, 2001; Luther and Longden, 2001; Abdel-Kader and Luther, 2006b).

2.4.2 Management accounting evolution

The field of organizational activity encompassed by management accounting has developed through four evolutionary yet recognizable stages. IFAC (1998) provides a framework explaining the development of management accounting in terms of a four stage evolution model (see Figure 2.2) as follows:

Stage 1: Cost Determination and Financial Control (CDFC)

IFAC describes management accounting before 1950 as a technical activity essential for the pursuit of organizational objectives. Production technology was relatively simple with products going through a series of distinct processes. Labour and material costs were easily identifiable and the manufacturing processes were mainly governed by the speed of the manual operation. Hence, direct labour provided a natural basis for assigning overheads to individual products. The focus on product costs was supplemented by budgets and the financial control of production processes. The emphasis at this stage was on internal matters and production capacity. Thus, the use of budgeting and cost accounting technologies was common in this period. The dissemination of cost information tended to be slight and its use for management decision-making poorly exploited.

Stage 2: Information for Management Planning and Control (IPC)

By 1965, the focus had shifted to the provision of information for management planning and control. IFAC considers this as a management activity stage but in a more staff role.

It therefore involved staff support to line management through the use of technologies such as decision analysis and responsibility accounting. Management controls were oriented towards manufacturing and internal administration rather than strategic and environmental considerations. Management accounting as part of the management control system tended to be reactive, that is, identifying problems and actions only when deviations from the business plan took place.

Stage 3: Reduction of Waste of Resources in Business Processes (RWR)

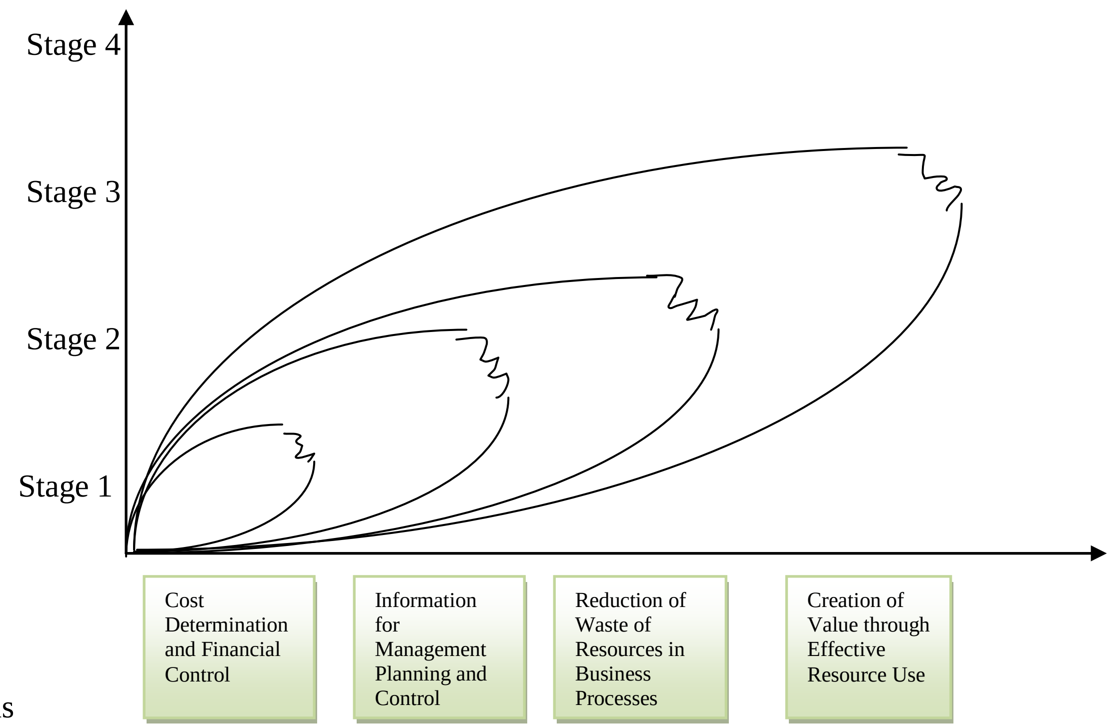
By 1985, the challenge of meeting global competition changed the focus of management. Attention was centred on the reduction of waste in resources used in business processes, through the use of process analysis and cost management technologies. This shift is partly attributed to the increased global competition in the early 1980s caused by the oil price shock in the 1970s, rapid technological development and the greater capability of information systems. Increased competition was accompanied and underpinned by rapid technological development which affected many aspects of the industrial sector. For example, the use of robotics and computer-controlled processes improved quality and in many cases, reduced costs. Developments in computers, particularly the emergence of personal computers, obviously changed the nature and the amount of data which could be accessed by managers. Thus, the design, maintenance and interpretation of information systems became of considerable importance in effective management. The challenge of global competition was met by introducing new management and production techniques, and at the same time controlling costs, often through reduction of waste in resources used in business processes supported by employee empowerment. The focus in this stage is on resource management and the development of process analysis and cost management techniques.

The challenge for management accountants, as the primary providers of cost and accounting information, is to ensure through the use of process analysis and cost management techniques that appropriate information is available to support managers and employees at all levels.

Stage 4: Creation of Value through effective resource use (CV)

By 1995, attention had shifted to the generation or creation of value through the effective use of resources, through the use of technologies which examine the drivers of customer value, shareholder value and organizational innovation. This shift in attention is due to uncertainty and new advances in manufacturing and information-processing technologies. For example the emergence and development of world-wide web and associated technologies led to the appearance of e-commerce.

Stage



Focus

Figure 2.2: Stages and evolution of management accounting practices

Source: IFAC (1998)

While these four stages are recognizable, the process of change from one to another has been evolutionary. Each stage of evolution represents adaptation to a new set of conditions facing organizations, by the absorption, reshaping and addition to the focus and technologies used previously. Each stage is a combination of the old and the new, with the old reshaped to fit with the new in addressing a new set of conditions in the management environment (IFAC, 1998).

A critical difference, however, between Stage 2 and Stages 3 and 4 is the change of focus away from information provision and towards resource management, in the form of waste reduction (Stage 3) and value creation (Stage 4) (Abdel-Kader and Luther, 2008). The use of resources (including information) to create value is seen to be an integral part of the management process in contemporary organizations. This, principally chronological, model provides an appropriate framework to classify the sophistication of MAPs that exist across the population of contemporary organizations. The first stage represents a lack of sophistication and the fourth stage is the highest level of sophistication. Accordingly, sophistication refers to the capability of an organization's management accounting practice to provide a broad spectrum of information relevant for planning, controlling and decision-making all in the aim of creating or enhancing value (Abdel-Kader and Luther, 2008; Tillema, 2005). The characteristics of MAPs in different stages and Management accounting practices[3] and techniques categorized under each stage as proposed by Abdel-Kader and Luther (2008) are simplified and as shown in Tables 2.2 and 2.3 respectively.

[3] Suggested items for MAPs by Abdel-Kader and Luther (2008) also following Joshi (2001), Luther and Longden (2001), and Chenhall and Langfield-Smith (1998a).

Table 2.2: Characteristics of MAPs in four stages of evolution

	Stage 1: CDFC	Stage 2: IPC	Stage 3: RWR	Stage 4: CV
Representative period:	Prior 1950	1950 - 1965	1965 - 1985	1985 to date
Where position in organization:	Similar to company secretarial,	A ‘staff’ management activity,	Management accounting as an integral part of management ‘owned’ by all managers as the distinction between ‘staff’ and ‘line’ management becomes blurred.	
Role:	A necessary technical activity in ‘running’ an organization.	Providing information to support ‘line’ management’s operations.	Managing resources (including information) to directly enhance profits by bearing down on inputs	Directly enhance outputs and add value through strategy of ‘leveraging’ resources (especially information).
Main Focus:	Cost determination and controlling expenditure	Information for management planning	Reduction of waste / loss in business resources through process analysis and cost management technologies.	Creation of value through using resources effectively to drive customer value, shareholder value and innovation.

Source: Abdel-Kader and Luther (2006a), p.28

Table 2.3: MAPs based on IFAC's Stage 1 – 4 Framework

Evolution	MAPs and management accounting techniques
Stage 1 Cost Determination and Financial Control (CDFC)	- A plant-wide overhead rate - Budgeting for controlling costs - Flexible budgeting - Performance evaluation based on financial measures - Evaluation of major capital investments based on payback period and/or Accounting Rate of Return (ARR)
Stage 2 Information for Management Planning and Control (IPC)	- Separation between variable and fixed/non incremental costs - Departmental overhead rates - Regression and/or learning curve techniques - Budgeting for planning - Budgeting with 'what if analysis' - Budgeting for long term / strategic plans - Performance evaluation based on non-financial measures related to operations - Cost-Volume-Profit (CVP) analysis for major products - Product profitability analysis - Stock control models - Evaluation of major capital investments based on Discounted Cash Flow (DCF) - Long range forecasting
Stage 3 Reduction of Waste of Resources in Business Processes (RWR)	- Activity-based costing (ABC) - Activity-based budgeting - Cost of quality - Zero-based budgeting - Performance evaluation based on non-financial measures related to employees - Evaluating the risk of major capital investments projects using probability analysis or computer simulation - Performing sensitivity 'what if' analysis when evaluating major capital investments projects
Stage 4 Creation of Value through Effective Resource Use (CV)	- Target costing - Performance evaluation based on non-financial measures related to customers - Performance evaluation based on residual income or economic value added (EVA) - Benchmarking - Customer profitability analysis - Non-financial aspects documented and reported for the evaluation of major capital investments - Use of Cost of capital in DCF for major capital investments evaluation - Shareholder value analysis - Industry analysis - Analysis of competitive position - Value chain analysis - Product life cycle analysis - The possibilities of integration with suppliers' and/or customers' value chains - Analysis of competitors' strengths and weaknesses

The following section discusses some of the MAPs and techniques particularly suited to an inter-organizational setting. The techniques employed are categorized either under Stage 3 or Stage 4 in the IFAC model of management accounting evolution.

2.4.3 Management accounting techniques for supply chains

Effective management accounting techniques can create considerable value for inter-organizational supply chains. They provide timely and accurate information about the activities required for their success and information about the efficiency and quality of tasks performed. Additionally, they also provide information about the performance of managers and operating units to ensure that actions are consistent with plans. Management accounting as part of management control mechanisms and processes can be used to support, plan, measure and assess the activities and their results which is essential in coordinating the supply chain relationships (Ramos, 2004).

Researchers have documented a large number of supply chain accounting practices influencing the ongoing management of buyer supplier relationships. They are value chain analysis and activity-based costing (Dekker and Van Goor, 2000; Dekker, 2003; Agndal and Nilsson, 2007; Askarany *et al.*, 2010) and inter-organizational cost management (Kulmala *et al*., 2002; Coad and Cullen, 2006; Cooper and Slagmulder, 2004). Other supply chain techniques include target and Kaizen costing (Carr and Ng, 1995; Mouritsen *et al*., 2001), joint performance measurement system (Liberatore and Miller, 1998; Hoque and James, 2000; Axelsson *et al.,* 2002; Mahama, 2006) and open book accounting (Seal *et al.,* 1999; Van der Meer-Kooistra and Vosselman, 2000; Mouritsen *et al.*, 2001; Tomkins. 2001; Agndal and Nilsson, 2010). Most of the studies in the management accounting literature as a response to SCM (inter-organizational relationships) are conceptual in nature or based on a few case studies (Dekker, 2003; Cooper and Slagmulder, 2004; Seal *et al.*, 2004). The following sections describe each technique and their relevance in SCM.

2.4.3.1 Value chain analysis and activity-based-costing

Activity-based costing (ABC) focuses on identifying the cost of major activities and allocating them to the cost object based on their usage of a particular activity. The technique is considered to be a major innovation in management accounting during the last 20 years. Essentially, it attempts to convert most overhead (indirect) costs into costs directly traceable to the cost object through cause-effect relations. The technique focuses on developing different cost pools for different activities. It attempts to reduce cost measurement distortions caused by the traditional single cost driver volume based approach when costing products or services that use the enterprise resources in differing proportions (Drury and Tayles, 2005).

The core idea of value chain analysis is to break up the chain of activities that runs from basic raw materials to end-use customers into strategically relevant segments (Shank and Govindarajan, 1992). An important part of value chain analysis is the diagnosis of cost drivers that explain variations in costs in each value activity. Hence, activity-based approaches fit into the value chain concept (Agndal and Nilsson, 2007). Studies show that activity-based information can provide relevant information about activities across the entire chain of value adding activities, both internal and external to the organization, in order to improve competitive advantage (Liberatore and Miller, 1998; Caudle, 1999; Dekker and Van Goor, 2000; Axelsson *et al*., 2002; Askarany *et al*., 2010). Management accountants must be familiar with the value chain concept as SCM involves the inclusion of the entire supply chain network. This is in contrast with the internal focus that is typically adopted in traditional management accounting.

According to Dekker (2003), inter-firm relationships introduce new challenges for management accounting, that is, the provision of information for the coordination and optimization of activities across firms in a value chain. Dekker used a case study on the use of an activity model by a large UK retail firm (Sainsbury) and a group of suppliers for supporting their SCM practices. The findings of the study provide some theoretical underpinnings for the use of value chain analysis in inter-firm relationships. The cost model was based on the principles of value chain analysis and integrated cost information across the supply chain.

Activity analysis and reengineering are important elements in value chain analysis and have implications for information systems within organizations. There is a need for management accountants to introduce horizontal information systems to match these new developments (Cooper, 1996). Horizontal systems provide managers with a new framework for measuring the real performance of the business. Strategy, satisfaction, quality, work, innovation and time should now appear in accountants' lexicon. The old vertical management structure should be replaced with horizontal information systems, which are directed horizontally towards the customer (Dekker, 2003).

Traditional cost accounting has included logistics as part of sales, general and administrative expenses where these costs were allocated arbitrarily based on volume for example direct labour hours consumed, cost per cases shipped or as a simple percentage of sales. Instead of focusing on logistics, most attention was focused on the manufacturing of products. The low level of management attention leads to many firms having insufficient insight into the distribution costs of their products. The physical distribution costs can range from 7 to 30 percent of sales (Davis, 1991). With this considered high percentage, the management of logistics costs has become increasingly important due to their significant impact on product profitability, product pricing, customer profitability and ultimately overall firm performance (Smith and Dikollli, 1995). The understanding of logistics' and SCM's importance has led firms to seek a competitive advantage derived from logistics and supply chain activities (Smith and Dikolli, 1995; Stapleton *et al.*, 2004). Managers require more accurate and focused costing of logistics functions to ensure the profitability and reflect the demands of lower prices from customers of the firm. This makes it necessary for firms to have more detailed management accounting information to identify ways to reduce costs of the supply chain (Stapleton *et al.*, 2004). The success of this course of action will be dependent on the ability of the firm to accurately trace costs to specific products, customers, supply chains and other logistics activities.

2.4.3.2 Inter-organizational cost management

The growing importance of cost management is significantly changing the practice of management accounting. The concept of inter-organizational cost management (IOCM) involves cooperative actions between buyers and suppliers for the purpose of achieving cost reductions and creating value. Its central concern is with cooperative efforts by members of separate organizational units to modify cost structures and create value for its participants. Inter-organizational cost management involves managing supplier and customer costs in coordinated cost reduction programmes during product design and manufacturing (Cooper and Slagmulder, 1999; Kulmala *et al.*, 2002; Cooper and Slagmulder, 2003).

According to Coad and Cullen (2006), information sharing is central to the concept of IOCM. A symbiotic relationship develops where firms share cost and performance information resulting in analysis and adjustment of interdependent activities and some sharing of costs and benefits. The role of information sharing has been presented as a way of understanding inter-organizational reality.

Traditionally, management accounting practice has limited its scope to the boundaries of the firm. According to Cooper and Slagmulder (1998), this limitation makes it difficult for the firm to take advantage of any cost-reduction synergies that exist across the supply chain. Such synergies can only be achieved by coordinating the cost-reduction activities of multiple firms. The coordination requires the firms in the supply chain to extend their cost management programmes beyond their organizational boundaries. The objective of such IOCM programmes is to find not only lower-cost but also more value-adding solutions than would be possible if the firm and its buyers and suppliers attempted to reduce costs independently. Effective and appropriate modern cost and management accounting systems and information should provide a multi-dimensional focus on a multiplicity of cost objects such as customers, products, services, functions, processes and activities (Kulmala *et al.*, 2002).

Coordinating cost-reduction programmes at firms can help reduce costs in two ways. First, it can help identify ways to make the interface between firms more efficient. Second, it can also help the firm and its buyers/suppliers find additional ways to reduce the manufacturing costs of products. The programmes may include improvements at the suppliers (such as improving quality, smaller batch deliveries and shorter lead times), improvements at the buyers (for example reducing reliance on customised as opposed to standard products, ordering as many different products at a time as possible) and improvements at the firm (such as adopting electronic data interchange to achieve savings).The actions the firms take should not only decrease costs, but also improve the ability of the supply chain to serve its customers. As the firms in the supply chain become more efficient and focused on customer satisfaction, the end customer will be better served. The strategic position of the chain and the firms within it are strengthened since it is the end customer that drives the economics of the entire supply chain (Cooper and Slagmulder, 1998).

The study on IOCM has been extended by exploring how firms enact inter-organizational cost management during product design and the characteristics of the relational contexts associated with them. The outcome of the relational forms appears to be the development of cost management techniques that cross the organizational boundary between buyers and suppliers and whose objective is to reduce costs through collaborative efforts (Cooper and Slagmulder, 2004; Coad and Cullen, 2006). The supply chain can also be made more efficient by having the firm and its buyers and suppliers jointly look for the ways to reduce manufacturing costs. Two cost management techniques that can be used to identify where joint costs reduction efforts are required are target costing and open book costing.

2.4.3.3 Target costing

Target costing aims to identify the cost at which a product should be manufactured by determining the expected selling price derived from the market (as opposed to the costs), before the product is developed, and then subtracting the expected profit (Ellram, 2002). The target costing process covers the entire life cycle of a product, although the focus in the literature is on pre-production stages (Agndal and Nilsson, 2009). According to Carr and Ng (1995), target costing also aims in reducing the life cycle costs of new products. It is also known as market-based costing since the target sales price of a product is determined primarily from market analysis. Hence, this approach is a direct reflection of the relentless forces of competition driven by globalization of capital and economies facilitated by technology. Market economics sets the price and a target for the cost is set beforehand and the engineers and designers strive to fit the product within the target (budgeted) cost (Gupta and Gunasekaran, 2005).

Target costing should be of relevance to SCM since it captures all costs involved in the entire system of suppliers contributing to the product. The supplier is usually involved when the target cost is broken down to component level. One of its important characteristics is that it tends to push cost pressure further upstream in the supply chain (Seuring, 2002). The use of target costing in inter-firm relationships is also regarded as the core of inter-organizational cost management practices (Cooper and Slagmulder, 1999; 2004). The key extension of this cost accounting mechanism beyond intra-firm cost management logics would be the active involvement of both the buyer and the suppliers in the joint management of cost and in the collaborative identification of opportunities for joint cost reduction). It aligns the cost management programmes of the firms in the chain by indicating to suppliers where the buyer expects cost reduction to occur. Inter-organizational cost management creates formal mechanisms for the design teams of the firms in the supply chain to interact. The interactions then enable the product and its components to be designed in ways that reduce costs throughout the supply chain (Cooper and Slagmulder, 2003).

Everaert (2006) identifies characteristics of target costing in three European companies that used the technique and found that those characteristics are related to the way a target is set and how progress towards that target is measured. She suggested further studies might investigate whether degree of openness to suppliers, leadership position, time pressure and position in the supply chain can explain the noted differences in characteristics among companies. In lean supply, the target costing process is extended into the supplier, in order to identify specific needs for cost reduction which become targets for the attention of both parties working together. Target costing is therefore not just a cost-reduction technique; rather it is part of a comprehensive strategic profit management system. For a particular product, any gap between the as-if cost and the target cost will then be the focus of attention using techniques such as value engineering. The target costing activity teams are multidisciplinary teams pulled from quality, design, engineering, purchasing and finance and they continue to meet until the target cost of a product is met.

2.4.3.4 Open book costing

Open Book Costing is defined as an open book agreement which effectively allows trading partners to see a breakdown of all the finances and costs involved in any given area. It is often legitimated from the potential positive consequences of increased transparency in cost calculations between different parties in inter-organizational supply chains (Mouritsen *et al*., 2001; Agndal and Nilsson, 2010) and transparency by which cost data is shared upstream and downstream and hence each partner's profit is visible to others (Christopher, 2005).

Networking places a number of demands on cost management. A company should not only know the costs of its operation but should also share part of the information flow with cooperating firms (Kulmala *et al.*, 2002). That part of the information flow should be *open* to all the companies in the network. Thus, linked to the concept of total cost control is the idea of open book costing. In an open book environment, the supplier opens his books to the customer and this supports the idea of active collaboration and partnership. It is said that a willingness to share information is a prerequisite for effective partnerships. Open book accounting implies that the supplier renders the buyer access to internal accounting data (Ellram, 1996; Kajüter and Kulmala, 2005). The purpose is to facilitate cooperation leading to the identification of critical areas and subsequent cost reduction.

This technique has been mentioned both as a means of improving the cost efficiency of supply chains and as a tool for building trust into the customer-supplier relationship (Mouritsen *et al*., 2001). According to Kajüter and Kulmala (2005), open-book accounting is most likely to work in long-term hierarchical networks that manufacture functional products, which provide a sound infrastructure for open-book practice and comprise a trust-based network relationship.

Clearly, for open-book costing to work, though, there needs to be trust between the parties and this need for trust is important in understanding the whole philosophy of

SCM. Certain conditions must be present for successful SCM adoption. The single most important prerequisite is a change in the corporate culture of all members of the supply chain. The traditional culture that emphasizes seeking good, short term, company focused performance conflicts with the SCM objective of realizing consistently high performance and profitability in a way that benefits all contributors in the supply chain. Thus, effective SCM rests on the twin pillars of trust and communication (Tomkins, 2001).

Information sharing based on an open book policy is intended to support activities aimed at reducing costs in a supply chain such as joint product development. In this sense, openly sharing data may be the foundation of an inter-organizational cost management system enabling for e.g. value engineering and continuous improvements or ‘kaizen’ (Seal *et al*., 1999; Mouritsen *et al*., 2001; Cooper and Slagmulder, 2004; Kajuter and Kulmala, 2005). A summary of existing accounting research has tended to focus on specific MAPs that are suited to an inter-organizational setting, as shown in Table 2.4.

Table 2.4: Management accounting techniques in SCM

Techniques	**Authors**
Management control and accounting in integrated planning and supply chain relations	Seal *et al*., 1999; Meer-Kooistra and Vosselman, 2000; Seal *et al*., 2004; Håkkansson and Lind, 2006; Mouritsen and Thrane, 2006
Cost management	Kulmala *et al*., 2002; Cigolini *et al*., 2004
Inter-organizational cost management, cost savings	Seal *et al*., 1999; Mouritsen *et al*., 2001; Kulmala *et al*., 2002; Cooper and Slagmulder, 2003; 2004; Coad and Cullen, 2006; Agndal and Nilsson, 2009
Open Book Costing	Carr and Ng, 1995; Seal *et al.*, 1999; Meer-Kooistra and Vosselman, 2000; Mouritsen *et al*., 2001; Tomkins, 2001; Kulmala *et al*., 2002; Kajuter and Kulmala, 2005; Agndal and Nilsson, 2010
Target costing	Mouritsen *et al*., 2001; Ellram, 2002; 2006; Everaert, 2006
Joint performance measurement system	Hoque and James, 2000 ; Axelsson *et al*., 2002 ; Mahama, 2006
Activity based costing and value chain analysis	Liberatore and Miller, 1998; Dekker and Van Goor, 2000; Lin *et al*., 2001; Axelsson *et al*., 2002; Dekker, 2003; Stapleton *et al*., 2004; Askarany *et al*., 2010

Source: Author

2.4.4 MAPs in developed and emerging countries

A significant body of research has been published in the field of management accounting practices (see e.g. Ghosh and Chan, 1997; Chenhall and Langfield-Smith, 1998a; Adler *et al*., 2000; Joshi, 2001; Luther and Longden, 2001; Hyvönen, 2005; Wu *et al*., 2007). These studies report on the adoption, benefits and future emphasis of MAPs in different countries. The findings from one country may not be generalizable to other countries because each country is unique in terms of business environment, ethnic and cultural patterns (Bromwich and Bhimani, 1989; Wallace, 1990; Atkinson *et al*., 1997). There is, however, less empirical evidence of MAPs adoption by developing countries (Anderson and Lanen, 1999; Luther and Longden, 2001; Ajibolade *et al*., 2010).

In developed countries, evidence exists on the changes that have taken place in management accounting during the last decade. Most of the research carried out in these countries was in reaction to the claim by Johnson and Kaplan (1987) that management accounting had not significantly changed during the last 60 years despite changes in the operating environment. MAPs in many developed countries have seen the introduction of new cost and management accounting systems such as activity-based costing, activity-based management, target costing, product life cycle costing, quality cost management, customer accounting and the balanced score-card approach (BSC) to performance measures (Innes and Mitchell, 1995; Libby and Waterhouse, 1996; Haldma and Lääts, 2002; Hoque, 2004).

A number of frameworks for understanding comparative management accounting have been developed (Joshi, 2001; Luther and Longden, 2001). Abdel-Kader and Luther (2006b) examine MAPs in the UK food and drinks industry and find that traditional MAPs are more widely used; direct costing is widely practised (compared to ABC and full absorption costing). The BSC and other non-financial measures, although perceived to be important, are never or rarely used. Thus, the performance measurement in the industry is still very much dominated by financial figures. It is argued that although there have been significant changes in MAPs during the last decades, the change is in the way management accounting is used and not necessarily in the introduction of new systems or techniques (Abdel-Kader and Luther, 2006b).

Chenhall and Langfield-Smith (1998a) identify the extent to which Australian manufacturing companies have adopted traditional and recently developed MAPs, the benefits received from those practices and the intentions to emphasize certain MAPs in the future. Even though traditional techniques were found to be more widely adopted, the adoption rates for many recently developed practices such as activity-based costing were higher than those reported in surveys from other countries. It was also found that the majority of large Australian firms have adopted MAPs that emphasize non-financial information and a more strategic focus.

Adler *et al*. (2000) collected data from New Zealand manufacturers and revealed that a minority of manufacturers have implemented many of the recently-developed advanced management accounting techniques (including activity-based costing, strategic management accounting and cost of quality reporting. The results also indicate a continuing rapid shift towards the advanced methods and towards the combined use of multiple advanced methods. However, traditional accounting techniques such as full costing and standard costing are still more popular with the majority of manufacturers. On the other hand, Libby and Waterhouse (1996) reported a change in management accounting systems within a period of three years in Canada, disproving claims that management accounting is generally resistant to change.

Emerging countries have also shown changes in MAPs. China, for instance, demonstrates that management accounting can play a positive role in improving business management and profitability. In particular, the system has integrated responsibility accounting and cost controls by introducing market mechanisms to substantially reduce production costs and raise profitability (Lin and Yu, 2002). The successful experiment reveals that the responsibility accounting cost control system is an effective tool for cost control under the changing Chinese business environment. The findings also indicate that even though business management and accounting practices are relatively weak in most developing countries in contrast to those in industrialized countries, effectively adopting the advanced management and accounting practices from the developed countries with necessary adaptation will contribute to improving business management significantly and raise the operating efficiency and profitability substantially in less developed countries.

Similarly, Wu *et al*. (2007) examine the adoption and expected future emphasis of MAPs in the Chinese emerging market economy based on a sample of joint ventures and State-owned enterprises. It was found that although traditional MAPs such as budgeting for cost control, profit and sales budgeting are still widely used, newer techniques like target costing and product life cycle are also emphasized. Interestingly, traditional MAPs, like CVP, were found in this study to be losing emphasis.

In South-east Asia, Ghosh and Chan (1997) examine the development of MAPs in Singapore companies. The results of the study show that more companies are employing the various accounting techniques to help them manage the business more efficiently. New techniques like TQM and ABC are slowly being accepted and used by local companies. Phadoongsitthi (2003) in her study shows that there are significant changes in the adoption of MAPs as well as perceived benefits derived from MAPs in Thailand over the five-year period (1996-2001). The results also show support for a positive association between the degree of perceived benefit from the use of certain management accounting practice and firm’s financial performance. Intense competition and a transfer of new information and production technology were said to be the causes for such changes.

Waweru *et al*. (2004) report on a field study of management accounting change in the South African context. The findings indicate considerable changes in management accounting systems within four retail companies. Such changes include increased use of contemporary MAPs notably activity-based cost allocation systems and the balanced scorecard approach to performance measures. The findings suggest that recent environmental changes in the South African economy arising from government reform, deregulation policy and global competition largely facilitated the management accounting change processes within the participating organizations. This is also supported by earlier research by Luther and Longden (2001). In countries undergoing structural change and volatility, the management accounting in the companies was influenced by intensity of competition, volatility of environment, changing stakeholder pressures and shortages of qualified accountants.

On the contrary, Indian manufacturing companies, according to Joshi (2001) and Anderson and Lanen (1999), rely heavily on traditional management accounting techniques. In most of the cases in India, higher benefits were derived from the traditional practices compared to the newly developed practices. Statistically significant differences were found between Indian and Australian practices, which could be attributed to the differing cultural values in respect of individualism, power distance and dynamism between the two countries (Joshi, 2001). The following table summarises MAPs in some developed and emerging countries.

Table 2.5: MAPs in different economies

Authors	Country	Findings
Abdel-Kader and Luther (2006b)	UK	Traditional MAPs are still widely used in UK food and drinks industry (conventional budgeting, direct costing, conventional budgets, and product profitability analysis). Although the balanced scorecard and other non-financial performance measures are perceived to be important, they are rarely used.
Chenhall and Langfield-Smith (1998**)**	Australia	Traditional MATs were found to be more widely adopted than recently developed techniques. The adoption rates for many recently developed practices were higher than those reported in surveys from other countries.
Hyvönen (2005)	Finland	Greater emphasis on newer practices and qualitative measures in performance evaluation. Financial measures like product profitability analysis and budgeting for controlling costs are still important.
Adler *et al*. (2000)	New Zealand	Traditional MAPs are still more popular compared to advanced management accounting techniques, although the newer techniques receive greater emphasis.
Luther and Longden (2001)	South Africa	Significant changes in the perceived benefits derived from management accounting techniques over the five year period (1996-2002) and these benefits differ from the UK equivalents. Factors causing management accounting change in South Africa include intensity of competition, volatility of environment and new factors namely changing stakeholder pressures and shortages of qualified accountants.
Haldma and Lääts (2002)	Estonia	Identify possible new factors e.g. legal accounting environment and shortage of properly qualified accountants. They confirm earlier findings related to the contingent factors that influence management accounting.
Wu *et al*. (2007)	China	The level of adoption of MAPs is most influenced by ownership type of the enterprise and to a lesser extent by the MATs to be adopted. MAPs like budgeting for controlling costs, profit and sales budgeting and target costing are perceived to be more beneficial for state ownership enterprises compared to joint ventures.
Joshi (2001)	India	Indian manufacturing companies still rely heavily on the traditional MATs. Higher benefits were derived from the traditional practices compared to newer ones. Significant differences in the adoption of several practices were found between Indian and Australian practices attributed to differing cultural values.
Anderson and Lanen (1999)	India	The results are consistent with the basic premise of contingency theory. Providing descriptive evidence that those changes in the external environment prompt changes in organizational strategy and structure (MAPs).

2.4.5 MAPs in Malaysia

Very few published empirical analyses of MAPs have been carried out in the country. Among the studies that have been carried out in the Malaysian environment are Abdul Rahman *et al*. (1998) and Sulaiman *et al*. (2004). The former research surveyed MAPs in Small and Medium Industries (SMI). The study provides evidence that the SMIs were still relying on the simple and less complicated MAPs. The advanced management accounting techniques were gaining favourable acceptance among the SMIs and there was a positive trend towards the implementation of these new techniques in future.

Sulaiman *et al*. (2004) surveyed companies in the industrial and consumer products sectors of the *Bursa Malaysia*'s (previously known as Kuala Lumpur Stock Exchange). The study suggests that the use of contemporary management accounting tools (like ABC, TQM, target costing and BSC) in Malaysia is still lacking. They found that traditional MAPs (e.g. standard costing, budgeting, cost-volume profit analysis and return on investment measures) are still widely used because of lack of awareness of new techniques, lack of expertise and management support and high cost of implementation. Sulaiman *et al*. (2005) report empirical findings which suggest that standard costing was still being used by a large majority of firms in Malaysia. However, there is still very limited Malaysian evidence provided by both traditional and advanced MAPs, and on the emphasis that organizations intend to place on particular MAPs in the future.

2.5 Performance measures

The role of performance measures in the success of an organization cannot be overstated (Gunasekeran *et al*., 2004). Performance measurement is an essential element of effective planning and control because it may not only provide necessary feedback information to reveal progress (Chan and Qi, 2003; Fynes *et al*., 2005) but it may also affect strategic, tactical and operational planning and control (Gunasekaran *et al*., 2004).

In a SCM context, performance measurement can further facilitate integration among the supply chain members. Gunasekaran *et al*. (2001) emphasise the importance of the performance measurement system being used in such a way as to enhance the shared destiny principles of partnership and long term relationships. Thus, performance in a supply chain is defined as the overall efficiency and effectiveness of SCM. To accomplish this, SCM must integrate a number of key business functions, including purchasing, demand management, distribution planning, transportation, quality management, production planning, and materials management throughout the supply chain. Consequently, the output of the processes enabled by the supply chain must then be measured and compared with a set of standards. Control of processes in a supply chain is crucial in improving overall firm performance (Tan *et al*., 1998; Li, 2002; Flynn, *et al*., 2010).

2.5.1 Supply chain performance measures

Despite the evolution of SCM over the last two decades, the topic of performance measurement has not received adequate consideration in SCM, especially in the 1990s (Beamon, 1999; Gunasekaran *et al*., 2001). Research interest in supply chain performance measures became more obvious only recently (Chan *et al.*, 2003; Gunasekaran *et al*., 2004; Fynes *et al.*, 2005; 2008; Gunasekaran and Kobu, 2007; Lee *et al*., 2007; Gunasekaran *et al.*, 2008; Theeranuphattana and Tang, 2008). However, some researchers in the past have addressed performance measures in SCM. Beamon

(1998) categorizes performance measures into qualitative and quantitative measures. The qualitative performance measures are those measures for which there is no single direct numerical measurement, although some aspects of them may be quantified. They include customer satisfaction and responsiveness, flexibility, integration, supplier performance. In a 1999 paper, Beamon identifies three types of measures which are based on resources, output, and flexibility. Gunasekaran *et al*. (2001; 2004) develop a framework for respectively measuring performance at strategic, tactical and operational levels in supply chains; this framework mainly deals with supplier, delivery performance, customer service and inventory and logistics costs in SCM.

Research on non financial performance measures is becoming of increasing interest in the supply chain environment (Beamon, 1998; 1999; Gunasekaran *et al.*, 2001; 2004; Fynes *et al.*, 2005; Chow *et al.*, 2008). Measures used include dependability, flexibility, delivery and quality (Fynes *et al.*, 2005; 2008), coordination, resource planning and forecasting (Koh *et al.*, 2007), competitive position, customer service and product quality (Wisner, 2003). Table 2.6 summarizes supply chain performance measures that are commonly used in the literature.

Table 2.6: Supply chain performance measures

Constructs	Definitions	Authors
Supply chain flexibility	Flexibility reflects an organization's ability to effectively adapt or respond to change that directly impacts an organization's customer.	Beamon, 1999; Gunasekaran *et al*., 2001; Chan *et al*., 2004; Gunasekaran *et al*., 2004; Fynes *et al*., 2005; Koh *et al*., 2007
Supply chain integration	The extent of all activities within an organization and the activities of its suppliers, customers, and other supply chain members are integrated together.	Frohlich and Westbrook, 2001; Chan *et al*., 2003; Cagliano *et al*., 2006; Lee *et al*., 2007; Flynn *et al*., 2010
Supplier performance	Suppliers' consistency in delivering materials, components or products to your organization on time and in good condition.	Beamon, 1998; Tan *et al*., 1998; Gunasekaran *et al*., 2001; Chan *et al*., 2003
Responsive-ness to customers	The speed of an organization's responses to the customer requests.	Beamon, 1999; Gunasekaran *et al*., 2001; Chan *et al*., 2003; Chen and Paulraj, 2004; Chen *et al*., 2004

In relation to firm performance, SCM has both short term and long term objectives. The short term objectives of SCM are primarily to increase productivity and reduce inventory and cycle time, while long-term objectives are to increase profits and market share for all members of the supply chain (Tan *et al*., 1998).

2.5.2 Organizational performance measures

Organizational performance refers to how well an organization achieves its financial goals and its market-oriented goals (Li *et al*., 2006). Financial performance has served as a tool for comparing and evaluating organizations over time. A number of prior studies have also measured firm performance using financial indicators (return on investment (ROI), the growth of ROI, profit margin on sales, the growth of sales) and market indicators (market share, the growth of market share (Hoque and James, 2000; Wisner 2003; Chen *et al*., 2004; Li *et al*., 2006).

At the same time, a number of researchers report an increased organizational use of non-financial measures for performance evaluations (Kaplan and Norton, 1996; Ittner and Larcker, 1998). Such researchers suggest that the past high emphasis on traditional performance metrics such as the above (return on investment, profit margin) distracted from due concern for non financial factors such as customer satisfaction, product quality and competitive position). Researchers also argue that non-financial measures may help managers to recognize changes in the business environment and determine and assess progress towards business objectives and achievement of broader performance goals. Dimensions on non-financial performance such as capacity utilization, customer satisfaction and product quality have also been reported, as shown in Table 2.7.

Table 2.7: Organizational performance measures

Measures	Authors
Financial measures	
Return on Investment (ROI)	Hoque and James, 2000; Chan *et al*., 2003; Chen and Paulraj, 2004; Chen *et al*., 2004; Kim, 2006; Li *et al*., 2006
Profit Margin on Sales (PMS)	Hoque and James, 2000; Chen and Paulraj, 2004; Chen *et al*., 2004; Chan *et al*., 2003; Kim, 2006; Li *et al*., 2006
Total Cost Reduction (TCR)	Chan *et al*., 2003; Kim, 2006
Market Share	Wisner, 2003; Li *et al*., 2006
Non-financial measures	
Product Quality (PQ)	Wisner, 2003; Hoque and James, 2000
Competitive Position (CP)	Wisner, 2003; Li *et al*., 2006
Customer Satisfaction (CS)	Hoque and James, 2000; Gunasekaran *et al*., 2001; Wisner, 2003; Kim, 2006; Fynes *et al*., 2008

2.6 Conclusion

This chapter has provided a comprehensive review of the relevant literature pertaining to the main issues covered in this study; that is, supply chain management and management accounting practices. It began by discussing supply chain management

(SCM) and its dimensions, specifically strategic supplier partnership, customer relationship, information sharing, information quality, internal lean practices and postponement. The chapter continued with a review of the development of management accounting practices, then stages of evolution and the adoption of management accounting techniques. It then described previous research undertaken in the SCM area which suggested the use and importance of management accounting in SCM context. The chapter concluded with the literature on measures used to evaluate supply chain performance and overall firm performance. All of these aspects are used within the present research. Following on from this review, the next chapter outlines the theoretical foundation and development of hypotheses for this research study. Greater understanding of the relationships between the two fields is much needed.

3 HYPOTHESIS DEVELOPMENT AND CONCEPTUAL MODELS

3.1 Introduction

Chapter 4 (the following chapter) of this thesis will establish the researcher's epistemological position as predominantly positivist and this will inevitably shape the theoretical framework adopted. When researching the phenomenon of SCM and management accounting, it is important to have a framework within which to work and from which testable hypotheses can be drawn. A theoretical framework enables predictions to be made about the likely outcome of SCM and management accounting initiatives. Thus, the aim of this chapter is to propose a series of hypotheses within the context of two conceptual models (Conceptual Model 1 and Conceptual Model 2). Each hypothesis will be subject to rigorous testing at a later stage to determine whether or not it is statistically supported. This chapter elaborates on the relationship between supply chain management practices (SCMPs), management accounting practices (MAPs), supply chain performance (SCPERF) and the impact of these constructs on firm performance (OPERF) based on both theoretical and existing empirical research findings.

The rationale underlying the research framework is that a higher level of SCMPs will lead to greater emphasis on MAPs, and a higher level of SCPERF will in turn improve firm performance. Hypothesis development and the subsequent research framework for the study are elaborated below. The contingency theory of management accounting is used as a basis to develop the conceptual framework. SCM dimensions are proposed as contingent factors influencing MAPs and firm performance.

3.2 Contingency theory of management accounting

Over the last 30 years, the contingency theory has provided a convenient theoretical framework for numerous studies of organizational structure and behaviour (Hayes, 1977; Otley, 1980; Tiessen and Waterhouse, 1983; Fisher, 1995; Chenhall, 2003; 2007). The contingency approach to management accounting advocates that there is no universally best management accounting control system that can be applied to all organizations as the appropriate system depends upon situational factors. The situational factors represent the contingent factors or the contingent variables (Otley, 1980). The effectiveness of the design of an accounting system depends on its ability to adapt to changes in external circumstances and internal factors. The continuous use of the theory signals the importance and acceptance of the theory (Gredin and Greve, 2004).

Several management control studies have adopted the theory in order to explain the apparent conflict in opinions about using more sophisticated management accounting systems over traditional ones. Such studies have examined the relationships between MAS design and some hypothesized contingent variables (see e.g. Gordon and Narayanan, 1984; Chenhall and Morris, 1986; Reid and Smith, 2000; Haldma and Lääts, 2002; Gerdin, 2005; Abdel-Kader and Luther, 2008; Ajibolade *et al*., 2010) and have suggested that certain factors may influence the designs adopted and their effectiveness.

Contingency theory, commonly referred to as the strategy-structure-performance paradigm, hypothesizes that organizational structure is a function of context, a context that is simultaneously determined by the external environment and other organizational factors (Fisher, 1995; Anderson and Lanen, 1999). Both exogenous environmental factors (such as nature of competition, environmental uncertainty and national culture) and endogenous firm-specific factors (such as size and experience) influence the firm's competitive strategy, the intervening variable of organizational structure, and, ultimately, firm performance (Luther and Longden, 2001). It is assumed that both high and low performing companies exist as a result of more or less consistent combinations of context and structure (Cadez, 2007). This is consistent with prior contingency-based management accounting studies (e.g. Chenhall and Langfield-Smith, 1998; Anderson and Lanen, 1999; Gerdin, 2005).

Important characteristics (contingencies) affecting organizational structure reported in numerous studies include size, environmental uncertainty, production technology, corporate strategy, market environment (Gordon and Miller, 1976; Anderson and Lanen, 1999; Reid and Smith, 2000; Joshi, 2001; Chenhall, 2003; Gerdin and Greve, 2004; Hoque, 2004; Abdel-Kader and Luther, 2008; Ajibolade *et al*., 2010). Haldma and Lääts (2002) and Chenhall (2003; 2007) have found some evidence that changes in MAPs are associated with shifts in the business and accounting environment as external contingencies. A summary of previous studies on contingency factors affecting MAPs is provided in Table 3.1.

Table 3.1: Previous studies on contingency factors

Contingent factors	Authors
External factors:	
Environmental uncertainty	Gordon and Narayanan, 1984; Chenhall and Moris, 1986; Chapman, 1997; Anderson and Lanen, 1999; Hartmann, 2000; Haldma and Lääts, 2002; Hoque, 2004; Agbejule *et al*., 2007; Abdel-Kader and Luther, 2008
National culture	Joshi, 2001
Competition and environmental volatility	Luther and Longden, 2001
Market position	Hoque and James, 2000
Industry specific factors (product perishability, customer's power)	Abdel-Kader and Luther, 2008
Other environmental aspects:	
Supply chain purchasing strategy	Agbejule *et al*., 2007
Network-specific factors	Kajüter and Kulmala, 2005
Internal factors:	
Size	Otley, 1995; Hoque and James 2000; Abdel-Kader and Luther, 2008; Cadez and Guilding, 2008
Technology	Haldma and Lääts, 2002
Strategy	Miles and Snow, 1978; Abernethy and Guthrie, 1994; Langfield-Smith, 1997; Anderson and Lanen, 1999; Chenhall, 2003; Gerdin and Greve, 2004, Hoque, 2004; Cadez and Guilding, 2008
Organizational structure	Gordon and Narayanan, 1984; Gul and Chia, 1994
Organizational aspects (such as competent staff, managerial practices, operational complexity, changing stakeholder pressures and shortages of qualified accountants)	Kaplan and Atkinson, 1998; Luther and Longden, 2001; Haldma and Lääts, 2002

Source: Author

Many of the contingency studies were, however, limited by their failure to investigate how the relationships noted impact on firms' performance, which would constitute a true test of the contingency proposition (Otley, 1980; Chenhall, 2003) (refer to Table 3.2 for selected prior studies on contingency approaches). This includes implications of management control systems for inter-organizational relationships, for instance, alliances between suppliers and customers (Cooper and Slagmulder, 2004; Dekker, 2004). There is also very little published contingency work in the context of the SCM environment such as target costing, life cycle costing and product life cycles. Furthermore, previous studies have focused on a specific or single management accounting practice (Fisher, 1995) and therefore there is limited evidence on MAPs as an aggregate practice (Anderson and Lanen, 1999).

The fundamental tenet of contingency theory holds that company performance is a product of an appropriate fit between the structure and the context. Contingency fit in management accounting means that a sophisticated management accounting system is not automatically associated with superior performance; superior performance instead is a product of an appropriate fit between the identified contingent factors and the management accounting system (MAS).

Gerdin and Greve (2004) reveal that many forms of contingency fit have been used in the strategy-MAS research and proposed a classificatory framework[4] for mapping different forms of contingency fit. The two forms of fit proposed by Gerdin and Greve (2004) represent two different approaches, namely, the Cartesian approach and the Configuration approach.

[4] For details of the classificatory framework in which different forms of contingency fit are outlined, please see Gerdin and Greve (2004; 2008).

Table 3.2: Selection and Interaction approach in MA Contingency Approach

Contingent factors	MA / MAS	Outcome	Country	Authors
Strategy and environmental uncertainty	Performance measurement (non-financial measures)	Performance	New Zealand	Hoque, 2004
Strategy, Market orientation and size	Strategic Management Accounting	Performance	Slovenia	Cadez, 2007:2008
Network-specific factors	Open-book accounting in networks	Performance	Finland and Germany	Kajüter and Kulmala, 2005
Market competition	Management accounting systems	Business unit Performance	Australia	Mia and Clarke, 1999
Size, product life cycle stage, market position	Balanced scorecards	Performance	Australia	Hoque and James, 2000
Strategy	Non-financial performance measures	Performance	US	Ittner and Larcker, 1998
Strategy and past performance	Budgetary control / Budgetary practices	Performance	Belgium	Van der Stede 2000,
External environment and implementation process	Activity based costing	**NA***	US	Anderson and Young, 1999
Environmental uncertainty, interdependence and decentralization	MAS information dimension (scope, aggregate, timeliness)	**NA**	Australia	Chenhall and Morris, 1986
Environmental uncertainty and structure	MAS	**NA**	United States	Gordon and Narayanan, 1984
Size, external environment, technology and operational complexity	Cost accounting and MAS	**NA**	Estonia	Haldma and Lääts, 2002
Technological uncertainty, production systems, strategy and market	MAS	**NA**	UK (Scotland)	Reid and Smith, 2000

*Studies with NA (Not Applicable) are studies employing Selection Approach.

The Cartesian approach is characterized by reductionism while the Configuration approach takes a holistic view. The focus of the Cartesian approach is on how single contextual factors affect single structural attributes and how these context-structure pairs affect performance. In this regard, it is assumed that a limited number of factors offer general explanations of organizational structure; contextual and structural factors are defined as continuous variables and fits between them are also analysed simultaneously. It means, hypothetically, an almost infinite number of combinations seem possible (Gerdin and Greve, 2004). The holistic view (the Configuration approach), on the other hand, assumes that relationships can only be understood if many contextual and structural variables are in a continuum.

A further issue relating to contingency-based studies concerns the operationalization of contingency fit. Drazin and Van de Ven (1985) suggest the emergence of three different approaches to appraising fit: selection, interaction and systems. Unlike the selection approach, studies under the interaction approach examine whether the context-structure relationship affects performance. The system approach, on the other hand, addresses multiple contingencies simultaneously. It is argued that the ultimate goal of contingent accounting research should be to develop and test a comprehensive model that includes multiple elements of accounting systems, multiple contingent variables, and multiple outcome variables.

Despite the importance of SCM in the supply chain and logistics research, there is a scarcity of literature in management accounting research. The inclusion of SCM practices for examination in this study was motivated also by the lack of recognition given to the contingency model by accounting researchers. Thus, SCM practices in this research are proposed as contingency factors. An interaction approach of the contingency model of management accounting is advanced and empirically assessed. Following Gerdin and Greve's (2004) hierarchical taxonomy of forms of fit, a Cartesian-contingency-mediation form of fit is tested via a path model based on data collected from large Malaysian companies. Chenhall (2003) suggests that the way in which the environment exerts pressure on MAPs should be explored. This research is an attempt to include the SCM construct in the contingency framework to further develop and complement the contingency theory. This study aims to identify possible new contingent factors within the supply chain management context. It proposes that SCM dimensions (namely, strategic supplier partnership, customer relationship, information sharing and quality of information shared, internal lean practices and postponement) influence MAPs, as simplified in Figure 3.1 below.

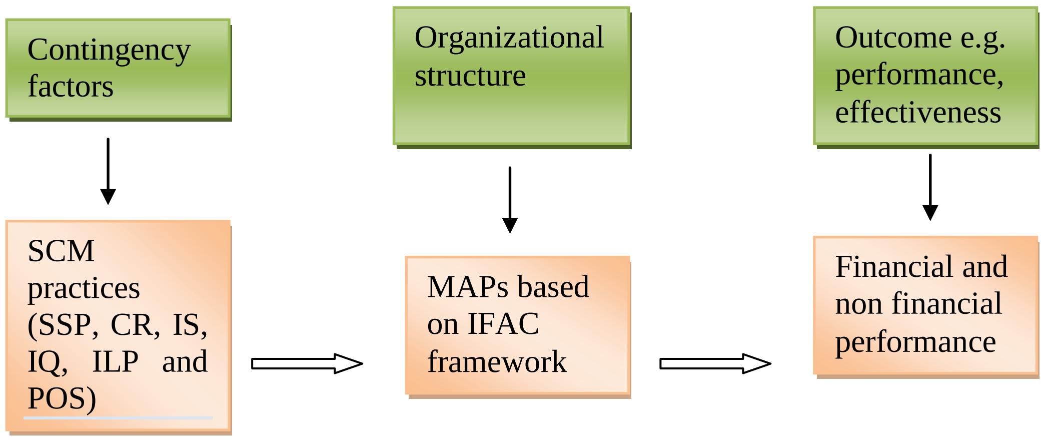


Figure 3.1: Basic contingency framework

Contingency-based studies have examined MCS as both dependent and independent variables. To examine fit between MCS (MAS) and context, some have claimed that the outcome variables should be dimensions of desired organizational or managerial performance. Good fit means enhanced performance while poor fit implies diminished performance (Chenhall, 2007).

Although this study adopts a contingency theory perspective, the theory is not without its criticisms (Fisher, 1995; Otley, 1980). The dominance of this method has resulted in a situation in which the understanding of what explains management accounting sophistication is regarded as incomplete (Tillema, 2005). Much contingency research examines the relationship between one contingency factor and one aspect of management accounting (Young and Selto, 1991; Fisher 1995; Firth, 1996). It is therefore difficult to integrate the findings in order to form a coherent body of knowledge (Fisher 1995; Chapman, 1997). Contingency variables are also said to be not well-defined (Fisher, 1995). As a consequence, it has been claimed that the contingency theory studies produce inconsistent findings (Gerdin and Greve, 2004; Abdel Kader and Luther, 2008).

Furthermore, in recent years, the contingency-based management accounting literature has been criticized for being fragmentary and contradictory as a result of methodological limitations (Gerdin and Greve, 2008). The criticism is largely related to the research method commonly used in contingency theory studies; that is; the cross-sectional survey method where survey and questionnaires are predominantly used. Respondent bias and weaknesses of the survey instruments may also influence the findings.

3.3 Hypothesis development

A detailed description of the development of the SCM practices (SCMPs) construct, management accounting practices (MAPs) construct, the supply chain performance (SCPERF) and organizational performance construct (OPERF) have already been provided in Chapter 2. Using literature support, the expected relationships among SCM practices, management accounting and firm performance are discussed, and hypotheses relating these variables are developed, in the following sections.

3.3.1 SCMPs and MAPs

Research suggests that changes in environmental factors surrounding organizations can have significant impact on their accounting and control systems (Otley, 1980; Anderson and Lanen, 1999; Burns and Vaivio, 2001; Baines and Langfield-Smith, 2003; Waweru *et al*., 2004). Contingency theorists posit that the competitive environment is a determinant of the form that firms' MAPs take and the intensity with which they are used. In this regard, the concept of SCM emerged as a result of the competitive business environment (Mentzer *et al*., 2001; Chen and Paulraj, 2004; Cigolini *et al*., 2004; Min and Mentzer, 2004; Burgess *et al*., 2006; Ballou, 2007; Chow *et al*., 2008). As global markets grow increasingly efficient, competition no longer takes place between individual businesses, but between entire supply chains (Sahay, 2003; Fynes *et al*., 2005).

In the SCM context, it has been suggested that to improve the effectiveness and efficiency of the supply chain, management requires accurate and timely information on supply chain activities and costs, including how best to allocate these costs among customers, products, services, suppliers and other important cost objects (Berry *et al*., 1997; Dekker and Van Goor, 2000; Caglio and Ditillo, 2008). Every aspect of decision making in SCM, from relocating distribution centres to outsourcing the transportation function to third-party logistics service providers, requires cost data (Seal *et al*., 1999; Askarany *et al*., 2010). Management accounting is viewed as an appropriate and powerful set of techniques capable of providing this kind of information (Ramos, 2004; Dekker, 2003).

Seuring (2006) suggests that more and more management accounting instruments need to be applied on a supply chain level due to the coordination and integration needs of a supply chain and the information needed to manage and control a supply chain. This rationale is supported by Seal *et al*. (1999; 2004) who suggest that accounting information may be used to build collaborative networks as new information and information technologies enable closer ties between firms. Kulmala *et al*. (2002) also present a framework that makes it possible to capture how cost management systems can be structured to fulfil specific tasks and coordinate activities. For instance, the smaller the number of sources and the longer the business relationship, the more important it is for the buyer to understand the cost structure of their suppliers (Kulmala *et al*., 2002). Cost transparency and the sharing of cost information between customer and supplier in a way which allows customers and suppliers to work together to reduce costs and improve other factors (Berry *et al*., 1997).

As an integral part of a management control system, numerous studies have presented a framework of accounting control in inter-organizational relationships (see e.g. Van der Meer-Kooistra and Vosselman, 2000; Mouritsen *et al*., 2001; Dekker, 2003; 2004; Cooper and Slagmulder, 2004; Mouritsen and Thrane, 2006; Chua and Mahama, 2007; Caglio and Ditillo, 2008). Mouritsen and Thrane (2006), for example, propose that accounting can be conceptualised as an actor helping to mediate, shape and construct inter-organizational relations through self-regulating. Similarly, due to the far-reaching consequences of close cooperation between firms, management control mechanisms should be used to coordinate the relationship and to support, plan, measure and assess the activities and their results (Van der Meer-Kooistra and Vosselman, 2000). Additionally, literature has also focused on the use of specific control mechanisms such as information systems (Tomkins, 2001), trust (Tomkins, 2001; Dekker, 2004; Coad and Cullen, 2006), or performance monitoring and rewarding (Dekker, 2004); although these control mechanisms are outside the scope of this study.

Setting up long-term supply collaborations usually involves complex negotiation processes with the aim to reduce cost. The reduction of cost is achieved through coordinated actions with buyers and suppliers, more than would be possible if the firms attempted to reduce costs independently. In this inter-organization cost management (IOCM), managing supplier and customer costs in coordinated cost reduction programmes is carried out during product design and manufacturing (Cooper and

Slagmulder, 2004). Similarly, Agndal and Nilsson (2009) also claim that a high level of cooperation leads to high importance of suppliers' managerial accounting. Based on a study of three buyer-supplier relationships, they find that suppliers' management accounting to be more important than before. The deepest collaboration around IOCM issues and the greatest joint use of suppliers' management accounting typically occurs in earlier activities in the exchange process including supplier selection, joint product design and joint manufacturing process development (Agndal and Nilsson, 2009). Consequently, the mechanisms and activities that play a part in supply chain relationships must be controlled. This requires information and hence the need for sharing information (Mouritsen *et al*., 2001; Kajüter and Kulmala, 2005; Agndal and Nilsson, 2010).

Ramos (2004) claims that setting up close relationships between suppliers and buyers and increasing complexity requires additional reporting on supply chain issues and the inclusion of more and wider organizational and external data. Consequently, due to the increasing complexity, there is a need to integrate accounting with other functions such as logistics. There is also the need to work across and outside the organizational boundaries with channel members and to link technical issues to managerial roles and problems. More specific control mechanisms on cost and accounting information exchanges as potential channels for partners control are open book accounting (Kajüter and Kulmala, 2002; Agndal and Nilsson, 2010), value chain analysis (Dekker, 2003; Coad and Cullen, 2006) and the IOCM (Cooper and Slagmulder, 2004; Coad and Cullen, 2006) as already discussed in earlier sections. However, much of the literature that can be related to supply chain and accounting presents a particular tool but does not discuss this in a wider conceptual framework. For example, Van Hoek (1998) investigates the integration of SCM with performance measurement while Cooper and Slagmulder (1999) and Dekker and Van Goor (2000) examine SCM with aspects of cost management.

The SCM framework developed in this study proposes that SCM practice has a direct impact on management accounting. Based on the above, the following hypothesis is proposed:

H1: The extent of emphasis on SCM practice is positively associated with the emphasis on management accounting practices

Cost accounting in the network economy has been a widely discussed issue during recent years (Dekker, 2003; Caglio and Ditillo, 2008). As networking places a number of demands on cost management, cost information plays a role, for instance, in the strategic supplier partnership and will also influence the ongoing management of the partnership. Detailed cost analysis is important for the buyers to understand the cost structures of their suppliers and the role of cost data in the construction of an agreement.

Management techniques such as costing systems can have an impact on one or more tiers of the supply chain. According to Cigolini *et al*. (2004), a supply chain cost accounting system has long been regarded as a SCM tool. They claimed that companies have extensively used supply chain accounting systems and performance metrics and they have become the most widely applied techniques in organizations.

Seal *et al*. (1999) examine the role of management accounting in a construction of a strategic partnership. They highlighted the constitutional role of accounting and the need to develop costing and performance measurement technologies that can be understood and respected by both senior managers and non-accountants involved in SCM. Seal *et al*. (1999) suggest a number of areas where management accounting is involved in SCM. It includes the role of management accounting in managing partnerships, make or buy decisions which lead to the choice of partnership mode and measuring the performance of the partnership.

The consequences of integration of SCM and management accounting systems may give rise to the creation of contemporary management accounting information systems that are specifically concerned with shared processes and activities. Research conducted by Kulmala *et al*. (2002) and Seuring (2006) found that traditional cost management is not prepared to take into account the supply chain perspective. Traditional cost management practice has limited its scope to the boundaries of the firm. It has also been argued that traditional management accounting techniques often provide information that is of limited use (Caudle, 1999; Ellram, 2002; Kajüter and Kulmala, 2005). Indeed, Axelsson *et al.* (2002) have articulated the view that modern management accounting could contribute greatly to the design of more sophisticated ways of operating purchasing and supply. SCM requires additional reporting on supply chain issues and the inclusion of more and wider organizational and external data. Axelsson *et al*. (2002) further state that the development of management accounting is connected to purchasing and supply management; and that there are some highly interesting and relevant techniques available, even though it would appear that managers largely fail to take advantage of these techniques.

SCM requires more accurate cost data regarding all activities and processes within the organisations (Liberatore and Miller, 1998; Lin *et al*., 2001; Dekker and Van Goor, 2002). Tools like Value Chain Analysis, ABC and target costing are particularly suitable in these relationships (Ellram, 2002; Dekker, 2003; Askarany *et al*., 2010). More modern costing systems, for example the ABC system, can provide a more accurate analysis of the true costs and therefore profits, and facilitate more accurate future projections of the profitability of alternative distribution channels.

An accumulated body of the literature highlighted the extent of the integration between ABC and SCM specifying a variety of contributions which ABC is providing to SCM in organisations such as 'cost reduction', 'cost estimation' and 'performance measurement' (Askarany *et al*., 2010). Similarly, Lin *et al*. (2001) examine the integration of supply chain and ABC and reveal that this vital cost information will only increase in significance in the near future, especially in the field of SCM. Stapleton *et al*. (2004) show how ABC can be used as a tool for determining costs of SCM activities (e.g. logistics , marketing etc) and help firms make better decisions based on more accurate costing information. Given the above, ABC can significantly contribute to global SCM as it is suggested to fulfil the above requirements by providing more accurate, detailed and up-to-date information on all activities and processes in organizations. These findings are supported by Gunasekaran *et al*. (2004) who suggest that companies are trying to make better use of SCM by implementing a variety of different technique such as JIT, TQM, lean production and kaizen costing.

Ellram (2002; 2006) finds that it is most effective for supply management to participate in target costing as a member of a cross functional team. The involvement provides the knowledge, cooperation and commitment needed to increase the likelihood that target costing will be successful within an organization. Furthermore, in order for cross-functional teams to be effective, it is important that target costing success be integrated into the performance objectives of each team member.

Although the study indicates that marketing and research tend to have primary responsibility for determining the target selling price to the end customer, supply management becomes involved in working with accounting and calculating the target costs on a component or material level (Ellram, 2002). Supply management and suppliers are frequently involved much earlier in the target costing process than indicated in prior studies. There appears to be a very tight linkage between supply management and the design function in the target costing process. This relationship has received little attention in the accounting or operations management literatures (Ellram. 2006).

Research results indicate that supply management plays a substantial role throughout the target costing process (Ellram, 2002). Supply management is involved to various degrees in target costing, from a very limited role to being the driver of the entire process. Ellram (2006) further states that the target costing process considers the voice of the customer, incorporates earlier supplier involvement and con-current engineering, utilizes cross-functional teams, and focuses on creating a good or service that is both desirable and affordable to the customer and profitable to the producing organizations. Target costing is not a stand-alone effort; it is a process most effectively undertaken by cross functional teams in conjunction with other value-adding processes such as early supplier involvement, value analysis and value engineering (Sahay, 2003; Kajüter and Kulmala, 2005).

From the above discussions, the following sub-hypotheses are proposed in relation to the sophistication level of different MAPs:

H1a: The extent of emphasis on SCM practice is positively associated with MAPs which support Cost Determination and Financial Control (CDFC)

H1b: The extent of emphasis on SCM practice is positively associated with MAPs which support Information for Management Planning and Control (IPC)

H1c: The extent of emphasis on SCM practice is positively associated with MAPs which support Reduction of Waste of Resources in Business Processes (RWR)

H1d: The extent of emphasis on SCM practice is positively associated with MAPs which support Creation of Value through Effective Resource Use (CV)

3.3.2 SCMPs and SCPERF

Various researchers have identified empirical support for the relationship between SCM practices and supply chain performance (Li, 2002; Wisner, 2003; Cagliano *et al*., 2006; Fawcett *et al*., 2007; Gunasekaran *et al*., 2008; Kim, 2009). The SCM framework developed in this study proposes that SCM practices have a direct impact on the supply chain performance of an organization. SCM practice is expected to increase an organization's supply chain flexibility (Beamon, 1998; 1999; Gunasekaran *et al*., 2004; Fynes *et al*., 2005) supply chain integration (Frohlich and Westbrook, 2001; Chan *et al*., 2003; Cagliano *et al*., 2006), supplier performance (Beamon, 1998; Tan *et al*., 1998; Gunasekaran *et al*., 2001), customer responsiveness (Gunasekaran *et al*., 2001; Chan *et al*., 2003; Chen *et al*., 2004) and overall organizational performance (Li *et al*., 2006; Koh *et al*., 2007).

Prior studies have indicated that the various components of SCM practices have an impact on supply chain performance. Strategic supplier partnership, through integration of suppliers into new product development and process improvement, can yield increased supplier performance and increase the level of customer responsiveness and satisfaction (Gunasekaran *et al*., 2001; Chan and Qi, 2003; Li *et al*., 2006). Likewise, Chen *et al*. (2004) found that strategic purchasing in terms of communication and long term orientation increases customer responsiveness. This latter finding is supported by Fynes *et al*. (2005) who indicate that by developing and engaging in deep partnership types of supply chain relationships, suppliers can improve supply chain performance. Similarly, Lee *et al*. (2007) have asseted that well-defined supply chain linkages have been a key determinant to improve supply chain performance and reliability across a wide range of industries.

Cagliano *et al*. (2006) examine the adoption of the lean production model and revealed that it has a strong influence on the integration of both information and physical flows along the supply chain, hence the need for consistency between external and internal integration.

Information sharing leads to high levels of supply chain integration (Chan *et al*., 2003; Cagliano *et al*., 2006) by enabling organizations to make dependable deliveries and introduce products to the market quickly. According to Fawcett *et al*. (2007), information sharing impacts operational performance and is critical to the development of improved information capability. Furthermore, other empirical studies find that information sharing and information quality contributes positively to customer responsiveness (Beamon, 1998; Spekman *et al*., 1998; Gunasekaran *et al*., 2001). This finding is supported by Da Silveira and Cagliano (2006), whose study observed that inter-organizational information systems appear to be associated with operational performance.

The adoption of a postponement strategy not only increases the flexibility in the supply chain, but also improves customer responsiveness (Van Hoek *et al.*, 1999). According to Beamon (1998), postponement also balances global efficiency and customer responsiveness.

It is claimed that SCM enables enhanced competitive performance by closely integrating the internal functions within a company and effectively linking them with the external operations of suppliers, customers and other channel members. Narasimhan and Jayaram (1998) also found specifically that integrating supply chain activities; for example by aligning sourcing decisions to achieve manufacturing goals in terms of flexibility, dependability, cost and quality, will lead to improved SCM performance. Similarly, the result from the study of Tan *et al*. (1998) provides empirical evidence that purchasing practices and customer relation practices are strongly associated with perceived firm performance.

It is expected that an effective SCM practice will lead to improved SCM performance. Most studies link SCM practice directly to organizational performance without explicitly considering any intermediate measures such as SCM performance and management accounting, but a direct link from SCM practice to supply chain performance is plausible. The above arguments lead to the following hypothesis:

H2: The extent of emphasis on SCM practice is positively associated with supply chain performance

Besides the direct influence of SCM practice on supply chain performance, supply chain performance is also indirectly influenced by SCM practices through MAPs, which is further discussed in Section 3.3.4.

3.3.3 SCMPs and OPERF

Within the context of firms operating in the supply chain setting, it is generally agreed that well-managed and well-executed SCM practice will directly lead to improved firm performance. Indeed, numerous empirical research studies found that SCMPs have a significant and substantive impact on firm performance (see e.g. Tan *et al*., 1999; Mentzer *et al*., 2001; Wisner, 2003; Kim, 2006; Li *et al*., 2006; Koh *et al*., 2007; Chow *et al*., 2008). Similarly, Min and Mentzer (2004) support the claim that a successful implementation of SCM brings greater efficiency and effectiveness and improved competitive advantage.

Components of SCM are found to have considerable effect on firm performance (Narasimhan and Jayaram, 1998; Fynes, 2005; Chow *et al*., 2008; Fynes *et al*., 2008). For example strategic supplier partnership has been reported to yield organization-specific benefits in terms of productivity, competitive advantage, and financial performance (Lamming 1996; Stuart, 1997; Tan *et al*., 1998). Customer relations practices have also been shown to lead to significant improvement in firm performance (Tan *et al*., 1998). According to Wisner (2003), supplier management and customer relationship strategies were found to be correlated with and to impact SCM strategies and were then found to impact firm performance. Chen *et al*. (2004) find that customer responsiveness is positively directly related to firms' financial performance in Taiwan although they only have indirect impact in the United States.

A higher level of information sharing is associated with a lower total cost, a higher-order fulfilment rate and a shorter-order cycle time. Information sharing reduces cycle times, fulfils customer orders more quickly, improves customer service and cuts out excessive inventory cost (Balsmeier and Voisin, 1996). Monczka *et al*. (1998) find that information quality is significantly related to improved quality and reduced cycle time.

Not all evidence supports this, however; on the contrary, Fabbe-Costes and Jahre (2007) reveal the lack of present evidence. They argue that some empirical evidence from SCM literature cannot permit a clear conclusion that SCM directly improves performance. This is because SCM, integration and performance may be defined, operationalised and measured in different and limited ways.

Based on the discussions above, the following hypothesis is proposed:

H3: The extent of emphasis on SCM practice is positively associated with firm performance

Besides the direct positive impact of SCM practices on firm performance, firm performance is also indirectly influenced by SCM practices, which will be further discussed in Section 3.3.6.

3.3.4 MAPs and SCPERF

Abdel-Maksoud (2004) and Abdel-Maksoud *et al*. (2008) investigate whether the deployment of contemporary MAPs is associated with the existence and importance of non-financial performance measures embracing measures related to supply chain performance such as flexibility, on-time delivery and efficiency and utilisation. In their study respondents were asked to indicate the extent of applying contemporary management accounting practices (Abdel-Maksoud *et al*., 2005) namely, benchmarking of performance, ABC, Activity-based Management (ABM) and Budgeting (ABB), Balanced Scorecard (BSC), Economic Value Added (EVA), throughput accounting, strategic management accounting and customer profitability analysis. It was found that these techniques can have an important impact on those supply chain performance measures. This finding is supported by Kannan and Tan (2005); their study revealed numerous approaches that have been proposed to improve operations performance. Three in particular, JIT, SCM, and TQM, have received considerable attention. While the three are sometimes viewed and implemented as if they were independent and distinct, they can also be used as three prongs of an integrated operations strategy. This study empirically examines the extent to which JIT, SCM, and TQM are correlated, and how they impact performance.

The target costing process for example is extended into the supplier environment in order to identify specific needs for cost reduction which become targets for the attention of both parties working together. The total cost control process is linked to suppliers and buyers philosophy, which requires a commitment by the customer and supplier to a long-term relationship (Berry *et al*., 1997; Ellram, 2002). From the above discussions it is considered appropriate to hypothesise:

H4: The greater emphasis on MAPs is positively associated with supply chain performance

H4a: The greater emphasis on MAPs which support Cost Determination and Financial Control (CDFC) is positively associated with supply chain performance

H4b The greater emphasis on MAPs which support Information for Planning and Control (IPC) is positively associated with supply chain performance

H4c The greater emphasis on MAPs which support Reduction of Waste of Resources in Business Processes (RWR) is positively associated with supply chain performance

H4d The greater emphasis on MAPs which support Creation of Value through Effective Resource Use (CV) is positively associated with supply chain performance

Besides the direct impact of SCM practice on supply chain performance (H2), hypotheses 1 and 4 jointly suggest an indirect relationship between SCM practice and supply chain performance through MAPs. Therefore it can be hypothesised that SCM practice influences supply chain performance both directly and indirectly.

3.3.5 MAPs and OPERF

The effectiveness of management accounting systems in the contemporary business environment has long been debated in the literature. The relationship between management accounting practice and performance has been subjected to numerous empirical investigations, particularly in the form of contingency framework (Gul and Chia, 1994; Chenhall and Langfield-Smith, 1998b; Mia and Clarke, 1999; Adler *et al*., 2000; Hoque and James, 2000; Luther and Longden, 2001; Hoque, 2004; Cadez, 2007; 2008; Ajibolade *et al*., 2010) and some of those studies produced mixed results.

Merchant (1981) finds that overall departmental performance was positively related to influence on budget plans. Adler *et al*. (2000) find a significant association between sales and the use of advanced management accounting techniques. Mia and Clarke (1999) examine the relationship between market competition and business unit performance incorporating MAS and discover that managers' use of MAS plays a mediating role in the relationship between competition and business unit performance. According to them, organizations that use management accounting information can more effectively face competition in the market and as a result improve performance. Similarly, Gul and Chia (1994) investigate the interaction effects of perceived environmental uncertainty and management accounting system design on managerial performance. Research conducted by them showed that the availability of management accounting system information characteristics of broad scope and aggregation were associated with higher managerial performance under condition of high perceived environmental uncertainty. Chenhall and Langfield-Smith (1998b) also examine how combinations of management techniques and management accounting practices enhance the performance of organizations, under particular strategic priorities.

CIMA (1993) indicates that dimensions of non-financial performance such as customer satisfaction and product quality were thought important by companies surveyed. Ittner and Larcker (2001) and Abdel-Maksoud (2004; 2005) find a positive relationship between the measurement of non-financial performance measures and the extent of innovative managerial practices including contemporary MAPs.

On the contrary, Gordon and Silvester (1999) warn organizations to consider carefully the cost/benefit aspects of implementing the new techniques. Their study indicates that the installation of an ABC information system was not associated with a significant stock market reaction. Sim and Killough (1998) also show no evidence of performance effects of using TQM or JIT.

Despite the above, a body of the literature suggests that modern management accounting techniques like ABC can contribute to organizational performance where firms adopting ABC techniques outperform non-ABC firms (Kennedy and Affleck-Graves, 2001; Askarany *et al*., 2010). Baykasoglu and Kaplanoglu (2008), for instance, also report that ABC can improve organizational performance by helping organizations to become more efficient and more effective; providing organizations with a clear picture of where resources are being spent, customer value is being created, and money is being made or lost; offering organizations a better alternative to volume-based product costing; identifying value-added activities and eliminating or reducing non-value-added activities.

Based on the above, the following general hypothesis and sub-hypotheses are proposed:

H5: The greater emphasis on MAPs is positively associated with firm performance

H5a: The greater emphasis on MAPs which support Cost Determination and Financial Control (CDFC) is positively associated with firm performance

H5b: The greater emphasis on MAPs which support Information for Planning and Control (IPC) is positively associated with firm performance

H5c: The greater emphasis on MAPs which support Reduction of Waste of Resources in Business Processes (RWR) is positively associated with firm performance

H5d: The greater emphasis on MAPs which support Creation of Value through Effective Resource Use (CV) is positively associated with firm performance

Besides the direct positive impact of MAPs on firm performance, firm performance is also indirectly influenced by MAPs, which will be further discussed in Section 3.3.6.

3.3.6 SCPERF and OPERF

Within the context of firms operating in a supply chain setting, numerous studies have cited its potentially positive impact on firm performance (Tan *et al*., 1998; Frohlich and Westbrook, 2001; Li, 2002; Cagliano *et al*., 2006; Koh *et al*., 2007; Kim, 2009; Flynn *et al*., 2010). A supply chain with flexibility should be capable of introducing new products and features in the market place quickly; an integrated supply chain will enable organizations to compete based on time, cost / price and delivery dependability; a supply chain characterized by quick responsiveness to customers and superior supplier performance will be competitive in terms of time, quality and cost (Li, 2002).

Higher levels of SCM practice will lead to improved SCM performance, enhanced competitive advantage and better firm performance (Li *et al*., 2006). Close inter-relationship between the level of SCM practices and competition capability have significant effect on the performance of large firms (Kim, 2006). The lean production model has a strong influence on supply chain integration (Cagliano *et al*., 2006).

Frohlich and Westbrook (2001) find that the greatest degree of integration with both suppliers and customers had the strongest association with performance improvement including cost, time and product quality. These findings were supported by Gimenez and Ventura (2005) and Cagliano *et al*. (2006); they claim that that the higher the level of supply chain integration, the higher the operational and business performance of a firm. Flynn *et al*. (2010) in their recent study reinforce the importance of supply chain integration in improving firm performance. Specifically internal integration and customer integration was directly related to performance. The above arguments lead to the following hypothesis:

H6: Supply chain performance is positively associated with firm performance

Besides the direct impact of SCM practice on firm performance (H3), hypotheses 2 and 6 jointly suggest an indirect relationship between SCM practice and firm performance through supply chain performance. Therefore it can be hypothesised that SCM practice influences firm performance both directly and indirectly. Additionally, besides the direct impact of MAPs on firm performance (H5), hypotheses 4 and 6 jointly suggest an indirect relationship between MAPs and firm performance through supply chain performance. Therefore, it can be hypothesised that MAPs influence firm performance both directly and indirectly.

3.4 Conceptual models

Following the contingency approach to management accounting and the above discussions, this research suggests two main conceptual models. Conceptual Model 1 proposes the SCM construct as a contingent variable influencing MAPs, supply chain performance and overall firm performance. Conceptual Model 2 extends the first model by separating the MAPs construct developed in this study into four components based on IFAC's (1998) framework of management accounting evolution.

3.4.1 Conceptual Model 1

The objective of Conceptual Model 1 is two-fold; first to examine SCMPs as contingent factors influencing MAPs and performance and secondly to position MAPs within an already established model of SCM practices developed by previous SCM studies. The four major proposed constructs (SCMPs, MAPs, SCPERF and OPERF) in Conceptual Model 1 have already been identified through a comprehensive literature review. All the constructs, except the OPERF construct, are higher-order (second-order) constructs that are represented by several sub-constructs; OPERF is a first-order construct.

SCM practice consists of six sub-constructs (strategic supplier partnership, customer relationship, information sharing, information quality, internal lean practices and postponement); SCM performance contains four sub-constructs (supply chain flexibility, supply chain integration, supplier performance and customer responsiveness); MAPs is represented by four sub-constructs following four stages of MA evolution; Cost Determination and Financial Control (CDFC), Information for Management Planning and Control (IPC), Reduction of Waste of Resources in Business Processes (RWR) and Creation of Value through Effective Resource Use (CV). For descriptive purposes, all constructs, including main constructs and sub-constructs, are called constructs in later discussion.

Figure 3.2 presents the first conceptual model developed in this research. This conceptual model is composed of a series of individual hypotheses, the first of which relates to management accounting, the core focus in this study. The framework proposes that SCM practices will have an impact on firm performance both directly and also indirectly through management accounting practices and supply chain performance.

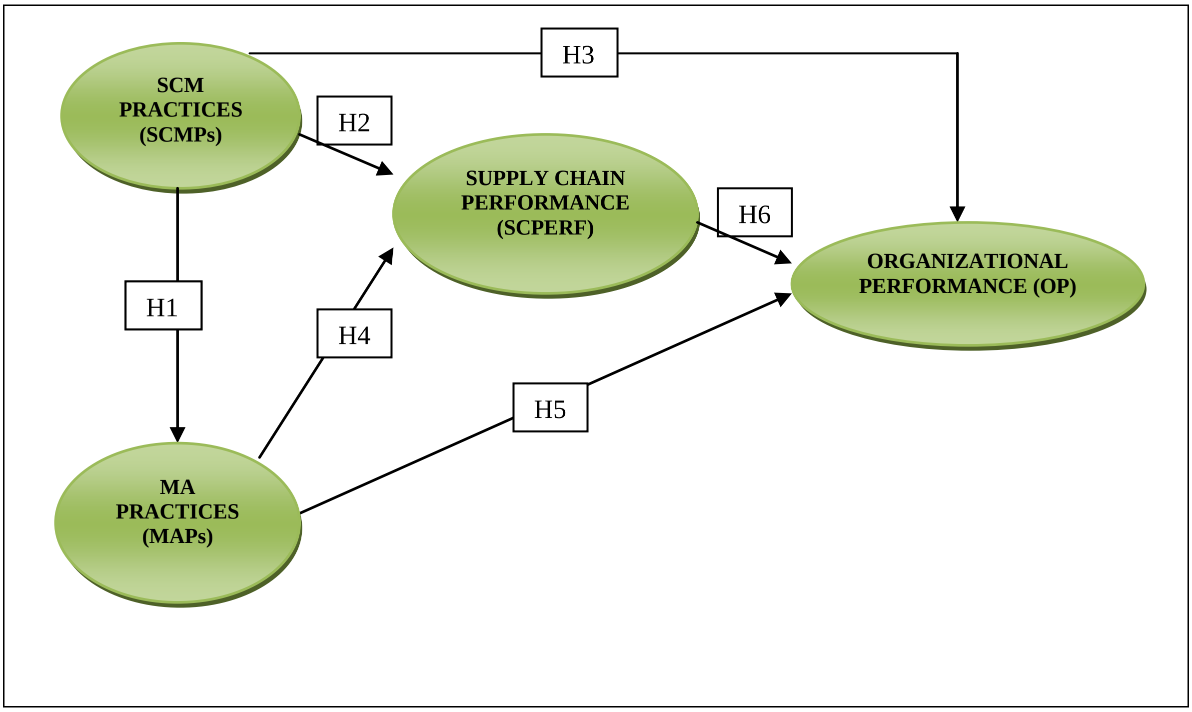


Figure 3.2: Conceptual Model 1

3.4.2 Conceptual Model 2

Conceptual Model 2 has two objectives. The first objective is to investigate the relationships between supply chain management practices and the different management accounting sophistication levels and the impact of these different levels of MAPs on supply chain performance (represented by Conceptual Model 2A). The second objective (represented by Conceptual Model 2B) is to examine the impact of different MAPs sophistication on overall firm performance (OPERF). In both conceptual models, the same constructs as those tested in Conceptual Model 1 are included. The MAPs construct is separated into four distinct and separate constructs following the IFAC framework (1998) as presented in Figure 3.3 and Figure 3.4 as follows.

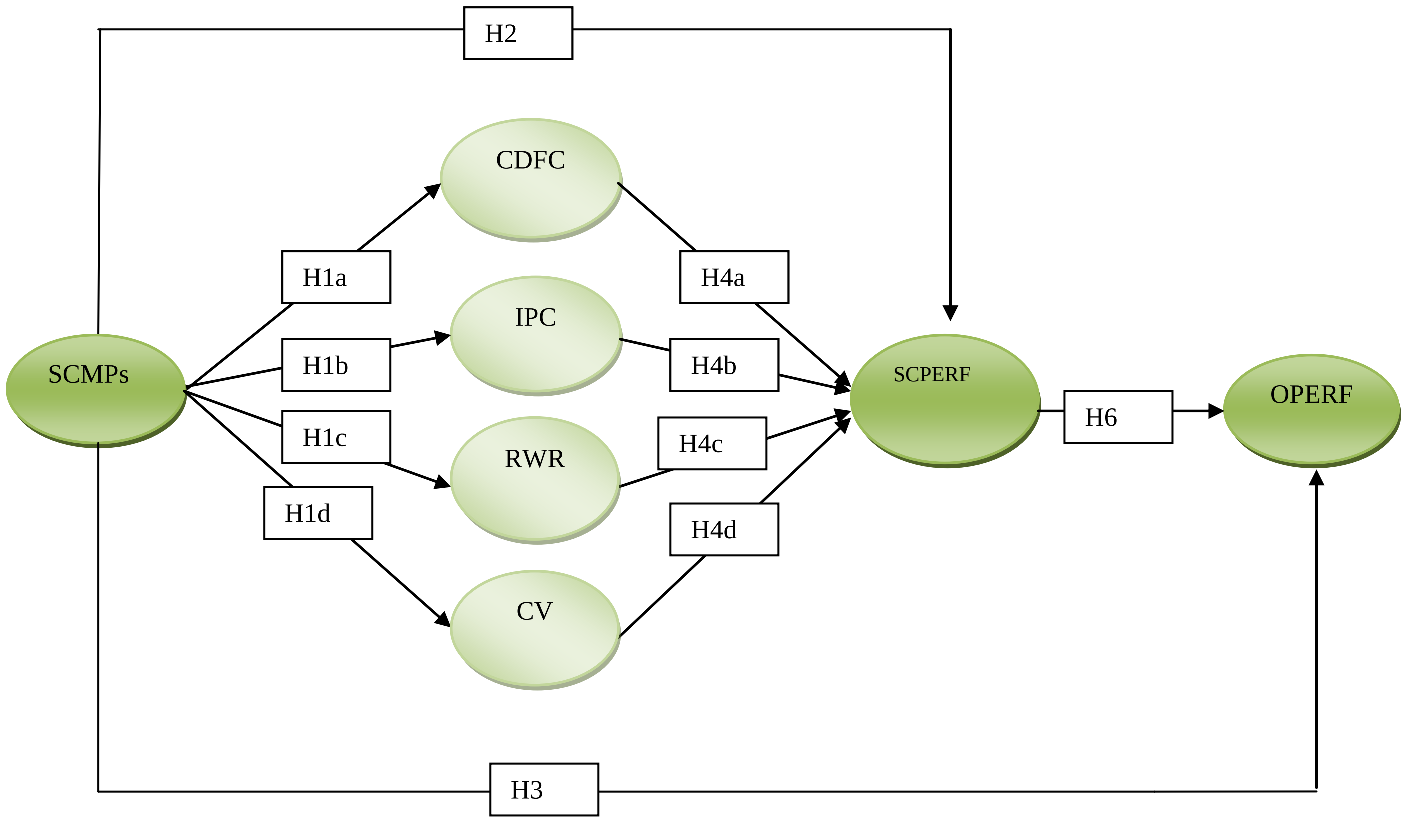


Figure 3.3: Conceptual Model 2A

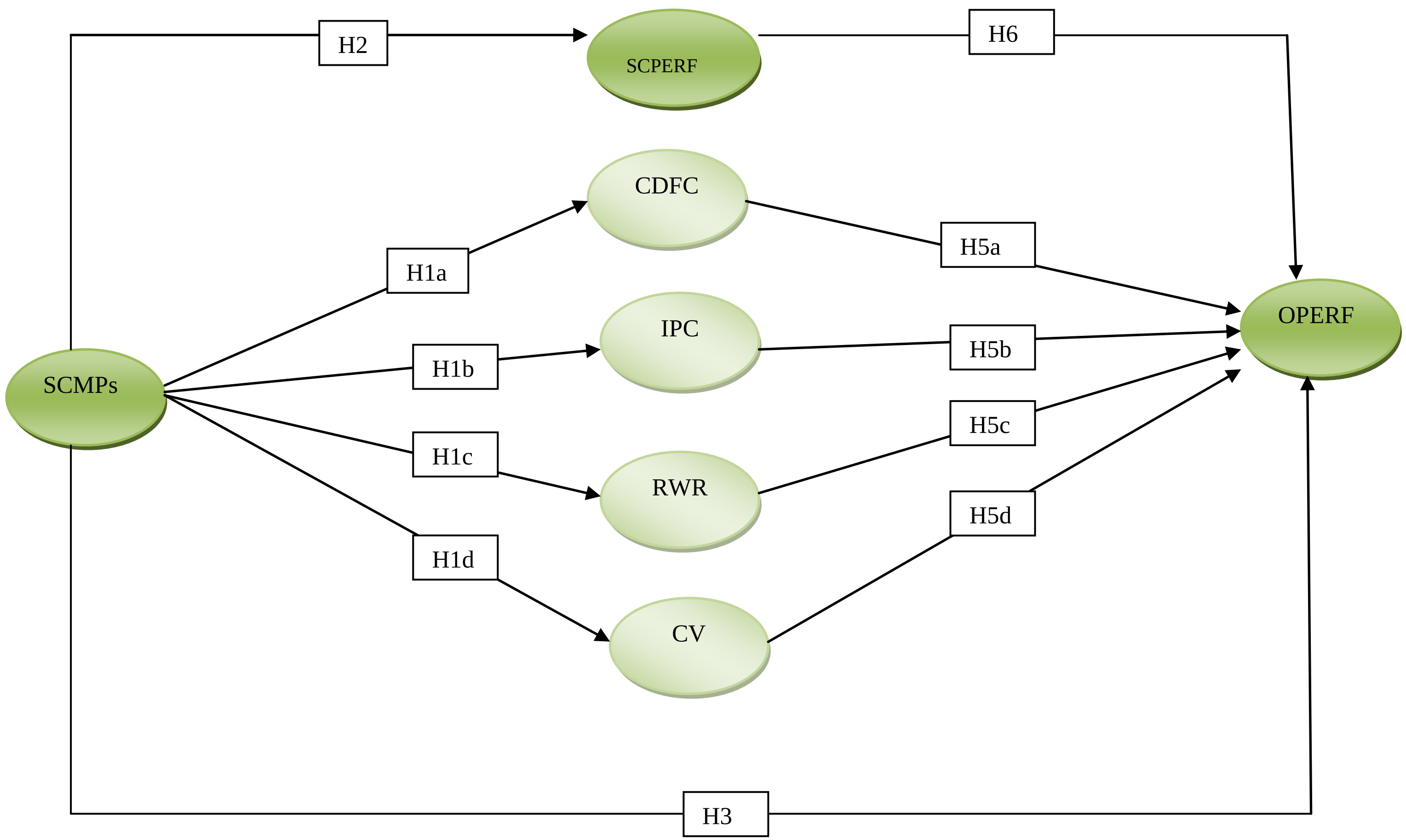


Figure 3.4: Conceptual Model 2B

3.5 Conclusion

This chapter has proposed three separate conceptual models and their constituent hypotheses. The rationale for each was justified with reference to previous academic research. A summary of each hypothesis under each model is as shown in Table 3.3 below:

Table 3.3: Summary of Hypotheses

Conceptual Model 1	Conceptual Model 2A	Conceptual Model 2B
H1: SCMPs to MAPs		
	H1a: SCMPs to CDFC	H1a: SCMPs to CDFC
	H1b: SCMPs to IPC	H1b: SCMPs to IPC
	H1c: SCMPs to RWR	H1c: SCMPs to RWR
	H1d: SCMPs to CV	H1d: SCMPs to CV
H2: SCMPs to SCPERF	H2: SCMPs to SCPERF	H2: SCMPs to SCPERF
H3: SCMPs to OPERF	H3: SCMPs to OPERF	H3: SCMPs to OPERF
H4: MAPs to SCPERF		
	H4a: CDFC to SCPERF	
	H4b: IPC to SCPERF	
	H4c: RWR to SCPERF	
	H4d: CV to SCPERF	
H5: MAPs to OPERF		
		H5a: CDFC to OPERF
		H5b: IPC to OPERF
		H5c: RWR to OPERF
		H5d: CV to OPERF
H6: SCPERF to OPERF	H6: SCPERF to OPERF	H6: SCPERF to OPERF

This chapter has focused on the important topics that determine the design of the research: the underlying theory, research hypotheses and research conceptual models. Contingency theory is adopted to provide a theoretical base for the hypotheses proposed. The literature proposes that integrated SCM practices affect the cost and management accounting practices of organizations; both of these practices, along with the SCM performance, are considered to influence overall firm performance. The next chapter outlines the research method and data collection approach adopted in pursuing the research objectives.

4 RESEARCH METHODOLOGY

4.1 Introduction

This chapter outlines and discusses the methodology used in this research. It begins by describing the research philosophy, followed by the research approach. The chapter then explains the research strategy and data collection methods employed, in particular, the pursuit of a triangulation data collection method, where a survey questionnaire is supplemented with semi-structured interviews. The chapter then describes the techniques used in the data analysis. Extensive attention has been given to applying and explaining the data analysis technique used in this research, Partial Least Squares (PLS), given its relative originality in dealing with MA and SCM.

The organization of this chapter is structured based on 'the research process onion' proposed by Saunders *et.al*. (2007) as shown below (see in Figure 4.1 below). Saunders *et al.* (2007) portray the research process as an 'onion' where assumptions must be made at each individual stage of the research approach, referred to as layers of the 'onion'. The layers of the research onion represent the following aspects: the philosophical paradigm, approach and strategy which highlight the influence of research method selection in this research. Based on this diagram, selection of research method should be based on the research philosophical paradigm, due to the fundamental nature of the research processes.

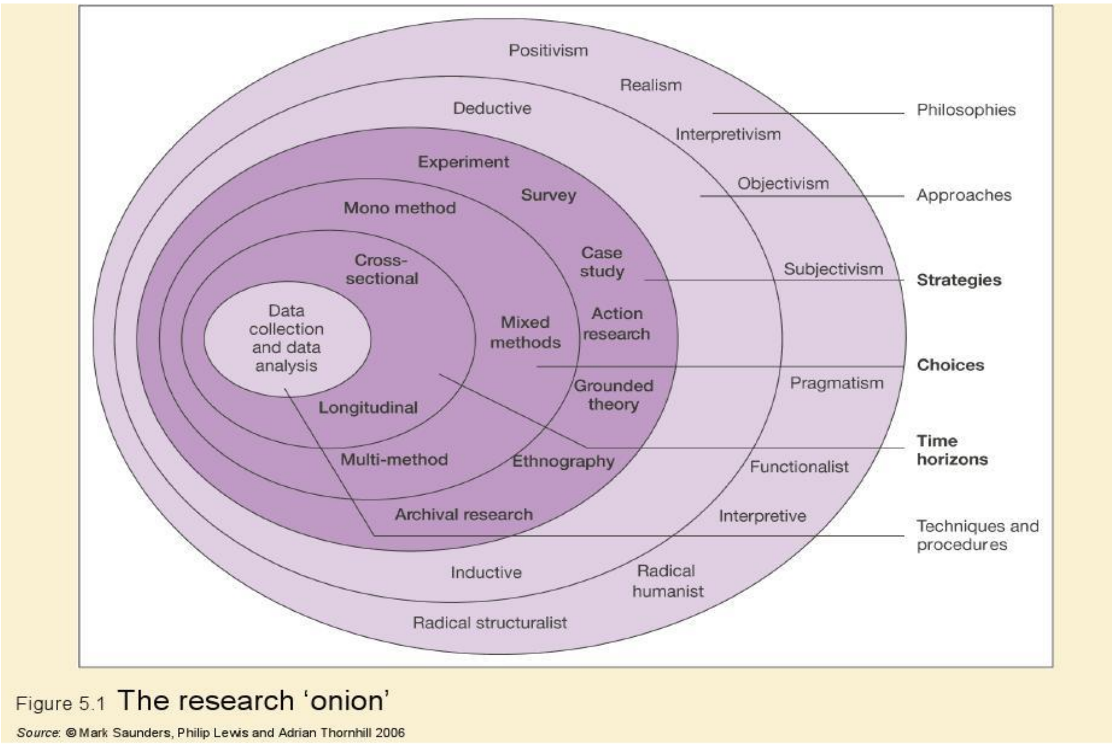


Figure 5.1 The research 'onion'

Source: © Mark Saunders, Philip Lewis and Adrian Thornhill 2006

Figure 4.1: The research process 'onion'

Source: Saunders *et al*. (2007), p.102.

4.2 Research philosophical paradigms

All theories that exist within social science, are derived from a selected philosophical paradigm. Therefore, it is important that a social scientist is aware of the different philosophical assumptions because these will then form the basis, as well as the process of research (Burrell and Morgan, 1979; Saunders *et al.*, 2007). The research philosophy adopted by researchers contains important assumptions about the way in which researchers view the world. These assumptions will underpin the research strategy and the methods researchers choose as part of the strategy. The axiom of "knowledge", driven by research paradigms, can be explained by the branches of philosophy known as ontology, epistemology and methodology (Guba and Lincoln, 2005; Bryman and Bell, 2007). The epistemological and ontological positions should have some bearing on the choice of methods that one selects for research.

Epistemology

An epistemology is a theory that presents a view of what can be regarded as knowledge rather than belief. It deals with the nature of knowledge and how knowledge can be gained. Sociologists have different views on this; a major epistemological debate in sociology concerns the similarity of sociological knowledge and scientific knowledge (Burrell and Morgan, 1979).

On the one hand, there are those (sometimes referred to as *naturalists*) who argue that the best way for sociology to transcend subjectivity and produce more objective knowledge of social life is to follow the logic and procedures of the natural sciences. This point of view holds that, as far as possible, sociology can develop methods of investigation based on the logic of experimentation and measurement found in the natural sciences. On the other hand, there are those (sometimes referred to as *anti-naturalists*), who argue that because nature and society are completely different from each other, the principles and methods of the natural sciences have little or no application to the study of social life. Unlike the matter studied by most natural scientists, people are reflective and try to make sense of the situations in which they find themselves. Therefore, they require a very different approach from that of the natural sciences, one where researchers transcend their subjectivity by interpreting the subjectivity of the people they are studying. In between these extremes, there are a variety of positions that accept the principles of scientific inquiry to a limited degree in relation to specific research questions (Burrell and Morgan, 1979; Saunders *et al*., 2007).

Three of the most influential theories of knowledge in sociology are positivism, interpretivism and realism. Positivism and interpretivism are opposite positions in epistemology. However, some research philosophers consider epistemology as a continuum. Hence, researchers can take positions between the extremes (Saunders *et al*., 2007).

Positivism

Positivism is the view that sociology can and should use the methods of the natural sciences. A pure positivist takes the attitude of a natural scientist and will only accept externally observable and measurable sources for the research, such as numerical data from machines, statistics or experiments. The positivist sees him/herself as independent from what is researched. The positivist ignores feelings or any other interactions between the researcher and what is being researched (Collis and Hussey, 2003; Saunders *et al*., 2007). Positivists believe that sociologists should use quantitative methods and aim to identify and measure social structures.

As much of the debate is based on how methods developed in natural science are transferable to social science, positivist approach gives a clear sense of separating subjective and objective data interpretation (McKensie, 1997). Under this assumption, it is to be believed that social phenomena could be scientifically observed and measured. Along with the emphasis on objectivity, the attained knowledge through scientific methods would expose greater strength in terms of reliability. Furthermore, the positivist approach asserts that results based on data set would be bias-free; bias is commonly caused by personal interpretations and values that may influence conclusions drawn from a set of data.

Interpretivism

A rapid increase in the number of available research methodologies has resulted in the positivist approach losing its once privileged position within the social sciences (Sarantakos, 1998). The inherent limitations of the positivist paradigm have led some researchers to argue that quantitative measures alone cannot capture the real meaning of social behaviour as they often result in 'meanings' that are closer to the researcher's own particular belief than to those of the respondents. Interpretivism, also referred to as anti-positivism or post-positivism, attempts to fill this void by seeking to understand and explain human and social reality (Crotty, 1998).

Interpretivists take social interactions into account and assume that every human has a social role and plays that role. They take the view that since human beings think and reflect, scientific methods are inappropriate for the study of society. They believe that only through beliefs, interpretations and perceptions of human beings, can reality be understood (Collis and Hussey, 2003).Unlike objects in nature, human beings can change their behaviour if they know they are being observed. An interpretivist, therefore, sees the necessity to take this social role into consideration when looking at the world and considers that knowledge cannot be gained without interpreting answers whilst keeping social roles in mind (Saunders *et al.*, 2007).

While positivism emphasises facts and predictions, interpretivism emphasises meanings and understandings. This more hermeneutic approach to research necessitates an interpretation on the part of the researcher. It is therefore primarily adopted in conjunction with qualitative research techniques and is used to examine various social settings and engaging in discussions with those who inhabit them (Denzin and Lincoln, 1998).

Realism

Realists acknowledge that scientific methods are not foolproof and agree that human are reflective. They argue that sociologists can be pragmatic and use methods that are appropriate for particular circumstances. Social reality is complex and to study it, sociologists can draw on both positivist and interpretivist methods. Realism, which is mostly associated with the positivist paradigm, presents an objective reality which is external to the researcher and because it is independent from any individual, realists believe that it is measurable and quantifiable (Collis and Hussey, 2003).

Ontology

Ontology considers the nature of reality. It is concerned with what societies are, what units make them up and how these units relate to each other. One key difference is between sociologists who see societies as social structures and those who focus on social action. The different ontological properties describe the world and humans are seen as living organisms, part of a systemic whole. Within this systemic whole, people are social actors that respond humanly to different situations. Different people see different aspects of the same phenomenon. The researcher has to choose whether to study the phenomenon depending on individuals' cognition about reality or whether reality is external and objective to individuals (Burrell and Morgan, 1979). It requires the researcher to position herself and to understand how her world view influences the research carried out.

Axiology

Axiology is about values in research and their judgemental influence. A researcher can either believe that his/her own values affect the research activity. A positivistic researcher believes that research is free of the researcher's biases and that the research and the objects are independent of the researcher. On the other hand, the interpretivistic researcher believes that the research results have to consider these own values and might have to be interpreted before the real results can be seen. To make sure that the research is not affected by any potential bias, the researcher will choose to select several sources to look at the object and choose methods which do not allow the influence of biases (Saunders *et al*., 2007).

In summary, there are many different views in sociology about what societies are and the best ways of obtaining knowledge of them. However, before looking at these theories, it is important to put them into perspective, as it would be quite wrong to see sociology as divided into three distinct and entirely separate approaches. These are terms used primarily by methodologists and social theorists to try to describe and evaluate the theoretical assumptions underlying different approaches to research. Secondly, many studies in sociology use a combination of positivist, interpretivist and, more recently, realist ideas, just as they use different research methods. Thirdly, positivism, interpretivism and realism are very general descriptive terms and there are many different theoretical approaches within the general framework of each one. For example, some interpretivists believe that understanding the meanings that people give to their actions is the first step towards explaining their behaviour. However, others argue that sociology cannot move beyond people's subjective meanings. The two main paradigms represent two extremes of a continuum; thus, any study may represent a blend of assumptions and methodologies. The summary of the assumptions held under both positivism and interpretivism paradigm is shown in Table 4.1 below.

Table 4.1: The assumptions of Positivism vs Interpretivism

Assumptions	**Positivism**	**Interpretivism**
Ontological	• Reality is external to the researcher and represented by objects in space. • Objects have meaning independently of any consciousness of them. • Reality can be captured by our senses and predicted.	• Reality is indirectly constructed based on individual interpretation and is subjective. • People interpret and make their own meaning of events. • Events are distinctive and cannot be generalized. • There are multiple perspectives on one incident. • Causation in social sciences is determined by interpreted meaning and symbols.
Epistemological	• The methodology of the natural sciences should be employed to study social reality. • Truth can be attained because knowledge rests on a set of firm, unquestionable, indisputable truths from which our beliefs may be deduced. • Knowledge is generated deductively from a theory or hypothesis. • Knowledge is objective.	• Knowledge is gained through a strategy that "respects the differences between people and the objects of natural sciences and therefore requires the social scientist to grasp the subjective meaning of social action". • Knowledge is gained inductively to create a theory. • Knowledge arises from particular situations and is not reducible to simplistic interpretation. • Knowledge is gained through personal experience.
Axiological	• Value-free and unbiased	• Value-laden purpose
Rhetorical	• Formal, impersonal voice, use of accepted quantitative words	• Often written in the first person indicating an involved, passionate investigator
Methodological	• Deductive process, quantitative, confirmatory, cause and effect, static design, context free, generalizations leading to prediction, explanation and understanding, accurate and reliable through validity and reliability.	• Inductive process, qualitative, exploratory and descriptive, new theory, events are understood through interpretation, interactions and external context, mutual understanding on what occurs and the meaning people make of phenomena

Source: Hussey and Hussey (1997); Crotty (1998)

Mainstream accounting research

Normative prescriptive theories have had a long history in accounting research. However, during the 1970s and 1980s, accounting researchers became increasingly interested in positive theories concerning explanation and prediction. Consequently, mainstream accounting journals have emphasized positivistic methods; ethnologies, action research and case studies have rarely appeared in mainstream accounting journals during this period.

According to Ryan *et al*. (2002), much of mainstream accounting research is primarily concerned with the functioning of accounting. Burrell and Morgan (1979) used the term 'functionalism', which combines an objectivist view of the world with a concern for regulation. The term 'functionalism' is derived from work in sociology that regards society as a single system of interrelated elements, with each element of social life serving specific function, and the role of the researcher being to discover the nature of those functions. Mainstream accounting research starts from an objective view of society, regards individual behaviour as deterministic, and uses empirical observation and a positive research methodology (Ryan *et al*., 2002).

A similar classification of accounting research has also been described by Chua (1986). Table 4.2 below is an adapted version of her categorization of the assumptions associated with mainstream accounting research. The table summarizes the epistemological and ontological positions of mainstream accounting research and adds some comments about the assumed relationship between accounting theory and practice.

Table 4.2: Mainstream accounting research

Beliefs about knowledge	Theory and observation are independent of each other, and quantitative methods of data collection are favoured to provide a basis for generalizations.
Beliefs about physical and social reality	Empirical reality is objective and external to the subject (and the researcher). Human actors are essentially passive objects, who rationally pursue their assumed goals. Society and organizations are basically stable, and dysfunctional behaviour can be managed through the design of control systems.
Relationship between accounting theory and practice	Accounting is concerned with means, not ends – it is value neutral, and existing institutional structures are taken for granted.

Source: adapted from Chua (1986) cited in Ryan *et al.* (2002)

Management accounting research, particularly survey research, is generally carried out within a positivist vein, primarily aimed at theory testing relying on mainly deductively derived hypotheses (Ryan *et al.*, 2002). Whilst case study methods have typically been confined to a relatively limited role as vehicles for theory (or hypothesis) development, more recent advances within this research tradition recognize their usefulness for broader purposes (Keating, 1995). Case study-based theory development generally aims at inductively dominated theory building (Eisenhardt, 1989), but may also encapsulate some refinements or modifications of existing theories. However, the use of case studies for testing theories by submitting them to critical attempts at refutation is relatively rare in management accounting research (Keating, 1995). As illustrated in the following section (see Section 4.5), the incorporation of qualitative methods in triangulated research may enhance their role in the process of theory testing.

For this research and the researcher, positivism is regarded as the most appropriate research philosophy. The paradigm follows a strong tradition, entailing the development of theoretical models which are tested by examining hypotheses derived from those models. The approach is ‘positive’ in the sense of offering an objective and true account of nature and society (Easterby-Smith *et al.*, 2002). This is an application of a scientific approach for social sciences, such as the use of statistical analysis. Additionally, according to Burgess *et al*. (2006), research methods employed in studies or research on SCM were mostly analytical conceptual, predominantly empirical surveys or case studies; the positivist research paradigmatic stance is therefore prevalent.

4.3 Research approach

This research follows the deductive approach. Deductive research is a study in which a conceptual or theoretical structure is developed and then tested by empirical observation. The approach is also referred to as moving from the general to the particular. In the deductive approach, hypotheses can be developed from literature and previous research and then can be tested. The researcher then has to construct measurable and quantifiable variables that allow testing of the hypothesis. A common method for deductive research is the use of survey questionnaires (Collis and Hussey, 2003; Saunders *et al*., 2007).

The inductive approach, on the other hand, is a study in which theory is developed from the observation or empirical reality (Saunders *et al*., 2007). The researcher tries to understand the research environment and objects and to extract theories from it. Induction starts at an individual observation and moves towards stating a general theory. This requires interpretation of researcher and potential danger of misinterpretation or bias which leads to difficulty in generalizing research results. Inductive research is mostly used when there is little or no previous knowledge about a topic and a hypothesis cannot be formed (Easterby-Smith *et al*., 2002). The deductive approach is usually associated with positivism and the inductive approach with interpretivism (Saunders *et al*., 2007).

4.4 Research strategy and data collection methods

This study employed a survey strategy. The survey strategy is normally associated with the deductive approach and most frequently used to answer who, what, where, how much and how many questions (Saunders *et al.*, 2007). The survey is also a popular and common strategy in business and management research as it allows the collection of a large amount of data from a sizeable population in a highly economical way. The importance of the survey instrument as a data collection technique in the behavioural sciences is widely recognised (Bryman and Bell, 2007). Research conducted in the management accounting field is no exception. It has been claimed that over the past 20 years, 30% of all published empirical management accounting research has utilised the survey approach, particularly mail survey research (Van der Stede *et al*., 2005). If surveys are constructed and administered appropriately, then they can be a reliable source of large scale and high quality data (Van der Stede *et al*., 2005).

There are two types of survey that generally predominate in academic research; descriptive survey and analytical survey. The descriptive survey counts a representative sample and then makes inferences about the population as a whole based on the data collected so they are descriptive in orientation and do not therefore do not investigate the relationships between one variable and another (Oppenheim, 1992). An analytical survey, on the other hand, is designed to explore the relationships between variables of interest to the researcher to find associations and explanations and move towards prediction (created to explore specific hypotheses) and consequently was the most appropriate for this study.

In this research, the survey questionnaire was employed in order to obtain a general picture of SCM practices, MAPs and firm performance. A number of studies on MAPs also employed questionnaire survey as their main research method (Chenhall and Langfield-Smith, 1998; Joshi, 2001; Luther and Longden, 2001; Haldma and Lääts, 2002; Wu *et al*., 2007; Abdel-Kader and Luther, 2008). Furthermore, research methods employed in studies or research on SCM were also predominantly empirical surveys (Burgess *et al*., 2006).

However, the data collected by the survey strategy are unlikely to be as wide-ranging as those collected by other research strategies (Saunders *et al*., 2007) (See Table 4.3 below). For instance, with a survey, there is a limit to the number of questions that any questionnaire can contain; the ability to explore and understand the context is limited by the number of variables for which data can be collected.

Table 4.3: Research strategies – Strengths and Weaknesses

	Strengths	Weaknesses
Survey questionnaire	• The responses are gathered in a standardised way, so questionnaires are more objective than interviews. • Quick to collect information using a questionnaire (design/analysis can take a long time) • Potentially information can be collected from a large sample but returns from questionnaires are usually low.	• Questionnaires occur after the event, so participants may forget important issues. • Questionnaires are standardised so it is not possible to explain any points in the questions that participants might misinterpret. • Open-ended questions can generate large amounts of data that can take a long time to process and analyse. • May get superficial answers if too long • Not willing to answer or reveal information
In-depth interviews	• Usually yield richest data, details, and new insights. • Permit face-to-face contact with respondents. • Provide opportunity to explore topics in depth. • Afford ability to experience the affective as well as cognitive aspects of responses. • Allow interviewer to explain or help clarify questions, increasing the likelihood of useful responses. • Allow interviewer to be flexible in administering interview to particular individuals or circumstances	• Expensive and time-consuming • Need well-qualified, highly trained interviewers • Interviewee may distort information through recall error, selective perceptions, desire to please interviewer • Flexibility can result in inconsistencies across interviews • Volume of information too large; may be difficult to transcribe and reduce data
Observation	• Provide direct information about behaviour of individuals and groups • Permit evaluator to enter into and understand situation/context • Provide good opportunities for identifying unanticipated outcomes • Exist in natural, unstructured, and flexible setting	• Expensive and time consuming • Need well-qualified, highly trained observers; may need to be content experts • May affect behaviour of participants • Selective perception of observer may distort data • Investigator has little control over situation • Behaviour or set of behaviours observed may be atypical

Source: Bryman and Bell (2007), Saunders *et al*., (2007), Creswell (2009)

The case study strategy can be employed if one wishes to gain a rich understanding of the context of the research; it also has considerable ability to generate answers to the question ‘why?’, ‘what?’ and ‘how?’ although what?’ and ‘how?’ questions tend to be more the concern of survey strategy. Most case study advocates point out that case studies produce much more detailed information than what is available through a statistical analysis. Advocates will also hold that while statistical methods might be able to deal with situations where behaviour is homogeneous and routine, case studies are needed to deal with creativity, innovation, and context. Detractors argue that case studies are difficult to generalize because of inherent subjectivity and because they are based on qualitative subjective data, generalizable only to a particular context.

The data collection techniques employed may be various and are likely to be used in combination (Saunders *et al.*, 2007). Consequently, qualitative data collected using semi-structured interviews may be a valuable way of triangulating quantitative data collecting by survey questionnaire.

In this study, a questionnaire survey was selected as the main empirical data collection method. According to Maylor and Blackmon (2005), a survey is a useful technique to capture facts, opinions, behaviours or attitudes from a range of respondents. However, according to Saunders, *et al.* (2007), it is worth noting that there are various types of survey methods that should be taken into account when implementing this specific method. First of all, there are two main streams of questionnaire, namely, self-administered and interviewer-administered. The main difference between these two is the involvement of an interviewer. In the self-administered version, the questionnaire is to be completed by the prospective respondent without any aid from the interviewer. On the other hand, interviewer administered requires verbal or face-to-face contact between the interviewer and the interviewee, such as telephone questionnaire or structured face-to-face interview or questionnaire (Maylor and Blackmon, 2005). In most cases, the interviewer-administrated questionnaire is regarded as one of the most common techniques used in all types of business and management research (Maylor and Blackmon, 2005; Aastrup and Halldorsson, 2008).

Regarding its flexibility, focusing on a specific subject and possible extension of its meaning has become a general aim of this particular technique. This method enables researchers to gain more freedom to probe beyond the answer through a form of dialogue with the respondent and to collect additional information (May, 2001; Bryman and Bell, 2007). However, this particular method is time and cost consuming when dealing with a large sample and especially when the prospective respondents are geographically dispersed. Alternatively, the self-administered method would be more advantageous over the latter in terms of convenience (time, cost and location for both interviewer and interviewee) and as it is less obstructive (absence of interviewer effects) to interviewees (Bryman and Bell, 2007). In self-administered questionnaires, several disadvantages could also be found, such as lack of clarification when needed and less opportunity to collect additional data (Maylor and Blackmon, 2005).

According to Kaplowitz, *et al.* (2004), a postal or mail survey would have typically 11 per cent more response rate when compared with an on-line survey. It should be noted also that, since the work of Kaplowitz, *et al.* (2004), many more on-line surveys have been launched, probably resulting in a further reduction in response rate due to “survey fatigue” on the part of the recipient.

A mail questionnaire survey was chosen for this research because this is the most popular method to get real, objective facts and opinions from the subjects. Mail survey allows large-scale distribution to widely dispersed sample simultaneously at relatively low cost (Bryman and Bell, 2007; Sekaran 2000). Another distinct advantage of mail survey is that it reduces time pressure on respondents as they have time to digest the accompanying materials and are able to choose their own time and place to answer, thus yielding more considered responses (Saunders *et al.*, 2007).

4.5 Research choice

A quantitative approach involves collecting and analysing numerical data, and applying statistical tests. On the contrary, a qualitative approach is more subjective in nature and involves examining and reflecting on perceptions in order to gain an understanding of social and human activities. Qualitative researchers are greatly influenced by different intellectual traditions, whereas quantitative researchers are intensely influenced by a natural science approach to what should count as acceptable knowledge (Bryman and Bell, 2007).

The two approaches are not mutually exclusive; it is possible to combine the two approaches and research can be enriched by doing so. A mixed methods approach can enable a richer and deeper investigation of the research problem (Atkinson et al., 1997; Sekaran, 2000; Easterby-Smith et al., 2002; Creswell, 2009).

In this research, both methods are employed, known as mixed methods or methodological triangulation. Mixed method applies when both quantitative and qualitative data collection techniques and analysis procedures are used in a research design (Collis and Hussey, 2003; Saunders *et al.*, 2007; Creswell, 2009). It refers to the use of different research methods or techniques in the same study. This methodological triangulation can be used to overcome the potential bias and sterility of a single method approach (Collis and Husey, 2003; Mangan *et al*., 2004; Bryman and Bell, 2007).

Accordingly, there have been repeated calls in management accounting research to methodologically triangulate between survey methods and other methods (Modell, 2005; 2009). The recent calls for the use of triangulation method to bridge the gap in accounting research paradigms have been emphasized by Merchant (2010), Modell (2010), and Vaivio and Sirén (2010). The case for mixed methods research has generally been stated in terms of its tendency to enable researchers to combine breadth and depth in empirical enquiries, to enhance the validity or research findings through triangulation and to facilitate the mobilization of multiple theories in examining MAPs (Modell, 2010). In SCM, triangulation is proposed to maintain the width of the overall research and the depth of single case (case studies) related analysis (Seuring, 2008). Thus, for this research, a questionnaire survey providing quantitative data was accompanied by selected interviews to provide qualitative insights. As the research project was time-constrained, the study was cross-sectional**,** that is, done at a particular time.

Based on the above discussions (sections 4.2 to 4.4), Figure 4.2 below summarises the choice of research philosophy, design and methodology for this study, shown in shaded, underlined and **bold**.

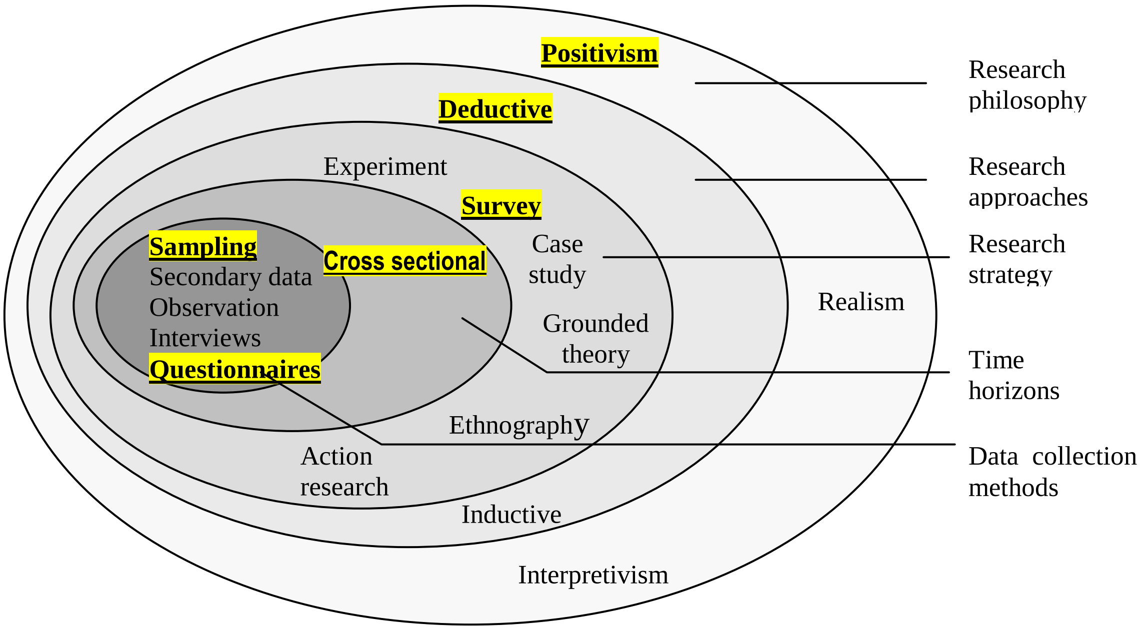


Figure 4.2: Choice of research philosophy, design and methodology

With research questions and objectives in mind, it seems clear to a certain degree that this research is positioned on a continuum towards the positivistic perspective. By adopting a positivistic view, the present study showed a focus on theory testing wherein theory was first adopted as the framework for developing and testing hypotheses in a specific research context. This emphasises deductive orientation of the research. Given the nature of the research objectives and the adequate availability of prior evidence to formulate hypothesised relationships for examination, it was deemed that cross-section descriptive and explanatory survey was the most appropriate option for this study. The questionnaire survey was used as the main data collection instrument as it enables the researcher to examine and explain relationships between constructs although qualitative method was also employed via semi-structured interviews.

4.6 Ethical considerations

As this research involves human participation (respondents answering questionnaire and interviews with selected respondents), ethical concerns emerged. There are normally general ethical issues in different stages of research, for instance, in formulating the research topic, designing and gaining access, collecting data, processing data, analysing and reporting (Saunders *et al.*, 2007).

When the research is a part of the normal professional practice of the individual, informed consent need not be obtained from participants, as consent has already been granted as part of their professional role (Hair *et al*., 2010). For this postal survey, even though physical access was not required in order to identify participants or the organization's permission to administer a questionnaire, a pre-survey contact by telephoning or emailing them to request them to complete the questionnaire was made. For the selected interviews, written requests were made to get consent from the organization for the interviews, i.e. the physical access, to take place.

A clear and fair description of the research in writing was provided to participants prior to their participation. All aspects that might reasonably be expected to influence their willingness to participate were explained to participants. The confidentiality of data provided by the respondents and their anonymity was assured and maintained through explicitly mentioning them in the covering letter of the questionnaire and through personal assurance in the interview. Participants were informed that their participation was voluntary in nature and that they had the right to withdraw from the process. This was done through the covering letter of the questionnaire and when physical access was required for the interview. The researcher also took precautions to avoid embarrassment, stress and discomfort to participants and to maintain appropriate behaviour and objectivity of the researcher (Hair *et al*., 2010).

4.7 Variables and their measurement

Scales must be developed that accurately measure the dynamic under investigation as quality research begins with quality measurement (MacKenzie *et al*., 2005; Hinkin, 1995). The latent variables (constructs) in this study were measured using multi-item manifest variables (measures). For most constructs, the measures were generated from previous research and modified to fit the current research context. Scales composed of five or six items that utilize five or seven point Likert scales are adequate for most measures (Hinkin, 1995). The wording and direction of the measures were reviewed by six management accounting academics and two practitioners and this resulted in refinement of some of the measures.

Empirical research is generally concerned with establishing the relationships between variables and may be dichotomized as dependent or independent variables. The independent variables are the variables selected as predictors and potential explanatory variables of the dependent variables (Hair *et al*., 2010) while the dependent variable measures the response to the effect of the independent variables (Ryan *et al.*, 2002). A third type of explanatory variable, known as a mediator variable, serves to clarify the nature of the relationship between the independent and dependent variables (MacKinnon, 2008). A mediating model seeks to identify and explicate the mechanism that underlies an observed relationship between an independent variable and a dependent variable (Rudestam and Newton, 2007).

In this study, the independent variables are the SCM practices (SCMPs); the dependent variables are the firm performance (OPERF) while the MAPs and the SCPERF are mediating variables. Discussion of the measure of each construct follows:

4.7.1 SCM practices (SCMPs)

This research employs dimensions of SCM practices (SCMPs) reported in numerous research (see e.g. Tan *et al*., 1998; 2002; Min and Mentzer, 2001; 2004; Chen and Paulraj, 2004; Li *et al*., 2005; 2006; Koh *et al*., 2007). These validated and reliable dimensions include strategic supplier partnership (SSP), customer relationship (CR), information sharing (IS), information quality (IQ), internal lean practices (ILP) and postponement (POS) (refer to Table 2.1). The practice of SCM is a multi-dimensional concept covering both the upstream and downstream sides of a supply chain. Although only six dimensions were included, they capture the major aspects of SCM practices (Min and Mentzer, 2004; Li *et al*., 2005; 2006). The justification for these six dimensions was also due to the length of the survey and the concerns regarding the parsimony of measurement instruments. The extent of SCM practices was measured using a 7-point scale ranging from “1” (not at all) to “7” (to a large extent). The approach aligns with other research in the area.

4.7.2 Management accounting practices (MAPs)

The IFAC statement of management accounting evolution was operationalized in order to provide a theoretical framework to model the sophistication of MAPs. In this framework, the sophistication of MA increases when more recently developed MAPs are emphasized by firms. The degree of emphasis on MAPs was measured using the same approach as Abdel-Kader and Luther (2008), Anderson and Lanen (1999) and

Chenhall and Langfield-Smith (1998). Companies were asked to rate both the frequency of use and the importance of MAPs in order to calculate the 'emphasis' score. The measurement was based on a 3-point scale (1=not important, 2=moderately important, 3=important) for the importance of MAPs; and based on a 5-point scale (1=never, 2-=rarely, 3=sometimes, 4=often, 5=very often) for the frequency of use. The mean for the emphasis (importance x usage) was also computed for each responding firm (Abdel-Kader *et al.*, 2008). Each MAP was categorised into one of the four levels based on the IFAC stages. The emphasis score for each category of MAPs was developed. The score was then used to cluster the firms into four groups. Each group represents a level of management accounting sophistication (Refer to Table 2.3).

Three practices under the Stage 4 of MA evolution (Open Book Costing, Inter-organizational Cost Management and Joint Inter-organizational Performance Measurement System) were added to the questionnaire based upon a rigorous review of MAPs in the SCM environment (see Section 2.4.3).

4.7.3 Supply chain performance (SCPERF)

This research uses SCPERF measures employed by numerous researchers in supply chain (see e.g. Tan *et al.*, 1998; Beamon 1999; Gunasekaran, 2001:2004; Li, 2002; Fynes, 2005). These include supply chain flexibility, supply chain integration, supplier performance and customer responsiveness. The definitions and scope of these measures have already been provided in Table 2.6. For each of these dimensions, respondents were asked to indicate their company's performance relative to their competitors on a scale ranging from "1" (significantly below) to "5" (significantly above).

4.7.4 Overall firm performance (OPERF)

To gauge overall performance, both financial and non-financial performance measures were employed using measures used by Tan *et al.* (1998), Hoque and James (2000), Li *et al.* (2006), and Cadez and Guilding (2008). Perceived overall firm performance includes market share, return on investment, profit margin on sales, total cost reduction, customer satisfaction, product quality and competitive position. For each of these dimensions, respondents were asked to indicate their company's performance relative to their competitors on a scale ranging from "1" (significantly below) to "5" (significantly above).

The detail of the measurement items used in the questionnaire is as per **Appendix A**. All questionnaires were sent to companies asking respondents to act as representatives of their companies and indicate the extent to which particular SCM practices and MAPs are adopted and their perceived supply chain and overall firm performance.

4.7.5 Pre-testing the questionnaire

The basic requirement for a good measurement is content validity which means that the measurement items in an instrument cover the major content of a construct. Content validity is usually achieved through a comprehensive literature review and interview with practitioners and academicians. As discussed in the earlier sections, the items for SCM practice were generated based on previous SCM literature. To improve the quality of a survey and to increase clarity, the survey questions should always be pre-tested to assess whether they can be correctly understood by respondents. Pre-testing is especially important in mail surveys as there are no interviewers to report problems in the questions and the survey instrument to the researcher. It can also increase the likelihood that the survey uses terminology that reflects the respondents' frame of reference (Bryman and Bell, 2007; Field, 2009).

The survey instrument was reviewed and pre-tested by six academicians and re-evaluated through structured interview with two practitioners. The focus was to check the relevance of each construct's definition, clarity of wording of questionnaire items. These experts were asked to review the questionnaire for structure, readability, ambiguity, and completeness (Dillman, 1991). Based on these evaluations, corrections and improvements were suggested, which were included in the measurement instrument.

4.8 Research sample

Data for this study were collected from a sample of firms drawn from the Consumer Products and Industrial Products[5] sectors listed under *Bursa Malaysia*. This permits the sample to include these largest and most advanced companies and may be advantageous because large companies, rather than small companies, are more likely to employ multiple SCMPs and MAPs as well as multiple performance measures. It is more likely that large organizations will have the means and the technical expertise to design and implement control systems comprising both SCMPs and MAPs which are appropriate to the survival of the business.

[5] Companies categorized under Consumer Products Sector are companies manufacturing materials or components into new products for consumer use. Companies categorized under Industrial Products Sector are companies manufacture materials or components into new products for industrial use (Bursa Malaysia Securities Berhad: http://bursamalaysia.com

These two sectors were selected for study for two reasons; firstly, both sectors are major contributors to Malaysian economic performance, with significant impact on the Malaysian manufacturing sector. The manufacturing sector is the major sector in generating employment opportunities and the fastest growing sector in Malaysia's growth experience. In 2008, the Malaysian manufacturing sector contributed 48.1% to gross domestic product (GDP), 85.2% to total export and over 30% to total employment (http://www.malaysian-economy.com/). They are widely acknowledged to be among the most influential firms in Malaysian economy (Malaysian Industrial Development Authority (MIDA) http://www.mida.gov.my).

Secondly, companies from both sectors are involved in collaborative arrangements in chains with suppliers and customers (involvement with suppliers, production, distributors, wholesalers, retailers, customers hence supply chains). Ittner *et al*. (2003) argue that restricting a survey sample to a single industry has an important advantage of implicitly controlling for the numerous confounding factors that impact on the results derived from cross-sectional surveys while at the same time it improves the internal validity of the study. The dominance of the selected sectors makes them useful research sites for this investigation. Additionally, the focus on the two sectors was made in order to remove from the findings distractions caused by peripheral industries. An initial list of 425 companies was prepared from the website of *Bursa Malaysia*.

One important factor in an empirical study is the quality of responses. In this study, the respondents have been targeted to have the extensive knowledge about management accounting practices, the management of supply chain and performance of their firms. It was decided to choose management accountants / senior accounting executives / senior or executive-level managers as the respondents for the current study because they were likely to be the most knowledgeable people in these areas.

A cross-sectional mail survey was utilized for data collection. Mailing lists were obtained from the *Bursa Malaysia*'s website, which has a link to all 425 companies' websites (from which the information on companies' full address and telephone numbers was found). Although the study was focusing on two sectors, it was not the objective of the study to make any comparison between the performances of the sectors; they were chosen only for the purpose of examining the practice of SCM and MAPs in a focused manner.

Before the survey was conducted, contact was made through phone calls to all 425 companies. The first aim was to obtain an agreement to fill in the questionnaire and thus get permission to send it to them. Through the phone calls, the objective of the research study was explained. The second aim was to verify the names and addresses of the companies or the appropriate business units. It was discovered that for a few companies or business units, their addresses were not the same as those listed in their websites. The preliminary contact, as a result, could increase the accuracy of the mailing list. Finally, but most important, the pre-contact survey was employed to obtain the names of the most appropriate persons to complete the questionnaire. It was desirable that the questionnaire was answered by a senior accounting executive, but given the objectives of the questionnaire, the most suitable person was sought in every case. This helped to ensure that the questionnaire reached the target person quicker and to ease the follow-ups for companies which failed to respond within the first three weeks.

From the pre-contact survey, the majority of the companies gave permission to administer the questionnaire. However, 70 companies asked to be removed from the sample, the main reasons given being, 'unwilling to disclose information regarding companies' practice', 'work pressures', 'decline to participate' and some without any reasons, leaving 355 potential respondents. The names of 191 persons responsible for heading the management accounting or equivalent, representing more than half of possible respondents; were received. Some companies preferred not to disclose target persons' names and suggested that the questionnaire could be sent directly to their 'Accounting and Finance Departments'.

4.9 Questionnaire administration and response rate

For data collection, a mail self-administered questionnaire was used. It is cost effective and time efficient and allows for a large sample population to be covered simultaneously. The fact that no interviewer is present when a questionnaire is being completed has the added advantage of eliminating the possibility of interviewer bias (Oppenheim, 1992).

The questionnaire, with a cover letter indicating the purpose and objectives of the study, was mailed to target respondents during the first week of July 2009. In an effort to increase the response rate, all mailings included, besides the cover letter and the survey, a postage-paid return envelope and a glossary of some technical SCM and management accounting terms used. The provision of a stamped and addressed envelope was for respondents' convenience. As an incentive, a copy of an executive summary of research findings and a draw prize of £100 were offered.

The anonymity of all respondents was assured, where no individual or company's identity would be revealed and all information disclosed would be treated as strictly confidential. In order to ease follow–ups for non-responding companies, the questionnaires were pre-coded for companies' identification. The details of replies were only used in the follow-up stages.

To ensure a reasonable response rate, the survey was sent in three waves. Second copies of the questionnaire were sent to non-responding companies three weeks after the first mailing. Follow-up telephone calls were made to all non-respondents of the companies at this stage. A third copy of the questionnaire was sent one month later to all non-respondents.

At the end of the process, a total of 99 responses were received from the mailings. Of these total responses, 14 were undeliverable due to address discrepancies and returned with notes indicating that the target respondents had moved or companies had ceased operations. A total of 3 responses were judged invalid because a portion of the questionnaire was not completed and were then discarded. Hence, the final number of complete and usable responses was 82 completed questionnaires, representing an effective response rate of 23.1%, which was considered acceptable. A significant problem with organizational-level research is that senior and executive-level managers receive many requests to participate and have very limited time. Because this interdisciplinary research collects information from several functional areas, the size and scope of the research instruments must be large and time consuming to complete which contributes to the low but acceptable response rate. Out of 82 respondents, the first wave produced 52 responses; the second and third waves generated another 30 responses.

Response rate in survey research

The average response rate in management accounting research is declining through the years (56% in 1970s and 1980s, 48% in 1995, and lower response rates in studies involving top management and organizational representatives (Van der Stede *et al*., 2005) revealing a similar pattern where the average response rate in surveys of managers bottomed out in the mid 1990s at about 32%. Various reasons for declining response rates in social science research have been cited, such as increased time and job pressure on respondents and rise in unsolicited mail (including surveys from consultants and the rise of academic research) (Van der Stede *et al*., 2005).

4.10 Non-response bias

One objective of survey based research is generalizability of results. One challenge to its generalizability is non-response bias. Non-response bias is the danger of any difference between the answers of respondents and non-respondents (Field, 2009). In this study, non-response bias was assessed using two approaches. As a convention, the responses of early and late waves of returned surveys were compared to check for non-response bias (Hair *et al*., 2010). The second and third waves are used as a proxy for non-respondents as they only responded after reminders and follow-up calls were made.

The final sample was split into two, depending on the dates they were received. The first group was the early wave group, which consisted of 52 responses, while the second group was the late wave group, which then consisted of 30 responses. The independent *t*-tests performed on the responses of these two groups yielded no statistically significant differences (at 95% confidence interval). Except for 15 out of 143 items, all the tests give significance (two-tailed) of greater than 0.05 ($p>0.05$) indicating there was no difference between the two groups in respect of the time of response. Accordingly, it can be concluded that non-response bias is unlikely to be a threat to the conclusions of the survey.

In addition, further randomly selected companies from the list (sampling frame) that did not respond were identified and publicly available size information (i.e., number of employees and sales volume) was collected. This information was combined with the responding firms to represent the population mean value. The sample and the population means of these demographic variables were compared for any significant difference. Using the Chi-square statistic and $P < 0.05$, it was found that there were no significant differences between the two groups in employment size and sales volume. An absence of non-response bias is therefore inferred.

4.11 Semi-structured interviews

In addition to the quantitative data collected through questionnaire survey, qualitative data was also collected by interviewing senior managers in six of the surveyed organizations. This was carried out to secure a deeper understanding and richer description of the nature of SCM practices and MAPs. The interviews aimed to check the reliability of the questionnaire responses and to gain more insights into the survey results. The details of the semi-structured interview protocol are as per **Appendix B**.

Semi-structured interviews from multiple case studies can be comprehended as a particularly useful research for assessing the "real world". According to Yin (2009), case studies allow direct observation of the field, which would be particularly suitable for approaching several stages of a supply chain. The use of qualitative data is helpful to gain more understanding of the relationships among constructs. Although case study research has often been criticized for its lack of rigour (Ellram, 1996; Seuring, 2008), this method can also be used to review the validity of the quantitative data findings. The case study research will continue to allow the in-depth analysis of the contemporary phenomena if the research process is carried out in a structured way and is well documented.

This set of six interviews was carried out to follow-up issues arising out of the analysis of responses to the survey instrument. These interviewees were key personnel responsible for the management accounting systems in their companies.

4.12 Data analysis

Once the data was collected, it was analysed with the following objectives in mind: purification, factor structure (initial validity), unidimensionality, reliability and the validation of second-order construct. The methods that were used for each analysis are corrected-item total correlation (for purification), exploratory factor analysis (for factor structure and initial validity), partial least squares analysis (for unidimensionality, convergent and discriminant validity, and T-coefficient (for the validation of second order construct).

The first part of the analysis consisted of descriptive statistics (detailed in Chapter 5) and the reliability and validity analysis of the measurement model, i.e., items used in the questionnaire (detailed in Chapter 6). The descriptive analysis of SCM practices, MAPs and firm performance mainly describes the data in terms of frequency, percentage, mean and standard deviation. Exploratory factor analysis (Principal Component Analysis (PCA) as the factor extraction) was employed to uncover the latent structure (dimensions) of a set of variables where the large number of variables precludes modelling all the measures individually. The factor analysis was also used as part of an initial validity test, that is, to validate the scale by demonstrating that its constituent items load on the same factor (and to drop proposed scale items which cross-load on more than one factor). The analyses in descriptive analysis and EFA are mainly based on the Statistical Package for Social Science (SPSS) output. Convergent and discriminant validity were tested by means of partial least squares analysis using PLS-Graph Version 3. This was then followed by the second part which consisted of the assessment of structural model (Chapter 7) to test the relationship among constructs. In order to test the proposed contingency model and the hypotheses, the alternative to structural equation modelling namely Partial Least Squares technique, was applied. The methods used in discussing the measurement model and the structural model are discussed below.

4.12.1 Structural equation modelling (SEM)

SEM is a statistical model that seeks to explain the relationships among multiple variables. In doing so, it examines the structure of interrelationships expressed in a series of equations, similar to a series of multiple regression equations. These equations depict all of the relationships among constructs (the dependent and independent variables) involved in the analysis (Hair *et al*., 2010). Constructs are unobservable or latent factors represented by multiple variables.

SEM encourages confirmatory modelling; thus, it is suited to theory testing rather than theory development. It usually starts with a hypothesis, represents this as a model, operationalises the constructs of interest with a measurement instrument and tests the model (Gefen *et al*., 2000; Byrne, 2006). This statistical technique allows for the simultaneous estimation of multiple and interrelated dependence relationships, has the ability to represent unobservable concepts and accounts for the measurement error in the estimation process (Bryne, 2006). The fact that a variable can play a double role in a SEM model (independent as well as dependent), means that SEM is more useful than linear regression, since instead of performing two regressions, one SEM will do.

SEM is characterized by two basic components: the structural model (the *path* model, which relates independent to dependent variables) and the measurement model (which enables researchers to use several variables (indicators) for a single independent or dependent variable). The measurement model is concerned with the measurement properties (validities and reliabilities) of the measurement instruments, while the structural model is concerned with causal relationships among the constructs. Following the recommended two-step approach, the measurement model was tested first, then the structural model (Bryne, 2006; Joreskog and Sorbom, 1984).

The use of SEM in management accounting research, according to Smith and Langfield-Smith (2004), has lagged behind that in some other disciplines in the social sciences (see Table 4.4). This was evidenced by the paucity of management accounting research using SEM techniques. Therefore management accounting researchers have been called on to make greater use of SEM to provide simultaneous tests of measurement reliability and structural relations, which may overcome some of the limitations that have been levelled at the way management accounting has used more traditional statistical techniques. SEM is particularly appropriate for modelling relations between environment, strategy, and organizational structure (Smith and Langfield-Smith, 2004).

Despite its popularity, covariance-based SEM theoretically needs rigorous requirements, such as data normality, minimum number of cases and reflective indicators, which often cannot be met by researchers. Additionally, it is regarded as poorly suited to deal with small data samples as it can yield non-unique or otherwise improper solutions in some instances (Chin and Newsted, 1999; Gefen *et al*., 2000). Therefore an alternative causal modelling approach called partial least squares (PLS) was developed to partly avoid some of the limitations inherent in SEM. In this study, PLS, a path modeling analytical approach, was chosen for data analysis.

Table 4.4: Past management accounting research utilising SEM / PLS analysis

Authors	Findings
Henri (2007)	SEM is still underutilized by management accounting researchers; only 41 studies have been published over a 25-year period in 14 accounting academic journals.
Smith and Langfield-Smith (2004)	The use of SEM in management accounting research lags well behind of other related disciplines.
Wisner (2003)	Developing and analyzing a hypothetical framework for supplier and customer issues and concerns, supply chain management strategy, and firm performance using SEM.
Chenhall (2003), Shields (1997)	There is a need to investigate and assess this technique.

SEM / PLS was the preferred method of analysis in this study as it allows the analysis of multiple relationships, simultaneously provides measures of overall model fit, as well as explaining the significance of each of the relationships between the variables (Chin, 1998a; Kline, 2005). The ability to model multiple relationships is an advantage of latent variable SEM over multiple regression and path analysis. In addition, unlike regression analysis and path analysis, SEM accounts for the effects of measurement error in multi-item variables (Chin, 1998a, Hulland, 2009).

4.12.2 Partial least squares (PLS)

4.12.2.1 Background of PLS

PLS, a second-generation multivariate data analysis tool, is relatively new and less known compared to covariance-based SEM. It was developed in early 1980s by, among others, Wold (1982), Fornell and Bookstein (1982) and Fornell and Larcker (1981). PLS first gained popularity in chemometric research and later in industrial applications (Joreskog and Sorbom, 1984; Chin and Newsted, 1999). PLS has been used widely in the field of information systems (Chin *et al*., 1998a; Gefen and Straub, 2005), strategic management (Hulland, 1999), marketing (Henseler, 2009), intellectual capital (Bontis, 1998), supply chain management (Koh *et al*., 2007) and management control systems (Mahama, 2006). Despite its popularity in other disciplines, limited evidence[6] in the management accounting field that used PLS was found (Smith and Langfield-Smith, 2004).

PLS is essentially a variance-based (or component-based) SEM methodological approach. It is an iterative combination of principal components analysis relating measures (also known as items) to constructs, and path analysis permitting the construction of a system of constructs (Barclay *et al*., 1995, Chin, 1998b). The approach

[6] Examples of published management accounting studies that utilize PLS to date are Ittner *et al*. (1997) and Cleary (2009).

is designed to maximize prediction, rather than fit, as claimed by Joreskog and Wold (1982, p. 270): “PLS is primarily intended for causal-predictive analysis in situations of high complexity but low theoretical information”. Consequently, PLS is more suited for predictive applications and theory building, in contrast to covariance-based SEM.

The primary objective of PLS is the explanation of variance in a regression sense, and therefore R^2 values and the significance of relationships among constructs indicate how well a particular model is performing. PLS shares the same assumptions as those of multiple regressions, especially concerning outliers and non-linear data relationships. Using Ordinary Least Squares (OLS) as its estimation technique PLS performs an iterative set of factor analyses combined with path analyses until the difference in the average R^2 of the constructs becomes insignificant (Barclay *et al*., 1995). PLS estimates the parameters in such a way as to minimize the residual variance of all the dependent variables in the model rather than estimating the variance of all the observed variables, as in covariance-based SEM (Chin, 1998b). Consequently, PLS is less affected by small sample sizes (Barclay *et al*., 1995), as in the case of linear regression models in general.

Furthermore, the segmenting of complex theoretical models allows PLS to operate using small sample sizes. As the subset estimation process consists of simple and multiple regressions, the sample size required needs to support the most complex multiple regression encountered. Generally, the most complex regression will involve (i) the indicators (items) on the most complex construct, or (ii) the largest number of antecedent (exogenous) constructs leading to an endogenous construct. Sample size requirements, using the rule of thumb of ten cases per predictor, become ten times the number of predictors from (i) or (ii), whichever is greater (Cohen, 1988; Barclay *et al*., 1995; Chin, 1998a). Smith and Langfield-Smith (2004, p.75-76) state with reference to management accounting research:

> *"The use of PLS…appears to be a way in which statistical modelling in management accounting research can move forward without the need to obtain large samples, something which management accounting researchers have traditionally found difficult. (PLS is therefore) tailor made for management accounting research".*

Additionally, PLS applies an iterative sequence of OLS and multiple linear regressions, analysing one construct at a time (Barclay *et al*., 1995). PLS, like linear regression models, is then less influenced by deviations from multivariate normal distribution (Barclay *et al*., 1995; Chin, 1998b), although sample size considerations influence the strength of the statistical test (Hair *et al*., 2010). As a consequence, PLS has a less extensive set of statistics.

Once the measurement and structural paths have been estimated in this way, PLS applies either a jackknife or a bootstrap approach to estimate the significance (t-values) of the paths. Neither of these PLS significance estimation methods requires parametric assumptions. This explains another reason why PLS is especially suited for the analysis of small data samples and for data that does not necessarily exhibit the multivariate normal distribution required by covariance-based SEM (Barclay *et al*., 1995; Chin, 1998b). The basic distinction between PLS and SEM as causal modelling methodologies rests in their objectives (Barclay *et al*., 1995). As Hulland (1999, pg. 202) states,

> *"LISREL and other covariance structure analysis modelling approaches involve parameter estimation procedures which seek to reproduce as closely as possible the observed covariance matrix. In contrast, PLS has as its primary objective the minimisation of error (or equivalently, the maximisation of variance explained) in all endogenous constructs. The degree to which a particular PLS model accomplishes this objective can be*

determined by examining the R^2 values for the dependent (endogenous) construct".

The table below outlines the primary differences between PLS and SEM.

Table 4.5: Partial Least Squares vs SEM

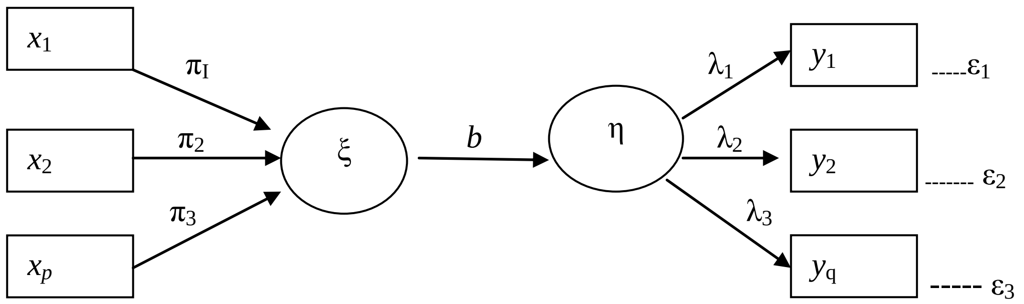
	PLS	**SEM**
Objective	Prediction oriented	Parameter oriented
Approach	Variance based	Covariance based
Assumptions	Predictor specification (non parametric)	Typically multivariate normal distribution and independent observations (parametric)
Parameter estimates	Consistent as indicators and sample size increase (i.e. consistency at large)	Consistent
Latent variable scores	Explicitly estimated	Indeterminate
Epistemic relationship between a latent variable and its measure	Can be modeled in either formative or reflective mode	Typically only with reflective indicators
Implications	Optimal for prediction accuracy	Optimal for parameter accuracy
Model complexity	Large complexity (e.g. 100 constructs and 1,000 indicators)	Small to moderate complexity (e.g. less than 100 indicators)
Sample size	Power analysis based on the portion of the model with the largest number of predictors. Minimal recommendations range from 30 to 100 cases.	Ideally based on power analysis of specific model – minimal recommendations range from 200 to 800 cases.

Source: Adapted from Hoyle (1999, p.314).

To summarise, the Maximum Likelihood estimation via the LISREL or AMOS program (Joreskog and Sorbom, 1984) is based on a factor construct concept that requires significantly more statistical specification than PLS and thus places more demands on the data. PLS, on the other hand, is based on a component construct concept. LISREL is better suited for theory testing while PLS is better suited for explaining complex relationships (Fornell and Bookstein, 1982). The main purpose of PLS is, thus, the prediction of empirical and / or theoretical variables. The analyst specifies the residual variances to be minimized, and PLS accomplishes the estimation via an iterative procedure in which each step involves a minimization of residual variance with respect to a subset of the parameters, given a fixed-point constraint of the other parameters.

4.12.2.2 PLS procedures

Figure 4.3 illustrates a simple generic model with two constructs and p and q measures (or items, variables) of each construct respectively. The standard notion for specifying PLS models is used. An exogenous construct (specified as ξ) is shown as predicting or 'causing' an endogenous construct (specified as η). An exogenous construct is consistent with that of an independent variable.



ξ: an exogenous construct
η: an endogenous construct
x_t t = 1, …, p: x variables, measures or indicators
y_i i = 1, …, q: y variables, measures or indicators
π_I, I = 1,…, p: regression weights
λ_m, m = 1,..., q: loadings
ε_n, n = 1,..., q: error terms
b = simple regression coefficient between ξ and η

Figure 4.3: A two-construct model
Source: Barclay *et al*. (1995), p.291

Once specified, the measurement and structural parameters of a PLS causal model are estimated in an iterative fashion using traditional Ordinary Least Squares (OLS) simple and multiple regressions.

The first step in a study employing PLS is for the researcher to specify explicitly both the structural (or path) model and the construct to measure (items) relationships in the measurement model (Barclay *et al.*, 1995). The nature of the links between constructs and measures are referred to as epistemic relationships (Fornell, 1982). Two basic types of epistemic relationships are reflective indicators and formative indicators.

Construct-measurement relationships - Reflective and Formative indicators

Reflective indicators relate to constructs which are conceptualized as giving rise to the observations. These indicators are typical of classical test theory and factor analysis models as they are designed as an attempt to account for observed variances. In contrast, formative indicators are used to minimize residuals (errors) in the structural relationship. Therefore if the study is intended to account for observed variances, reflective indicators are most suitable (Hulland, 1999).

If in a single model, both reflective indicators are used for endogenous and exogenous variables, Fornell and Bookstein (1982) called it Mode A. If both constructs in the model have formative indicators, it is Mode B while if mixed-mode estimation is used, it is known as Mode C (Fornell and Bookstein, 1982). Modes A and B represent two separate principles; Mode A minimizes the trace of the residual variances in the "outer" (measurement) equations and Mode B minimizes the traces in the "inner" (structural) equations while Mode C is the compromise between the two.

According to Chin (1998a), SEM analysis assumes that items (indicators) used are 'reflective'. This suggests that items in the respective construct (latent variable (LV)) are caused by the same underlying concept. Graphically the reflective item is shown by an arrow leading to the items. The use of reflective items implies that a change in an item will lead to a similar directional changes at other items (Chin, 1998a).

Formative indicators, on the other hand, are defined as 'measures that form or cause the creation or change in a LV' (Chin, 1998a). The arrows are pointing from indicators towards latent variables. The use of formative items in covariance-based SEM can lead to serious problems concerning validity of the results and conclusions.

In SEM, all items must be reflective to be consistent with the statistical algorithm that assumes that the correlations among indicators for a particular latent variable are caused by that latent variable (SEM techniques such as LISREL attempt to account for all the covariance among its measures). However, to provide answers to this problem, Chin (1998b) proposes that the component-based approach (PLS) enables the researcher to use both reflective and formative items in the research model. He argues that the algorithm supports both types of items.[7]

In this study, the type of relationships between constructs and items is classified as reflective indicators, i.e., Mode A type. To determine the minimum sample required in Mode A, the number of independent variables (exogenous) related to the dependent variables (endogenous) is multiplied by ten. If the model also has formative indicators (Mode B or Mode C) the largest number of formative indicators from the most complex

[7] Further discussion on this particular issue can be seen in Chin (1998a, 1998b).

construct is multiplied by ten. The higher of the two results (dependent variable and the formative construct) is then compared to the number of observations. It should be less than or equal to the number of observations in order to meet the minimum sample requirement for PLS.

In this study, essentially, the relationships are reflective indicators as it is assumed that one or sometimes more underlying unobservable constructs cause the observed variable (Diamantopoulos, 1994).

4.12.2.3 PLS path models

PLS path models are formally defined by two sets of linear equations, the inner (the structural) model and the outer (the measurement) model. The inner model specifies the relationships between unobserved or latent variables whereas the outer model specifies the relationships between a latent variable and its observed or manifest variables. The inner model for relationships between latent variables can be written as:

$$\xi = B\xi + \zeta \qquad (1)$$

where ξ = the vector of latent variables

B = the matrix of coefficients of their relationships,

ζ = the inner model residuals

The basic PLS design assumes a recursive inner model that is subject to predictor specification; thus it constitutes a causal chain system, that is, with uncorrelated residuals and without correlations between the residual term of a certain endogenous latent variable and its explanatory latent variables. Thus, predictor specification reduces (Henseler *et al*., 2009) Eq. (1) to:

$$(\xi \mid \xi) = B\xi \qquad (2)$$

As discussed earlier, PLS path modelling includes two different kinds of outer models; reflective (Mode A) and formative (Mode B) measurement models. The selection of a certain outer mode is subject to theoretical reasoning. The reflective mode has the causal relationships from the latent variable to the manifest variable in its block. Thus, each manifest variable in a certain measurement model is assumed to be generated as a linear function of its latent variables and the residuals ε:

$$X_x = \Lambda_x\xi + \varepsilon_x \qquad (3)$$

Where Λ = the loading coeffiecients

The outer relationships are also subject to predictor specification which implies that there are no correlations between the outer residuals and the latent variables of the same block; hence reducing Eq. (3) to

$$X_x \mid \xi) = \Lambda_x\xi \qquad (4)$$

On the other hand, the formative mode of a measurement model has causal relationships from the manifest variables to the latent variable.

The PLS algorithm is essentially a sequence of regressions in terms of weight vectors obtained at convergence satisfying 'fixed point equations'. As suggested by Lohmöller (1989), the basic PLS algorithm includes the following three stages[8].

Stage 1 Iterative estimation of latent variable scores, consisting of a four-step iterative procedure that is repeated until convergence is obtained.

[8] For further details, see Henseler *et al*. (2009), Tenehaus *et.al*. (2005).

i. Outer approximation of the latent variable scores.
ii. Estimation of the inner weights.
iii. Inner approximation of the latent variable scores.
iv. Estimation of the outer weights.

Stage 2 Estimation of outer weights/loading and path coefficients.
Stage 3 Estimation of location parameters

4.12.2.4 Summary of strengths and limitations of PLS

As an alternative to SEM technique, PLS shares one obvious advantage, that is, its ability to map paths to many dependent variables in the same research model and to analyze all paths in the structural model simultaneously rather than one at a time (Barclay *et al*., 2005). PLS has a less extensive set of statistics than covariance-based approach such as LISREL. It is robust in regard to multivariate normality deviation because data are not assumed to be multivariate normal. In other words, it can handle numerous independent variables even when these display multicollinearity (Chin, 1998a; Hulland, 1999). Additionally due to the minimal demand on measurement scale, sample size and residual distributions, PLS can be used to suggest where relationships may or may not exist and to suggest propositions for later testing (Chin and Newsted, 1999).

For application and prediction, a PLS approach has relative strengths. Under this approach, parameters are estimated so as to maximize the variance explained in either the set of observed measures (reflective mode) or the set of latent variables (formative mode) (Fornell and Bookstein, 1982). Fit is evaluated on the basis of the percentage of variance explained in the specified regressions. As PLS estimates the latent variables as exact linear combinations of the observed measures, it offers the advantage of exact definition of component scores. The exact definition in conjunction with explaining a large percentage of the variance in the observed measures is useful in predicting the strength of the components (Anderson and Gerbing, 1988).

Nevertheless, PLS also has its limitations. Because it is a limited-information estimation method, PLS parameter estimates are not as efficient as full-information estimates (Fornell and Bookstein, 1982). Jackknife or bootstrap procedures are required to obtain estimates of the standard errors of the parameter estimates. No overall test of model fit is available. Furthermore, the technique makes neither assumptions nor assessments of unidimensionality measurement. Therefore the theoretical meaning imputed to the latent variables can be problematic. Finally, PLS estimates will be asymptotically correct under the joint conditions of consistency (sample size becomes large) and consistency at large (the number of indicators per latent variable becomes large). In practice, the correlations between the latent variables will tend to be underestimated whereas the correlations of the observed measures with their respective latent variables will tend to overestimated (Dijkstra, 1983).

In most accounting studies, data tend to be distributed non-normally and PLS does not require any normality assumptions and handles non-normal distributions relatively well. Additionally, PLS accounts for measurement error and should provide more accurate estimates of interaction effects such as mediation (Chin, 1998b, Bontis *et al*, 2007).

Mediation effects and PLS

PLS poses challenges and opportunities for the study of mediation effects. However, it is particularly well suited to the study of mediation. Mediation effects are the product of two relationships; between the independent variable and the mediator, and between the mediator and the dependent variable. PLS employs bootstrapping to test the significance of relationships so it work well with non-normal data and therefore may perform well in testing mediation effects. On the other hand, there appears to be no official guidelines providing instructions on how to use PLS to study mediation.

4.12.2.5 Justifications for using PLS

PLS has many advantages that make this technique particularly suitable for this study. It is especially effective for exploratory studies and for model-prediction testing, the purpose of this research study. The measures used in this study are designed to 'reflect' each underlying construct; the measures are thus classified as 'reflective' indicators. Due to this, the acceptable sample size for regression purposes is determined by multiplying the largest number of antecedent constructs leading to an endogenous construct by ten (thus $6 * 10 = 60; 60 < 82$). Therefore based upon this result, the sample size of 82 completed survey instruments is acceptable for regression purposes.

PLS was preferred to SEM for this study since the interest in this study is to assess the predictive validity of SCM and MAPs constructs measured separately from SCPERF and OPERF responses, making a focus on the paths rather than the model appropriate. In addition, PLS does not require distributional assumptions regarding the underlying data; tests of univariate normality (Kolmogorov-Smirnov test) showed that none of the manifest variables in this study were normally distributed (all $p<0.0001$)[9] reported in the following chapter.

[9] Inspection of the histograms showed that most of the items were negatively skewed.

PLS is also adopted because it is appropriate for complex structural models and has minimal requirements as to residual distributions and sample size (Chin, 1998a; Gefen *et al*., 2000) as the research model in this study indicates more than one dependent variable (endogenous variable). In this situation, given a limited number of cases together with non-normal multivariate data; the use of PLS is suitable in these circumstances. The computer software used to analyse data was PLS-Graph beta version 3.0 developed by Professor Wynne Chin (www.plsgraph.com).

4.12.3 Scale purification and scale dimensionality

Before factor loadings are examined through Exploratory Factor Analysis (EFA), data purification was firstly completed. The need to purify the items before administering factor analysis is emphasized by many authors (Churchill, 1979; Hair *et al*., 2010; Field, 2009). Purification is carried out by examining the corrected-item total correlation (CITC) score of each item with respect to a specific dimension of a construct. The CITC score is a good indicator of how well each item contributes to the internal consistency of a particular construct as measured by the Cronbach's alpha coefficient (Nunnally, 1978).

Exploratory factor analysis

Exploratory factor analysis (EFA) was used to conduct a preliminary examination of the structure (dimensionality) of the data as well as to achieve data reduction (Hair *et al*., 2010). Principal Component Analysis (PCA) was employed as the factor extraction method and Varimax orthogonal rotation method was chosen. The reasons for PCA are two-fold: first, data reduction is the primary concern focusing on the minimum number of factors needed to account for the maximum portion of the total variance represented in the original set of variables; second, data reduction involves a set of uncorrelated measures (Ford *et al*., 1986; Fabrigar *et al*., 1999; Hair *et al*., 2010). Orthogonal rotational approaches (specifically Varimax rotation) are more widespread and more widely used (Field, 2009; Hair *et al*., 2010). Retaining factors with eigenvalues greater than one was the most commonly used criteria for retention of factors, although the use of scree tests based on a substantial decrease in eigenvalues was occasionally reported (Hinkin, 1995).

Reliability tests suggested that screening the data along Churchill's recommendations would improve reliability levels. Following the guideline established by Nunally (1978), an alpha value (α) of 0.70 and higher is often considered the criterion for internally consistent established factors (Hair *et.al*, 2010), the threshold used for SCM practices and SCM performance constructs. Nunnally (1978) further states that permissible alpha values can be slightly lower (0.60) for newer scales. The constructs for MAPs (Stage 1 to Stage 4) developed in this study are new, even though they are strongly grounded in the literature. Therefore, an alpha value of 0.60 was considered as the cut-off value. As this study is considered exploratory, alpha value 0.60 for MAPs construct is acceptable in the early stages of this sort of research.

After purifying the items, an exploratory factor analysis of the items in each construct was conducted. Items with good measurement properties should exhibit high factor loadings on the latent factor of which they are indicators, and small factor loadings on the factors that are measured by differing sets of indicators. The results could provide some evidence of initial validity of measurement items. The elimination of cross-loading items for each factor-analysed construct is common and necessary because the primary objective of EFA is to “define the underlying structure among the variables” (Hair *et al*., 2010, p. 94).

Since the goal is to examine the most significant loadings in interpreting the factor solution, it was decided to use a cut-off point of 0.70 for item loadings. Given the sample size of 82, factor loadings of 0.70 and higher will be considered significant (Hair *et al*., 2010) for SCM practices, SCM performance and overall organizational performance constructs. Since the MAPs constructs following the IFAC framework is regarded as new factors, the cut-off point is 0.60. There are no accepted “absolute” standards for the cut-offs; the choice is based on judgment, purpose of the study, and prior studies (Ford *et al*., 1986; Fabrigar *et al*. 1999).

The appropriateness of factor analysis can be judged by correlation coefficients above 0.3. To measure the adequacy of the sample, the Kaiser-Meyer Olkin (KMO) Measure of Sampling Adequcy (MSA) value of above 0.6 can be used. The Bartlett’s Test of Sphericity value should also be significant (i.e. the sig. value should be 0.05 or smaller).

EFA is useful at identifying an underlying factor structure and thus providing initial unidimensionality (convergent validity) and discriminant validity for a strong measurement model for the PLS analysis, the subsequent multivariate analysis. However, EFA assumes that the measurement errors of the items are uncorrelated. In practice there is always some degree of error correlations among items and this cannot be detected by EFA. Additionally, it does not provide an explicit test of unidimensionality neither does it explicitly reveal second-order construct. Consequently, the results obtained from PCA and reliability analysis using SPSS will be submitted to Partial Least Squares (PLS).

4.12.4 Assessing the reflective measurement model

The measurement model within a PLS model is assessed by examining its reliability and validity. Reliability is a necessary pre-condition for validity (Nunnally, 1978). Several criteria have been proposed for assessing the psychometric soundness of measures including internal consistency and convergent and discriminate validity (construct validity) (Henseler *et al*., 2009). Internal consistency refers to the homogeneity of the items in the measure or the extent to which item responses correlate with the total test score while construct validity[10] is concerned with the relationship of the measure to the underlying attributes it is attempting to assess. The important statistics of the measurement model are item reliability, internal consistency, Average Variance Extracted (AVE), square-root of AVE and cross loadings (Barclay *et al*., 1995). The first three tests are known as convergent validity (Fornell and Larcker, 1981) and the last two tests are known as discriminant validity (Barclay *et al*., 1995).

Convergent validity measures the similarity or convergence between the individual items measuring the same construct while discriminant validity measures the extent to which the individual items of a construct are unique and do not measure any other constructs (Henseler *et al*., 2009). In other words, discriminant validity represents the extent to which measures of a given construct differ from measures of other constructs in the same model.

[10] For details on convergent and discriminant validity in PLS context, see Straub et al. (2004) and Hulland (1999).

A set of variables presumed to measure the same construct shows convergent validity if their inter-correlations are at least moderate in magnitude. In contrast, a set of variables presumed to measure different constructs shows discriminant validity if their inter-correlations are not too high (Field, 2009).

Item reliability

Within the PLS context, the measurement model is firstly assessed by investigating individual item reliability. Item reliability measures the amount of variance in an item due to the underlying variable rather than to error (Naranjo-Gil and Hartmann, 2007). Individual item reliabilities are evaluated by examining the factor loadings, or simple correlations of the individual measures (items) on their respective constructs. A rule of thumb is to accept items with loadings of 0.70 or more, which implies more shared variance between the construct and its measures than error variance. Since loadings are correlations, this implies that more than 50% of the variance (loading squared) in the observed measure (item) is shared with the construct (Barclay *et al*, 1995). If all of the loadings are above 0.7, it means that more than one-half of the variance is accounted for by the loading on a single factor.

Although the conservative acceptable reliability is 0.707 (Fornell and Larcker, 1981; Barclay *et.al.*, 1995), some argue that a value of 0.5 might be regarded as acceptable factor loading as long as there are some other factors in the same construct that load highly (Chin, 1998a). Hulland (1999) further contends that items with loadings of less than 0.4 – 0.5 should be excluded. Evidence of convergent validity can be concluded when the item reliability is at least 0.50.

Internal consistency / composite reliability

The reliability analysis was conducted for all the measured items in the questionnaire: the SCM practices, MAPs, SCM performance and overall firm performance. The reliability (internal consistency) of the items comprising each dimension was traditionally examined using Cronbach's alpha.

While Cronbach α assumes that all indicators are equally reliable, PLS prioritizes indicators according to their reliability, resulting in a more reliable composite. Cronbach's α tends to provide a severe underestimation of the internal consistency reliability of latent variables in PLS path models, it is more appropriate to apply a different measure, the composite reliability, P_c (Fornell and Larcker, 1981). Composite reliability measures the correlation among the multiple indicators for a particular variable (where minimum level is 0.70 as suggested by Nunally (1978)). Composite reliability is the preferred alternative to Cronbach's alpha as a measure of reliability because Cronbach's alpha may over or under-estimate scale reliability.

The composite reliability takes into account that indicators have different loadings and can be interpreted in the same way as Cronbach's α (that is; no matter which particular reliability coefficient is used, an internal consistency reliability value above 0.7 is regarded as satisfactory for an adequate model, whereas a value below 0.6 indicates a lack of reliability).

Average Variance Extracted (AVE) and square-root of AVE

Reliability alone simply does not assure validity (Nunnally, 1978); therefore the demonstration of construct validity (convergent and discriminant validity) of a measure is an important objective of the scale development. Convergent and discriminant validity are assessed by checking that the AVE of each construct is larger than its correlation with the other constructs (Fornell and Larcker, 1981). AVE is the average variance shared between a construct and its items. Chin (1998a) suggested an AVE higher than 0.5; indicating the convergent validity measures contain less than 50% error variance. Following Hair *et al*. (2010), the AVE index measures the variance captured by the variable relative to the variance due to the measurement error. AVE measures the variance captured by a latent construct, that is, the explained variance (Hulland, 1999). For each specific construct, it shows the ratio of the sum of its measurements item variance as extracted by the construct relative to the measurement error attributed to its items (Gefen and Straub, 2005).

The AVE measures for any two constructs that are related in the model exceed their squared correlations indicating discriminant validity (Fornell and Larcker, 1981). This measure should be greater than the variance shared between the construct and other constructs in the model (i.e. the squared correlation between two constructs). This can be demonstrated in a correlation matrix which includes the correlations between different constructs in the lower left off-diagonal elements of the matrix (and the square roots of the average variance extracted values calculated for each of the constructs along the diagonal). For adequate discriminant validity, the diagonal elements should be significantly greater than the off-diagonal elements in the corresponding rows and columns. One criterion for adequate discriminant validity is that a construct should share more variance with its measures than it shares with other constructs in a given model (Gefen and Straub (2005). In other words, the diagonal values that indicate the square-root of AVE should be larger than the off-diagonal values in the corresponding correlation matrix columns and rows (Hulland, 1999; Compeau *et al*., 1999). Fornell and Larcker (1981) and Barclay *et al*. (1995) have also argued that for a construct to possess convergent validity, the majority of the variance in its items (more than 50%) should be accounted for by the underlying construct rather than by measurement error.

If the construct-level validity and reliability are good, it is not a worry if a few of the individual-item reliabilities or validities do not meet the desired standards. Only items with unacceptably low validity or reliability should be eliminated (Spector, 1992; Nunnally and Bernstein, 1994; Hinkin, 1995). AVE reflects the average communality for each latent factor. In an adequate model, AVE should be greater than 0.5 (Chin, 1998a) which means factors should explain at least half the variance of their respective indicators.

Cross-loadings

Besides the Fornell and Larcker criterion, discriminant validity can also be assessed using cross-loadings. Cross loading measures the correlation of the particular items with all constructs within the model including the construct they are required to reflect. The criterion is that an item should load more highly to the construct it is required to reflect than to the other constructs (Fornell and Larcker, 1981; Chin 1998b). In other words, the loading of each indicator is expected to be greater than all of its cross-loadings. An item that loads more highly to the other constructs can be considered to be excluded from the PLS model. The cross-loadings allow the evaluation of discriminant validity on the indictor level while the Fornell-Larcker criterion assesses it on the construct level. The table below summarises the criterion used to validate the measurement model for PLS analysis. A reliable and valid reflective measurement of latent variables should meet all the criteria listed below.

Table 4.6: Summary of reflective measurement model assessment

Criterion	Description
Item (indicator) reliability	Absolute standardized outer (component) loadings should be higher than 0.7.
Composite reliability	The composite reliability is a measure of internal consistency and must not be lower than 0.6. $P_c = (\Sigma\lambda_i)^2 / [(\Sigma\lambda_i)^2 + \Sigma\ Var(\varepsilon_i)]$, where λ_i is the outer (component) loading to an indicator and $Var(\varepsilon_i) = 1 - \lambda_i^2$ in case of standardized indicators.
Average variance extracted (AVE)	The average variance extracted should be higher than 0.5. $AVE = (\Sigma\lambda_i^2) / [\Sigma\lambda_i^2 + \Sigma\ Var(\varepsilon_i)]$ where λ_i is the component loading to an indicator and $Var(\varepsilon_i) = 1 - \lambda_i^2$ in case of standardized indicators.
Farnell-Larcker criterion	In order to ensure discriminant validity, the AVE of each latent variable should be higher than the squared correlations with all other latent variables. Thereby, each latent variable shares more variance with its own block of indicators than with another latent variable representing a different block of indicators.
Cross-loadings	Cross-loadings offer another check for discriminant validity. If an indicator has a higher correlation with another latent variable than with its respective latent variable, the appropriateness of the model should be reconsidered.

Source: Adapted from Henseler *et al*. (2009), p.300.

4.12.5 Validation of second-order constructs

In this study, SCM practices, MAPs and SCM performance were conceptualized as second-order factors composed initially of between six and four dimensions respectively. In essence, a second order factor is directly measured by observed variables for all the first order factors. In a second-order factor model, the measurement model involves two layers of latent constructs. These models introduce second-order latent factors that cause multiple first-order latent factors, which in turn, cause the measured variables. A second-order model is supported to the extent that it shows a greater nomological validity[11] than a first-order model.

The specification of a second-order factor analysis model is actually quite similar to a first-order model as the first-order constructs are viewed as indicators (Chin, 1998a). The first order model should fit better in absolute terms because it uses more paths to capture the same amount of covariance but the higher-order model is more parsimonious (it consumes fewer degrees of freedom) although it is not simpler because it involves multiple levels of abstraction. If the higher order factor explains theoretically related outcomes e.g. firm performance as well or better than does the combined set of first-order factors, then evidence in favour of the higher-order representation is provided.

According to Hair *et al*. (2010), higher order factors must have theoretical justifications and should be used only in relationships with other constructs of the same general level of abstraction. Additionally, all of the first-order factors should be expected to influence other related constructs in the same way and at least three first-order constructs should be used to meet the minimum conditions for identification and good measurement practice.

The higher-order measurement model is appropriate in this study; the higher-order factors are used to predict other constructs of the same general level of abstraction. Therefore, a primary validation criterion becomes how well a higher-order factor

[11] Nomological validity is a test of validity that examines whether the correlations between the constructs in the measurement theory make sense.

explains theoretically related constructs. According to Hair *et al*. (2010), higher order measurement models are also still subject to construct validity standards.

Second order factors can be approximated using various procedures. One of the easiest to implement is the approach of repeated indicators known as the hierarchical component model. While this approach repeats the number of manifest variables used, the model can be estimated by the standard PLS algorithm. This procedure works best with equal numbers of indicators for each construct. A T-coefficient higher than 0.8 may also indicate the existence of a second-order construct since most of the variation shared by the first-order construct is explained by the single-order factor.

According to Yi and Davis (2003), a PLS-Graph does not directly permit the representation of second-order latent constructs. It tests such models indirectly by separately testing the first-order constructs comprising a second-order construct in a sub-model and then treating the computed first-order factor scores as manifest indicators of the second-order construct in a separate model.

4.12.6 Assessment of structural model

While at the measurement model level, PLS estimates item loadings and residual covariance, at the structural level, PLS estimates path coefficients and correlations among the latent variables, together with the individual R-square (R^2) of each of the latent constructs.

R-square

As in multiple regression analysis, PLS procedures also produce R^2 to determine the variance in the construct that is explained by the model (Barclay *et al*., 1995). Therefore R^2 values will determine the explanatory power of the model. The interpretation of the value of R^2 in PLS is the same as the R^2 produced by regression analysis (Henseler *et al*., 2009). This is the overall effect size measure, as in regression.

Resampling and bootstrapping technique

Good model fit is established with significant path coefficients, acceptably high R^2 and internal consistency (construct reliability) being above 0.70 for each construct (Barclay *et al*., 1995). As the distribution of PLS is unknown, conventional significance testing is impossible. Resampling procedures are therefore used to assess the significance of PLS parameter estimates. Testing may be accomplished by resampling methods such as jack-knifing or bootstrapping. In addition to a blind-folding option, PLS-Graph incorporates both jackknife and bootstrap options.

To assess the statistical significance of the loadings and the structural path coefficients, bootstrapping (or the alternative, jack-knifing procedure) are commonly used in PLS. The use of these non-parametric approaches is due to the data that are not assumed to be multivariate normal in PLS (Barclay *et al*., 1995). Both methods which are provided in the PLS-Graph should produce the converged standard errors. The choice between bootstrapping or jack-knifing is based on the trade-off between computational time and efficiency. Chin (1998a, p.320) states:

> *"Jack-knife estimation tends to take less time for standard error estimation under the joint assumptions that the bootstrap procedure utilizes a confidence estimation procedure than those of the Jack-knife. Conversely,*

the Jack-knife is viewed as less efficient than the bootstrap because it can be considered as an approximation to the bootstrap."

In PLS, the default Bootstrap options are 100 resample with each sample consisting of the same number of cases as your original sample set. The bootstrap procedure samples with replacement from the original sample set. It continues to sample until it reaches the number of cases specified (or the default). T-values of both paths and loadings are then calculated using either a jack-knife or a bootstrap method. If the model fits the data adequately, the beta (β) coefficient and t-values will be evaluated to test the significance of the hypotheses. Using the one-tailed test, a t-value greater than 2.33 is significant at the level of 0.01; a t-value greater than 1.65 is significant at the level of 0.05; and a t-value greater than 1.28 is significant at the level of 0.10.

4.12.7 Indirect effects

A variable may be considered a mediator to the extent to which it carries the influence of a given independent variable (IV) to a given dependent variable (DV). Generally speaking, mediation can be said to occur when:

1. The IV significantly affects the mediator.
2. The IV significantly affects the DV in the absence of the mediator
3. The mediator has a significant unique effect on the DV
4. The effect of the IV on the DV shrinks upon the addition of the mediator to the model.

These criteria can be used to judge informally whether or not mediation is occurring, but MacKinnon (2008) has popularized statistically based methods by which mediation may be formally assessed. Below is an illustration of the mediation model:

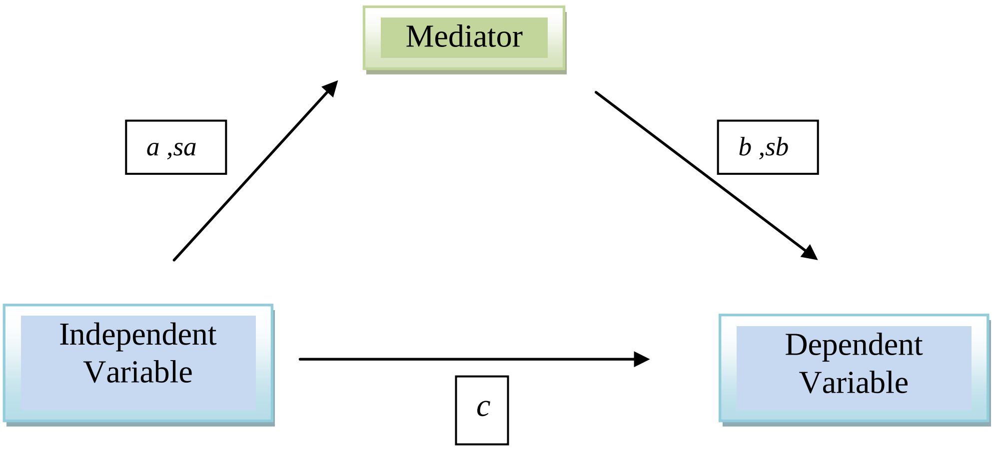


Figure 4.4: The mediator model

Source: Sobel (1982), Preacher and Leonardi (2001)

The calculation of coefficients for indirect paths, according to Sobel (1982) is as follows:

$$\textbf{z-value} = \mathbf{a*b / SQRT\ (b^2 * sa^2 + a^2 * sb^2)} \text{ where,}$$

a, *b*, and *c* are path coefficients. Values in parentheses are standard errors of those path coefficients.	
a =	the raw (unstandardized) regression coefficient for the association between independent variable and mediator.
sa =	the standard error of a
b =	the raw coefficient for the association between the mediator and the dependent variable (when the independent variable is also a predictor of the dependent variable)
sb =	the standard error of b
c =	the raw coefficient for the association between the independent and dependent variable
SQRT = square root	

4.13 Conclusion

This chapter has outlined the research philosophy, approach and strategy pursued in conducting this study. The methods and instruments used to gather data were also described. The study employs a primarily quantitative approach with survey methodology. A cross-sectional mail questionnaire survey supplemented by semi-structured interviews was employed. Data were collected from 82 Malaysian publicly listed firms from the Consumer and Industrial Products Sectors. For this research and in response to call for a mixed method approach in management accounting, the questionnaire survey was also accompanied by selected interviews to provide qualitative insights.

Data were analysed using Partial Least Squares (PLS) path modelling via PLS-Graph Version 3. Extensive attention has been given to applying and explaining the data analysis used in this research, particularly to the PLS, given its relative originality in dealing with MA and SCM. The data analysis involves the validation of measurement model and assessment of structural model. Following a review of the study, testing for non-response bias was then performed upon the accumulated data, the results of which confirmed that the accumulated data set was valid and appropriate for the research.

5 DESCRIPTIVE ANALYSIS

5.1 Introduction

These descriptive statistics represent the first step in developing a series of pragmatically relevant and statistically reliable constructs as well as providing valuable initial insights in regard to the data collected. All forms of statistical analysis assume sound measurement and data which is free of coding errors. It is therefore good practice to run descriptive statistics on the data so that one is confident that data are generally as expected in terms of means and standard deviations, and that any outliers are examined. In this section, descriptive statistics are used are to describe the basic features of the data in the study. It provides summaries about the sample and the measures and forms the basis of virtually every quantitative analysis of data. The tables from the descriptive analysis demonstrate a pattern of evidence. The chapter presents the profile of respondents and the participating companies, the descriptive statistics of SCM practices, MAPs and performance to answer the first research objective; i.e. to explore the status of SCM practices and MAPs in Malaysian large firms. Finally the data were also examined for outliers and univariate and multivariate assumptions to establish foundations for multivariate techniques used in subsequent analysis.

5.2 Profile of respondents and participating companies

The focus of this section is to provide general information on respondents and participant companies. It presents sample characteristics in terms of respondents (job title, job function and years worked in the organization), and the companies (employment size, annual sales, years of implementing the SCM programme and the position of the company in the supply chain). Frequency analysis was used to provide a brief account of these sample characteristics.

5.2.1 Job title and job function of respondents in companies

With regard to respondents in companies, the final sample included 30 management accountants and financial controllers (37%), 47 financial managers (57%) and 5 directors (6%). In relation to respondents' job functions, slightly more than half (52.4%) of the respondents are responsible for accounting and finance matters while 47.6% of respondents are in the corporate executive function. The other areas of expertise were manufacturing production, purchasing, transportation and distribution which account for 7.3%, 6.1%, 4.9% and 3.7% respectively. It can be seen that respondents have also covered other functions across the supply chain. In addition, more than 30% of the respondents are responsible for more than one job function; thus, they are expected to have a broad view of SCM practices as well as MAPs in their organization.

Slightly more than half of respondents (52%) indicate they have been with the organization over five years while 23% indicate having been at the organization between two to five years. The respondents with less than two years at the organization account for 27%.

In short, almost all of the respondents are management accountants and financial managers, and are responsible for accounting and finance as well as corporate executive functions. Half of the respondents have been in the organization for more than five years. Table 5.1 illustrates the profiles of respondents in companies.

Table 5.1: Summary of Profiles of respondents

Job title	Frequency	Percent
Management accountants / controllers	30	36.6
Finance Managers	47	57.3
Directors	5	6.1
Total	82	100.0

Years worked	Frequency	Percent
under 2 years	22	26.8
2-5 years	19	23.2
6-10 years	12	14.6
over 10 years	29	35.4
Total	82	100.0

Job Functions*	Frequency	Percent
Corporate executive	39	47.6
Accounting and finance	43	52.4
Manufacturing production	6	7.3
Purchasing	5	6.1
Transportation	4	4.9
Distribution	3	3.7
Sales	3	3.7

Percent from total 82 respondents
*Note: For this item, respondents may give more than one answer as they may be involved in more than one function.

5.2.2 Profile of participating companies

The companies' profiles are with regard to their sizes, their position in the supply chain and their involvement in the SCM programme. The size of companies was measured by number of employees and annual average sales.

Number of employees

The respondents worked primarily for medium and large firms with nearly 43% working for firms employing more than 500 employees. A total of 23 companies (28%) and 24 companies (29%) have numbers of employees between 251 – 500 and less than 250 respectively. This indicates that the majority of companies are in the large category.

Annual average sales

Table 5.2 indicates that slightly more than 60% of the firms had average annual sales exceeding RM100 million. Companies with average annual sales less than RM100 million account for 38%. This suggests that the majority of companies are large in size with respect to their annual sales.

Position of the company in the supply chain

A company can be positioned at or near the initial source of supply (raw material and component suppliers), be at or near the ultimate customer (distributor / wholesaler / retailer) or somewhere between these end points of the supply chain (manufacturers and assemblers). Among all surveyed companies, manufacturers account for 76.8% (63 companies), raw materials suppliers and component suppliers account for 34% (28 companies) and 17% respectively (14 companies). In addition, 13% and 5% of respondents consider themselves as assemblers and sub assemblers correspondingly. Distributors, wholesalers, and retailers account for 13%, 12% and 13% respectively. (Note: one company may occupy multiple positions and may represent multiple data items; the calculation of the percentage is based on the total sample size of 82 companies). The respondents were primarily involved in the manufacturing of consumer and industrial products and related services. It can be seen that the largest category of responding companies are manufacturers, who inevitably have suppliers of raw materials and most probably deal with assemblers, wholesalers or retailers, and the final consumers to reflect the whole supply chain.

Companies having an SCM programme/functions

The majority of the total respondents do not have a specific SCM programme or functions. Of the total 32 companies (39%) which have an SCM programme/functions, almost half have implemented the SCM programme/functions within the last two to five years and about 30% have implemented SCM programme/functions more than 5 years ago. Table 5.2 summarises the demographic profiles of participating companies.

Table 5.2: **Summary of Profile of Participating Companies**

Number of employees	**Frequency**	**Percent**
<250	24	29.3
251-500	23	28.0
501-1000	14	17.1
over 1000	21	25.6
Total	82	100.0

Average Annual sales in RM (millions)	**Frequency**	**Percent**	**Valid Percent**
<50	15	18.5	18.5
50 to <100	16	19.5	19.8
100 to < 500	34	41.5	42.0
over 500	16	19.5	19.8
Total	81	98.8	100.0
Missing system	1	1.2	
Total	82	100.0	

Position of the company in the supply chain*	**Frequency**	**Percent**
Raw material supplier	28	34.1
Component supplier	14	17.1
Manufacturer	63	76.8
Assembler	11	13.4
Sub-assembler	4	4.9
Distributor	11	13.4
Wholesaler	10	12.2
Retailer	11	13.4
Service provider	17	20.7
Other	5	6.1

Percent from total 82 respondents
*Note: For this item, respondents may give more than one answer.

Companies implementing SCM programme	Frequency	Percent
Having SCM Programme	32	39.0
Not having SCM Programme	50	61.0
Total	82	100.0
Years implementing SCM*	**Frequency**	**Percent**
< 2 years	7	21.9
2 < years < 5 years	15	46.9
5 – 10 years	7	21.9
More than 10 years	3	9.4
Total	32	100.0

*Percent from total 32 companies having SCM programme

5.3 Supply chain management practices

This section outlines the supply chain management practices items that were included in the survey instrument that was completed by respondents. For 35 items related to SCM, 82 companies indicated their level of SCM practices ranging from a very high level of practice (indicated by ‘to a large extent’ measurement of score 7) to a zero level of practice (indicated by ‘not at all’ measurement of score 1). Table 5.3 summarizes the descriptive statistics for SCM practices. Generally it is found that there are relatively high levels of practice in companies’ external relationship with suppliers and customers and lean practices, moderate levels of practice in dealing with information shared with trading partners and relatively low levels of practice in postponement.

In relation to strategic supplier partnership (SSP), the findings reveal high levels of practice in ‘long-term relationships with suppliers’ (mean 6.220) followed by ‘quality as number one criterion in selecting suppliers’ (mean 5.963) and ‘solve problems jointly with suppliers’ (mean 5.793). Companies also indicate above moderate levels of practice in helping suppliers improving their product, having continuous improvement programme with key suppliers, involving key suppliers in planning and goal setting and new product development processes, with the lowest mean of 4.793. The findings indicate that long term strategic partnerships with suppliers are vital in supply chain management.

The results of the mean scores reveal practices with the mean score above 5.00 with regard to customer relationships (CR). This is considered a considerably high level of practice, as the range of mean is between 6.000 and 5.488. High levels of practices in customer relationship include handling formal and informal complaints, interacting with customers to set reliability, responsiveness and other standards and making follow-up with customers for quality or service feedback. The results demonstrate that companies place high emphasis on customer relationship and preferences.

There are moderate levels of practice in terms of information sharing and quality of information shared. It is found that the most highly adopted practices are ‘inform trading partners in advance of changing needs’, ‘keep each other informed about events or changes that may affect the other partners’ and ‘fully informed about issues that affect business’. It illustrates that companies do share general information affecting them and their trading partners.

Table 5.3: Descriptive statistics for SCM practices

Constructs and items	Range	Mean	Std. Deviation
Strategic Supplier Partnership			
Quality as number one criterion in selecting suppliers.	4 – 7	5.963	0.777
Long-term relationships with our suppliers.	4 – 7	6.220	0.786
Solve problems jointly with our suppliers.	3 – 7	5.793	0.952
Help suppliers to improve their product quality.	2 – 7	5.024	1.342
Continuous improvement programs with key suppliers.	2 – 7	5.073	1.245
Include key suppliers in planning and goal-setting.	2 – 7	4.854	1.316
Involve key suppliers in new product development processes.	1 – 7	4.793	1.340
Customer Relationship			
Evaluate the formal and informal complaints of customers.	4 – 7	6.000	0.956
Interact with customers to set reliability, responsiveness and other standards.	4 – 7	5.927	0.872
Follow-up with our customers for quality / service feedback.	4 – 7	5.854	0.944
Measure and evaluate customer satisfaction.	3 – 7	5.659	0.997
Determine future customer expectations.	2 – 7	5.488	1.069
Facilitate customers' ability to seek assistance from us.	4 – 7	5.598	0.928
Evaluate the importance of our relationship with our customers.	2 – 7	5.598	1.110
Level of Information sharing			
Share business units' proprietary information with trading partners.	1 – 7	4.134	1.377
Inform trading partners in advance of changing needs.	2 – 7	4.976	1.042
Trading partners share proprietary information.	1 – 7	4.182	1.335
Fully informed about issues that affect business.	2 – 7	4.671	1.228
Trading partners share business knowledge of core business processes	2 – 7	4.573	1.155
Exchange information that supports business planning.	1 – 7	4.671	1.228
Keep each other informed about events or changes affecting partners.	1 – 7	4.890	1.197
Level of Information Quality			
Information exchange is timely.	2 – 7	4.927	1.052
Information exchange is accurate.	2 – 7	4.878	1.082
Information exchange is complete.	1 – 7	4.768	1.200
Information exchange is adequate.	1 - 7	4.781	1.187
Information exchange is reliable.	2 – 7	4.988	1.094
Internal Lean Practices			
Targets the reduction of set-up time.	1 – 7	5.488	1.200
Continuous quality improvement.	2 – 7	5.744	0.991
Pull production system.	1 – 7	4.573	1.587
Pushes suppliers for shorter lead-times	1 – 7	5.085	1.416
Streamlines ordering, receiving and other paperwork from suppliers.	1 – 7	5.012	1.495
Postponement			
Products are designed for modular assembly.	1 – 7	3.476	1.951
Production process modules can be re-arranged so that customization can be carried out later.	1 – 7	3.817	1.873
Delay final product assembly activities until customer orders have actually been received.	1 – 7	3.488	1.920
Delay final product assembly activities until the last possible position (or nearest to customers) in the supply chain.	1 – 7	3.439	1.963

Similarly, companies also indicate a higher than moderate level of practice in terms of Internal Lean Practices (ILP); types of practices like continuous ‘quality improvement’ (mean 5.744), ‘reduction of set-up time’ (5.488) and ‘push suppliers for shorter lead-times’ (5.085) and ‘pull production system’ (4.573).

On the other hand, it is found that companies indicate relatively low levels of postponement activities, where lower mean scores are observed (mean ranging from 3.439 to 3.817*)*. It appears that there is a lower level of customization of products at a later stage of production. This might be due to a lack of awareness of this practice among the responding companies.

As can be seen from the range and standard deviation, there is a high variation in the responses. While there is considerable variety in responses, the majority of the mean scores are within the range of 4.000 to 6.000 (for most items). This is most apparent in strategic supplier partnership, customer relationship and internal lean practices, and least in postponement.

5.4 Management accounting practices based on purpose

Respondents to the survey instrument were initially requested to indicate the frequency of use and the importance of MAPs. The measurement was based on a 3-point scale (1=not important, 2=moderately important, 3=important) for the importance of MAPs; and based on a 5-point scale (1=never, 2=rarely, 3=sometimes, 4=often, 5=very often) for the frequency of use.

For descriptive purpose, five MAPs' classifications were used, namely, costing systems, budgeting, performance evaluation, information for decision making and strategic analysis (Abdel-Kader and Luther, 2006; 2008). An emphasis score was calculated for each practice; the mean of the emphasis was computed by multiplying importance score and usage score (Abdel-Kader *et al.*, 2008). In general, it is observed that all practices have been to a certain extent emphasized; naturally they differ in terms of importance and frequency of use.

Costing systems

It is found that less sophisticated costing techniques such as 'a plant-wide overhead rate', 'departmental overhead rate', and 'separation between fixed and variable cost' are still perceived as of considerable importance, with mean scores of 2.476, 2.366 and 2.695 respectively. More modern techniques like 'activity-based costing' (ABC) (mean 2.122), 'target costing' (mean 2.024) and 'quality costing' (mean 1.976) are perceived as moderately important, while 'open book costing' and 'regression and learning technique' are considered as the least important MAPs with mean score 1.659 and 1.732 respectively. Only one more modern technique, that is, 'inter-organizational cost management' (IOCM) is perceived as highly important (mean 2.390); a sign of early importance placed on cost management related to an inter-organizational setting. As might be expected, the perceived importance of these techniques is associated with their frequency of use. A MAP perceived by responding firms as highly important is likely to have high implementation. 'A plant-wide overhead rate' (mean 3.671), 'a departmental overhead rate' (mean 3.512), 'separation between fixed and variable costs' (mean 4.012), and 'IOCM' (mean 3.439), are often being used and therefore moderately emphasized (with mean score of emphasis at least 8.805). Consistent with their perceived importance, ‘ABC’, ‘target costing’ and ‘quality costing’ are only sometimes being used and hence moderately emphasized; with mean score of usage 3.061, 2.854 and 2.744 respectively. ‘Open book costing’ (mean score of usage 2.293) is, as expected, deemed as the least emphasized technique, with mean emphasis below 5.000.

Budgeting

The budgeting techniques that are perceived as most important are more conventional techniques which consist of ‘budgeting for planning’ (mean 2.671), ‘budgeting for controlling costs’ (mean 2.646) and ‘budgeting for long term and strategic plans’ (mean 2.329). These are the budgeting techniques that are often being used and consequently highly emphasized. ‘Flexible budgeting’, on the other hand, despite being a traditional budgeting technique, has relatively low levels of importance (mean 2.037) and usage (mean 2.878).

More sophisticated budgeting techniques are perceived as moderately important and sometimes being used. They are ‘activity-based budgeting’ and ‘budgeting for what if analysis’. On the other hand, ‘zero based budgeting’ is scored as the least important budgeting technique (mean 1.671) and is also rarely being used (mean 2.342) and consequently has a low emphasis (mean score 4.622).

It is apparent from the above findings that the budget emphasis is focused on planning and cost control (with mean score of emphasis above 10.000) rather than focused on budgeting for strategic plans.

Performance evaluation

Performance evaluation was measured based on financial as well as non-financial measures. The non-financial measures of performance evaluation could be related to operations, employees or customers. It was found that ‘performance evaluation based on financial measures’ is recognized as very important (mean 2.756) and very often used (mean 4.134) by the participating companies. Other measures which are perceived to be of high importance are ‘performance evaluation based on non-financial measures related to operations’ (mean 2.390) and ‘performance evaluation based on non-financial measures related to customers’ (mean 2.366). These two non-financial performance measures are often used, with mean score 3.622 and 3.573 respectively. Consistently, their mean scores of emphasis are above 8.500, which indicate high emphasis. Even though this suggests that high emphasis is placed on financial measures, the results also illustrate that other non-financial measures specifically related to customers (an important party in any supply chain) are gaining high emphasis as well.

Measures which are perceived as moderately important are ‘performance evaluation based on non-financial measures related to employees’ (mean 2.390), ‘benchmarking’ (mean 2.220) and ‘joint inter-organizational performance measurement system’ (mean 1.927). Mean usage scores for these techniques are 3.524, 3.244 and 2.683 respectively indicating the frequency of use from ‘often’ to ‘sometimes’ being used. The least important MAP in this category is ‘performance evaluation based on residual income or economic value added (EVA)’ (mean 1.781), rarely being used (mean 2.476) and thus less emphasized (mean 5.110).

Information for decision making

Regarding the use of MAPs for the purpose of decision making, 'product profitability analysis' (mean importance of 2.744 and mean usage of 4.000) is seen as the most highly emphasized MAP (mean emphasis 11.293). 'CVP analysis', 'customer profitability analysis' and 'stock control models' are also perceived as highly important techniques and often being used. It is interesting that these companies now regard 'customer profitability analysis', an analysis related to the performance of the downstream relationship, as increasingly important and it is highly emphasized (mean 8.500). Additionally, it is also apparent that more traditional MAPs are still predominantly used.

Less emphasized MAPs in this category, such as 'evaluating risk of major capital investment using probability analysis or computer simulation', 'evaluating of major capital investment using non financial aspects' and 'evaluation of major capital investments based on discounted cash flow', are less emphasized with mean scores of just above 6.000.

Strategic analysis

Five MAPs classified under strategic analysis are perceived as at least moderately important, namely, 'long range forecasting' (mean 2.305), 'analysis of competitive position' (mean 2.341), 'analysis of competitors' strengths and weaknesses' (mean 2.293), 'industry analysis' (2.366) and 'shareholder value analysis' (mean 2.195). These techniques, on the other hand, are not often used. Subsequently, the mean emphasis scores for these techniques are all below 8.5000, which indicate that they are relatively less moderately emphasized MAPs.

Other more modern MAPs such as ‘product life cycle analysis’, ‘integration with suppliers and customers value chain’ and ‘value chain analysis’ are also less emphasized (with mean emphasis scores 6.134, 6.146 and 6.317 respectively). Their mean scores for importance (1.988, 1.988 and 2.037 respectively) and usage (2.707, 2.744 and 2.768 respectively) confirmed this. Table 5.4 summarises the descriptive analysis of MAPs’ classifications.

Table 5.4: Classification and Descriptive statistics of MAPs

MAPs	Importance		Usage		Emphasis	
	Mean	S.D	Mean	S.D	Mean	S.D
Costing Systems						
Separation between variable and fixed/non incremental costs	2.695	0.537	4.012	1.000	11.183	3.875
A plant-wide overhead rate	2.476	0.707	3.671	1.187	9.768	4.547
Departmental overhead rates	2.366	0.694	3.512	1.189	8.963	4.561
Activity-based costing (ABC)	2.122	0.792	3.061	1.373	7.463	5.104
Target costing	2.024	0.785	2.854	1.380	6.720	4.957
Quality costing	1.976	0.831	2.744	1.313	6.317	4.863
Regression and/or learning curve techniques	1.732	0.754	2.354	1.299	4.915	4.448
Inter-organizational cost management / cost reduction program	2.390	0.624	3.439	1.187	8.805	4.545
Open book costing	1.659	0.757	2.293	1.271	4.659	4.381
Budgeting						
Budgeting for planning	2.671	0.546	3.951	1.005	10.927	4.045
Budgeting for controlling costs	2.646	0.575	3.866	1.063	10.695	4.207
Activity-based budgeting	2.159	0.745	3.159	1.310	7.622	4.783
Budgeting with ‘what if analysis’	2.085	0.740	2.976	1.314	7.024	4.640
Flexible budgeting	2.037	0.675	2.878	1.159	6.476	4.001
Zero-based budgeting	1.671	0.721	2.342	1.219	4.622	3.996
Budgeting for long term / strategic plans	2.329	0.668	3.378	1.183	8.512	4.519
Performance Evaluation						
Performance evaluation based on financial measures	2.756	0.460	4.134	0.886	11.683	3.634
Performance evaluation based on non-financial measures related to customers	2.366	0.599	3.573	1.043	8.927	4.154
Performance evaluation based on non-financial measures related to operations	2.390	0.604	3.622	1.118	9.183	4.338
Performance evaluation based on non-financial measures related to employees	2.390	0.662	3.524	0.959	8.793	3.912
Performance evaluation based on residual income or economic value added (EVA)	1.781	0.667	2.476	1.240	5.110	4.055
Benchmarking	2.220	0.648	3.244	1.128	7.744	4.354
Joint inter-organizational performance measurement system	1.927	0.733	2.683	1.285	6.000	4.527
Information for Decision Making						
CVP analysis for major products	2.451	0.651	3.524	1.209	9.305	4.747
Product profitability analysis	2.744	0.466	4.000	0.956	11.293	3.766
Customer profitability analysis	2.354	0.658	3.342	1.189	8.500	4.622
Stock control models	2.342	0.655	3.342	1.167	8.720	4.539

Evaluation of major capital investments based on Discounted Cash Flow (DCF)	2.049	0.752	2.940	1.303	6.817	4.688
MAPs	**Importance**		**Usage**		**Emphasis**	
	Mean	**Std. deviation**	**Mean**	**Std. deviation**	**Mean**	**Std. deviation**
Evaluation of major capital investments based on payback period and/or Accounting Rate of Return (ARR)	2.195	0.728	3.159	1.278	7.659	4.787
Evaluation of major capital investments using non-financial aspects	2.085	0.652	2.915	1.157	6.683	4.271
Evaluating the risk of major capital investments projects using probability analysis or computer simulation	2.000	0.703	2.720	1.260	6.171	4.348
Performing sensitivity 'what if' analysis when evaluating major capital investments projects	2.098	0.730	2.927	1.265	6.927	4.608
Strategic Analysis						
Long range forecasting	2.305	0.679	3.291	1.187	8.317	4.648
Shareholder value analysis	2.195	0.728	3.012	1.222	7.366	4.490
Industry analysis	2.366	0.578	3.220	1.006	8.037	3.970
Analysis of competitive position	2.341	0.613	3.354	1.023	8.317	4.100
Value chain analysis	2.037	0.711	2.768	1.147	6.317	4.151
Product life cycle analysis	1.988	0.694	2.707	1.281	6.134	4.357
Integration with suppliers' and/or customers' value chains	1.988	0.694	2.744	1.174	6.146	4.208
Analysis of competitors' strengths and weaknesses	2.293	0.657	3.305	1.130	8.159	4.353

5.5 Management accounting practices based on Stage 1 – 4 IFAC framework

For 40 MAPs, 82 companies indicated the importance of MAPs ranging from 1 (little importance) to 3 (high importance) and the frequency of use ranging from 1 (never) to 5 (very often). Subsequently, the mean score of the importance, frequency of use and emphasis of individual MAP was calculated and ranked.

It was found that the top ten highly emphasized MAPs include three Stage 1 MAPs; ‘performance evaluation based on financial measures’ (ranked 1), ‘budgeting for controlling costs’ (ranked 5) and ‘ a plant wide overhead rate’ (ranked 6). Six Stage 2 MAPs were also listed under the top 10 highly emphasized practices. They are ‘product profitability analysis’ (ranked 2), ‘separation between variable and fixed costs’ (ranked 3), ‘budgeting for planning’ (ranked 4), ‘CVP analysis for major products’ (ranked 7), ‘performance evaluation based on non financial measures related to operations’ (ranked 8) and ‘departmental overhead rates’ (ranked 9). The Stage 4 MAP which is most emphasized is ‘performance evaluation based on non financial measures related to customers’ (ranked 10).

The above indicates that traditional MAPs are still largely emphasized. It can be observed that companies are still focusing on financial performance and product profitability. Thus, financial mentality is still a main concern. With regard to decision making, budgeting for controlling and planning purposes are still highly emphasized.

Interestingly, there is some evidence that MAPs related to Stage 4 are more emphasized; ‘inter organizational cost management’ (ranked 11), ‘customer profitability analysis’ (ranked 14), ‘analysis of competitive position’ (ranked 15), ‘industry analysis’ (ranked 17) and ‘benchmarking’ (ranked 18).

The analysis also illustrates that some contemporary and more sophisticated techniques under Stage 3 (reduction of waste in business resources) and Stage 4 (value creation) are less emphasized. They are ‘activity-based costing’ and ‘activity based budgeting’ (ranked 21 and 20 respectively), quality costing (ranked 29), ‘target costing’ (ranked 26), ‘open book costing’ (ranked 36).

Although it is observed that MAPs from Stage 1 and 2 are mostly emphasized, there are techniques from these stages that are less emphasized; ‘evaluation of major capital investments based on payback period’ (ranked 19), ‘budgeting with what if analysis’ (ranked 23), ‘evaluation of major capital investments based on DCF’ (ranked 25), ‘flexible budgeting’ (ranked 28), ‘regression and/or learning curve techniques’ (ranked 35).

Table 5.5 summarises the descriptive analysis and mean rank based on Stage 1-4 IFAC framework.

Table 5.5: Descriptive statistics of MAPs (based on IFAC Stage 1 - 4)

Management Accounting Practices	Importance		Rank	Usage		Rank	Emphasis		Rank
	Mean	S.D		Mean	S.D.		Mean	S.D.	
Stage 1 Cost determination and financial control (CDFC)									
A plant-wide overhead rate	2.476	0.707	6	3.671	1.187	6	9.768	4.547	**6**
Budgeting for controlling costs	2.646	0.575	5	3.866	1.063	5	10.695	4.207	**5**
Flexible budgeting	2.037	0.675	22	2.878	1.159	27	6.476	4.001	**28**
Performance evaluation based on financial measures	2.756	0.460	1	4.134	0.886	1	11.683	3.634	**1**
Evaluation of major capital investments based on payback period and/or ARR	2.195	0.728	16	3.159	1.262	20	7.659	4.787	**19**
Stage 2 Provision of information for management planning and control (IPC)									
Separation between variable and fixed/non incremental costs	2.695	0.537	3	4.012	1.000	2	11.183	3.875	**3**
Departmental overhead rates	2.366	0.694	9	3.512	1.189	10	8.963	4.561	**9**
Regression and/or learning curve techniques	1.732	0.754	29	2.354	1.299	35	4.915	4.448	**35**
Budgeting for planning	2.671	0.546	4	3.951	1.005	4	10.927	4.045	**4**
Budgeting with 'what if analysis'	2.085	0.740	20	2.976	1.314	23	7.024	4.640	**23**
Budgeting for long term / strategic plans	2.329	0.668	12	3.378	1.183	13	8.512	4.519	**13**
Performance evaluation based on non-financial measures related to operations	2.390	0.604	8	3.622	1.118	7	9.183	4.338	**8**
CVP analysis for major products	2.451	0.651	7	3.524	1.209	9	9.305	4.747	**7**
Product profitability analysis	2.744	0.466	2	4.000	0.956	3	11.293	3.766	**2**
Stock control models	2.354	0.636	10	3.476	1.168	11	8.793	4.543	**12**
Evaluation of major capital investments based on DCF	2.049	0.752	21	2.939	1.290	24	6.793	4.708	**25**
Long range forecasting	2.305	0.679	13	3.329	1.187	16	8.371	4.648	**15**
Stage 3 Reduction of waste in business resources (RWR)									
Activity-based costing (ABC)	2.122	0.792	18	3.061	1.373	21	7.463	5.104	**21**
Quality costing	1.976	0.831	26	2.744	1.313	30	6.317	4.863	**29**
Activity-based budgeting	2.159	0.745	17	3.159	1.310	20	7.622	4.783	**20**
Zero-based budgeting	1.671	0.721	30	2.342	1.219	36	4.622	3.996	**37**
Performance evaluation based on non-financial measures related to employees	2.390	0.662	8	3.524	0.959	9	8.793	3.912	**12**
Evaluating the risk of major capital investments projects using	2.000	0.703	24	2.720	1.260	31	6.171	4.348	**30**

probability analysis or computer simulation									
Management Accounting Practices	**Importance**		**Rank**	**Usage**		**Rank**	**Emphasis**		**Rank**
	Mean	**S.D**		**Mean**	**S.D.**			**Mean**	**S.D**
Performing sensitivity 'what if' analysis when evaluating major capital investments projects	2.098	0.730	19	2.927	1.265	25	6.927	4.608	**24**
Stage 4 Creation of value through effective use resources (CV)									
Target costing	2.024	0.785	23	2.854	1.380	28	6.720	4.957	**26**
Inter-organizational cost management / cost reduction programme	2.390	0.624	8	3.439	1.187	12	8.805	4.545	**11**
Open book costing	1.659	0.757	31	2.293	1.272	37	4.659	4.381	**36**
Performance evaluation based on non-financial measures related to customers	2.366	0.599	9	3.573	1.043	8	8.927	4.154	**10**
Performance evaluation based on residual income or economic value added (EVA)	1.781	0.667	28	2.476	1.240	34	5.110	4.055	**34**
Benchmarking	2.220	0.648	15	3.244	1.128	18	7.744	4.354	**18**
Joint inter-organizational performance measurement system	1.927	0.733	27	2.683	1.285	33	6.000	4.527	**33**
Customer profitability analysis	2.354	0.655	10	3.342	1.189	15	8.476	4.641	**14**
Evaluation of major capital investments using non-financial aspects	2.085	0.652	20	2.915	1.157	26	6.683	4.271	**27**
Shareholder value analysis	2.195	0.728	16	3.012	1.222	22	2.366	0.578	**22**
Industry analysis	2.366	0.578	9	3.220	1.006	19	8.037	3.970	**17**
Analysis of competitive position	2.342	0.613	11	3.354	1.023	14	8.317	4.100	**15**
Value chain analysis	2.037	0.711	22	2.768	1.147	29	6.317	4.1511	**29**
Product life cycle analysis	1.988	0.694	25	2.707	1.281	32	6.134	4.357	**32**
Integration with suppliers' and/or customers' value chains	1.988	0.694	25	2.744	1.174	30	6.146	4.208	**31**
Analysis of competitors' strengths and weaknesses	2.293	0.657	14	3.305	1.130	17	8.159	4.353	**16**

Note:

Importance: Rank 1 -31 (3 items ranked 8th, 3 items ranked 9th, 2 items ranked 10th, 2 items ranked 16th, 2 items ranked 20th, 2 items ranked 22nd)

Usage: Rank 1 -37 (2 items ranked 9th, 2 items ranked 20th, 2 items ranked 30th)

Emphasis: Rank 1 – 37 (2 items ranked 12th, 2 items ranked 15th, 2 items ranked 29th

5.6 Performance measures

Respondents were asked how they rated their performance in comparison to their competitors. The performance measures used related to supply chain performance and overall firm performance. Supply chain performance measures are supply chain flexibility, supply chain integration, supplier performance and customer responsiveness. Organizational performance was measured by using seven dimensions of performance; four are categorized as financial performance measures (return on investment, profit margin on sales, total cost reduction and market share) and three are non-financial measures (product quality, competitive position and customer satisfaction).

Specifically, respondents were asked to indicate the extent of supply chain management performance and overall organizational performance relative to their competitors in the industry. The item scales are six-point Likert scales; 1= significantly below, 2= below, 3= same as your competitor, 4= above, 5= significantly above and 6= not applicable. Tables 5.6 and 5.7 show the mean scores of supply chain performance and organizational performance respectively.

Table 5.6: Descriptive statistics for supply chain performance

Supply chain performance measures	Min	Max	Mean	Std. Deviation
Supply chain flexibility				
Ability to handle non –standard orders.	1	6	3.85	1.044
Ability to meet special customer specification.	2	6	4.22	0.847
Ability to produce products characterized by numerous features options, sizes, colours, etc.	1	6	4.04	1.105
Ability to rapidly adjust capacity so as to accelerate to decelerate production.	2	6	3.83	1.028
Ability to rapidly introduce product improvements / variation.	1	6	3.77	1.058
Ability to handle rapid introduction of new products.	1	6	3.74	1.235
Ability to respond to the needs and wants of the firm's target market(s).	2	6	3.94	0.947
Supply chain Integration				
Communication and coordination between all functions in the firm.	1	6	3.83	0.858
Cross-functional teams used for process design and improvement in the firm.	1	6	3.56	0.944
Communication and coordination between us and suppliers	2	6	3.76	0.658
Communication and coordination between us and customers	2	6	3.85	0.756
Integration of information systems in the firm.	1	6	3.56	1.043
Integration of activities of our firm and our trading partners.	1	6	3.55	0.996
Supplier Performance				
Timely delivery of materials / components / products to our firm.	2	6	3.91	0.773
Dependability of delivery to our firm.	3	6	3.85	0.756
Providing materials /components / products that are highly reliable.	2	6	3.94	0.759
Providing high quality materials /components /products to our firm.	2	6	3.93	0.798
Providing high quality materials/components/products to our firm at low cost.	2	6	3.66	.906
Responsiveness to customer				
Fulfilling customer orders on time.	2	6	4.06	0.775
Shorter order-to-delivery cycle time	2	6	3.83	0.783
Customer response time	1	6	3.89	0.846

Interestingly, the mean scores for all non financial measures are higher than the financial measures, implying the importance of non-financial measures in overall firm performance. The statistics indicate that the respondents' mean scores of overall financial performance were above their competitors'. Table 5.7 summarizes the descriptive statistics of organizational performance measures.

Table 5.7: Descriptive statistics of overall organizational performance

Organizational performance measures	Minimum	Maximum	Mean	Std. Deviation
Return on investment	1	6	3.60	1.004
Profit margin on sales	1	6	3.62	1.026
Total cost reduction	2	6	3.56	0.890
Market share	1	6	3.55	1.020
Product quality	2	6	4.07	0.782
Competitive position	2	6	3.87	0.872
Customer satisfaction	2	6	3.96	0.823

5.7 Classification of participating firms

Participating firms were categorised into four groups according to the sophistication level of their MAPs. As stated earlier, the IFAC's MA development model with four stages of sophistication was adopted as follows: Stage 1: cost determination and financial control (CDFC), Stage 2: information for management planning and control (IPC), Stage 3: reduction of waste in business resources (RWR), and Stage 4: creation of value through effective resource use (CV).

These IFAC stages were operationalised by classifying each of 40 MAPs into one of four levels of sophistication relating to each of IFAC's four stages. The questionnaires asked respondents to rate both the frequency of use and the importance of 40 MAPs and an emphasis score was calculated for each responding firm. Then, the emphasis scores for the MAPs that had been attached to each IFAC stage were used to classify individual firms into groups using cluster analysis. Cluster analysis was used to classify cases/observations into groups that are relatively homogeneous within themselves and heterogeneous between each other on the basis of a defined set of variables. These groups are called clusters.

For each firm, an average (composite) score was calculated for the set of MAPs related to each IFAC stage: CDFC, IPC, RWR and CV. These four scores were used to cluster each of the 82 companies into four groups A, B, C and D. As a result of clustering procedures, 20 firms were categorised in Cluster A, 25 firms in Cluster B, 13 firms in Cluster C and 24 firms in Cluster D. The mean scores of variables within each cluster are presented in Table 5.8.

The labelling of the clusters was done by matching the clusters to a related level of sophistication (Stage 1 to Stage 4). According to IFAC's theoretical model of MA evolution, firms in Stage 1 place more emphasis on CDFC practices and less emphasis on the practices in other sets (i.e. those relating to IPC, RWR and CV). Firms in Stage 2 place emphasis on practices of both CDFC and IPC (provision of information for management planning and control) and less emphasis on practices in the other two sets (RWR and CV). Firms in Stage 3 emphasise CDFC, IPC (provision of information for management planning and control) and RWR (reduction of waste in business resources) but not the fourth stage CV (creation of value through effective resources use). Finally, firms in Stage 4 emphasise all four sets of practices.

An inspection of the mean scores of CDFC, IPC, RWR and CV in Table 5.8 provides a basis for preliminary labelling of the empirically derived clusters of sample firms. Mean scores of firms in Cluster A are the lowest for all sets (CDFC, IPC, RWR and CV) and this suggests that Cluster A represents Stage 1 of MAPs sophistication. Firms in Cluster B have higher mean scores for all of CDFC, IPC, RWR and CV than those of Cluster A; thus Cluster B can represent Stage 2 of MAPs sophistication. Clusters C and D have higher mean scores for all sets of CDFC, IPC, RWR and CV than those of Clusters A and B. Also, mean scores of CV in both Clusters C and D are higher than those of RWR. Because the mean scores of all four sets of CDFC, IPC, RWR and CV in Cluster C are higher than those in Cluster D, Cluster C is best considered to represent Stage 4. Thus, Cluster D represents Stage 3.

Table 5.8 shows that 20 firms (24%) are in Stage 1, 25 firms (31%) are in Stage 2, 24 firms (29%) in Stage 3 and 13 firms (16%) in Stage 4 of MA sophistication. About 45% of firms have MAPs in either Stage 3 or Stage 4. It can be concluded that MAPs in these firms are moving from the simple, or naive, role of CDFC towards a more sophisticated role in the creation of value through effective resource use.

Table 5.8: Classifications of firms based on cluster analysis

	Clusters					
	A (n = 20)	**B** (n = 25)	**C** (n = 13)	**D** (n = 24)	*F*-test	*P*
Cost Determination and Financial Control (**CDFC**)	5.930 (1.687)	8.560 (1.516)	11.831 (1.308)	11.358 (1.527)	60.296	0.000
Provision of Information for Management Planning and Control (**IPC**)	5.633 (1.684)	7.536 (0.861)	12.839 (1.316)	10.454 (1.274)	103.717	0.000
Reduction of Waste of Resources in Business Processes (**RWR**)	3.321 (1.279)	6.074 (1.763)	10.956 (2.284)	8.357 (2.169)	50.535	0.000
Creation of value through effective resource use (**CV**)	3.953 (1.097)	6.187 (1.368)	12.086 (1.135)	7.971 (1.397)	113.603	0.000
	Stage 1	**Stage 2**	**Stage 4**	**Stage 3**		

Note: Values in the table are mean scores of variables within clusters. Standard deviations are in parentheses.

5.8 Data screening and data preparation

Before purification of the data could be carried out, the initial steps involved preparing and screening the data (Field, 2009, Hair *et al.*, 2010). All data were edited, coded and entered into the Statistical Package of Social Sciences (SPSS) software. The SPSS version 18 was employed to analyse the data.

The raw data were edited in order to detect any errors and omissions. Three incomplete questionnaires with a number of missing values were discarded as a result of this process. The research items (variables) were then coded into specific formats for the SPSS where unique labels were given to the variables to prepare the software for analysis purposes. Each returned questionnaire was screened for errors and omissions before the responses were manually entered into SPSS. For this study, all the completed questionnaires were considered free from missing values (except data for demographic profiles). Frequencies and ranges (minimum and maximum values) were also used to assess the range of possible data values for all questions in the survey. The validation of the measurement model, which consists of data purification, reliability and validity test analysis, is discussed and elaborated in the next chapter (Chapter 6).

5.8.1 Outliers

Outliers can radically alter the outcome of analysis and are considered as violations of normality. According to Hair *et al*. (2010), there are four classes of outliers based on their source of uniqueness:

1. Outliers from a procedural error where they are derived from a data entry error or a mistake in coding; this entry should be removed or recoded as missing values.

2. Outliers from an extraordinary event; where they arise from the uniqueness of the observation.
3. Outliers from extraordinary observation which are unexplainable by the researcher so they could depend upon the judgement of the researcher.
4. Outliers from the ordinary values which vary within normal range of values on all variables. They are not exceptionally high or low values on the variable but their combination of values are unique across variables. This type of outlier should be retained in the analysis unless certain evidence degrading their valid membership of the population.

Simple outliers are cases with extreme values with respect to a single variable. It is common to define outliers as cases which are more than plus or minus three standard deviations from the mean of the variable. Multivariate outliers are cases with extreme values with respect to multiple variables (Hair *et al*., 2010).

Outliers in this research data were examined for all variables. They were identified using the standard scores, which have a mean of 0 and a standard deviation of 1. The cases with standard scores of 2.5 or greater are regarded as the outliers in the small sample size.

It was found that there were a few variables containing outliers and extreme values. (In particular, there are five items from 35 SCMPs items which contain outliers; no outliers appear from all 40 MAPs items; two items from a total of 28 items for SCPERF and OPERF). Each outlier was examined and after they had been identified, they were categorized in the fourth class, where there was no error from data entry or miscoding.

It was found that the values of the outliers are not affected by outstandingly high or low values on the variables or extraordinary events. The observed values were placed within the normal range; consequently they are classified as the fourth type of outlier (that is, unique in their combinations of value across variables). Thus all of the outliers were retained in the analysis because they represent a valid element of the population.

5.8.2 Testing Assumptions

Normality of distribution

Normality tests were conducted using the Kolmogorov-Smirnov statistical test. The data were found to be non-normal as scales and measures used have scores that are negatively skewed. Tables 5.9 and 5.10 below indicate that the significance value is 0.000, suggesting violation of the assumption of normality. (Note: Sig value > 0.05 indicates normality).

However, in large samples (in excess of 30) the Kolmogorov-Smirnov statistics can be significant even when the scores are only slightly different from a normal distribution. (Field, 2009). Therefore it is recommended that they should be interpreted in conjunction with histograms, P-P or Q-Q plots, and the values of skew and kurtosis. The actual shapes of the distribution were then investigated by histograms where the scores appear to be reasonably normally distributed. This is also supported by an inspection of the normal probability plots (labelled Normal Q-Q Plot). The observed value for each score is plotted against the expected value from the normal distribution. A reasonably straight line suggests a normal distribution.

Additionally, according to Pallant (2007), many scales and measures used in the social sciences have scores that are skewed, either positively or negatively. This does not, according to her, necessarily indicate a problem with the scale but rather reflects the underlying nature of the constructs (in this study SCM, MAPs and Performance) being measured.

Table 5.9: Test of Normality on SCM practices

Variables	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Quality as number one criterion in selecting suppliers.	0.226	82	0.000	0.835	82	0.000
Long-term relationships with our suppliers.	0.254	82	0.000	0.806	82	0.000
Solve problems jointly with our suppliers.	0.269	82	0.000	0.867	82	0.000
Help suppliers to improve their product quality.	0.181	82	0.000	0.919	82	0.000
Continuous improvement programs with key suppliers.	0.199	82	0.000	0.914	82	0.000
Include key suppliers in planning and goal-setting.	0.178	82	0.000	0.927	82	0.000
Involve key suppliers in new product development processes.	0.183	82	0.000	0.923	82	0.000
Evaluate the formal and informal complaints of customers.	0.220	82	0.000	0.837	82	0.000
Interact with customers to set reliability, responsiveness and other standards.	0.216	82	0.000	0.855	82	0.000
Follow-up with our customers for quality / service feedback.	0.208	82	0.000	0.863	82	0.000
Measure and evaluate customer satisfaction.	0.219	82	0.000	0.889	82	0.000
Determine future customer expectations.	0.233	82	0.000	0.895	82	0.000
Facilitate customers' ability to seek assistance from us.	0.278	82	0.000	0.860	82	0.000
Evaluate the importance of our relationship with our customers.	0.215	82	0.000	0.891	82	0.000
Share business units' proprietary information with trading partners.	0.181	82	0.000	0.940	82	0.001
Inform trading partners in advance of changing needs.	0.229	82	0.000	0.914	82	0.000
Trading partners share proprietary information.	0.193	82	0.000	0.935	82	0.000
Fully informed about issues that affect business.	0.191	82	0.000	0.928	82	0.000
Trading partners share business knowledge of core business processes with us.	0.217	82	0.000	0.910	82	0.000
Exchange information that supports business planning.	0.215	82	0.000	0.924	82	0.000
Keep each other informed about events or changes that may affect the other partners.	0.207	82	0.000	0.905	82	0.000
Information exchange is timely.	0.223	82	0.000	0.916	82	0.000
Information exchange is accurate.	0.216	82	0.000	0.922	82	0.000
Information exchange is complete.	0.211	82	0.000	0.927	82	0.000
Information exchange is adequate.	0.232	82	0.000	0.919	82	0.000
Information exchange is reliable.	0.224	82	0.000	0.915	82	0.000
Targets the reduction of set-up time.	0.245	82	0.000	0.816	82	0.000
Continuous quality improvement.	0.236	82	0.000	0.868	82	0.000
Pull production system.	0.179	82	0.000	0.907	82	0.000
Pushes suppliers for shorter lead-times	0.281	82	0.000	0.832	82	0.000
Streamlines ordering, receiving and other paperwork from suppliers.	0.228	82	0.000	0.881	82	0.000
Products are designed for modular assembly.	0.190	82	0.000	0.861	82	0.000
Production process modules can be re-arranged so that customization can be carried out later.	0.139	82	0.001	0.916	82	0.000
Delay final product assembly activities until customer orders have actually been received.	0.183	82	0.000	0.895	82	0.000
Delay final product assembly activities until the last possible position (or nearest to customers) in the supply chain.	0.186	82	0.000	0.889	82	0.000

Table 5.10: Test of Normality on MAPs

Management Accounting Practices	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Separation between variable and fixed/non incremental costs	0.227	82	0.000	0.832	82	0.000
A plant-wide overhead rate	0.268	82	0.000	0.849	82	0.000
Departmental overhead rates	0.232	82	0.000	0.887	82	0.000
Activity-based costing (ABC)	0.168	82	0.000	0.896	82	0.000
Target costing	0.163	82	0.000	0.888	82	0.000
Quality costing	0.154	82	0.000	0.899	82	0.000
Regression and/or learning curve techniques	0.205	82	0.000	0.858	82	0.000
Inter-organizational cost management / cost reduction program	0.170	82	0.000	0.901	82	0.000
Open book costing	0.223	82	0.000	0.850	82	0.000
Budgeting for planning	0.218	82	0.000	0.850	82	0.000
Budgeting for controlling costs	0.209	82	0.000	0.860	82	0.000
Activity-based budgeting	0.159	82	0.000	0.901	82	0.000
Budgeting with ‘what if analysis’	0.203	82	0.000	0.890	82	0.000
Flexible budgeting	0.225	82	0.000	0.900	82	0.000
Zero-based budgeting	0.218	82	0.000	0.855	82	0.000
Budgeting for long term / strategic plans	0.199	82	0.000	0.891	82	0.000
Performance evaluation based on financial measures	0.263	82	0.000	0.799	82	0.000
Performance evaluation based on non-financial measures related to customers	0.195	82	0.000	0.894	82	0.000
Performance evaluation based on non-financial measures related to operations	0.206	82	0.000	0.881	82	0.000
Performance evaluation based on non-financial measures related to employees	0.202	82	0.000	0.894	82	0.000
Performance evaluation based on residual income or economic value added (EVA)	0.176	82	0.000	0.883	82	0.000
Benchmarking	0.208	82	0.000	0.908	82	0.000
Joint inter-organizational performance measurement system	0.158	82	0.000	0.897	82	0.000
CVP analysis for major products	0.181	82	0.000	0.884	82	0.000
Product profitability analysis	0.218	82	0.000	0.845	82	0.000
Customer profitability analysis	0.223	82	0.000	0.887	82	0.000
Stock control models	0.179	82	0.000	0.897	82	0.000
Evaluation of major capital investments based on Discounted Cash Flow (DCF)	0.164	82	0.000	0.905	82	0.000
Evaluation of major capital investments based on payback period and/or Accounting Rate of Return (ARR)	0.163	82	0.000	0.907	82	0.000
Evaluation of major capital investments using non-financial aspects	0.190	82	0.000	0.908	82	0.000
Evaluating the risk of major capital investments projects using probability analysis or computer simulation	0.155	82	0.000	0.903	82	0.000
Performing sensitivity ‘what if’ analysis when evaluating major capital investments projects	0.149	82	0.000	0.910	82	0.000

Long range forecasting	0.213	82	0.000	0.893	82	0.000
Management Accounting Practices	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df		Statistic	df	
Shareholder value analysis	0.203	82	0.000	0.904	82	0.000
Industry analysis	0.245	82	0.000	0.894	82	0.000
Analysis of competitive position	0.221	82	0.000	0.902	82	0.000
Value chain analysis	0.202	82	0.000	0.908	82	0.000
Product life cycle analysis	0.176	82	0.000	0.896	82	0.000
Integration with suppliers' and/or customers' value chains	0.196	82	0.000	0.905	82	0.000
Analysis of competitors' strengths and weaknesses	0.180	82	0.000	0.911	82	0.000

Linearity

The linearity of the relationship between dependent and independent variables represents the degree to which the change in the dependent variable is associated with change in the independent variable (Hair *et al*., 2010). Linearity can be assessed by examining scatterplots of the variables (or by running simple regression to examine the residuals. A straight line from the scatterplot represents a linear relationship. If any non-linear relationship exists, it will affect the relationship between the two variables.

Scatterplots of any two variables and the residual plots from simple regressions are examined. It is noted that firm performance is used as a dependent variable while the extent of practice of SCM and MA are used as independent variables. The results show that relationships between any two variables appear to be linear; no non-linear relationships are identified.

Homoscedasticity

According to Hair *et al*. (2010) 'homoscedasticity' refers to the assumption that the dependent variable exhibits equal levels of variance across the range of predictor variables. The variance of the dependent variable being accounted for in the dependent relationship should be equally dispersed across the range of the independent values to allow a fair test of the relationship across all values (i.e. the points around the regression line show no pattern). On the contrary, ‘heteroscedasticity’ occurs when the variance of the dependent variable is not relatively equal at each value of the independent variable. Scatterplots of any two variables can be used to assess heteroscedasticity. It was found that scatter plots produced by the regression models in this research did not reveal any of these tendencies.

5.9 Conclusion

This chapter provides descriptive analysis of the sample and the measures. The objective of the chapter is to answer the first research objective, i.e., to explore the extent to which firms have implemented SCM practices and MAPs. The chapter initially presents the profile of respondents and the participating companies, followed by the descriptive statistics of SCM practices, MAPs and performance. Generally, there are relatively high levels of practice in firms’ external relationship with suppliers and customers and lean practices; moderate levels of practice in dealing with information shared with trading partners and relatively low levels of practice in terms of postponement. Although it is observed that MAPs from Stage 1 (CDFC) and Stage 2 (IPC) were largely emphasized, firms are moving from less sophisticated MAPs towards a more sophisticated role in the reduction of waste (RWR) and in the creation of value through effective resource use (CV). This is evidenced from newer techniques being emphasized. Assumptions underlying the statistical bases for multivariate analysis were also tested. The next chapter presents the large-scale instrument validation results on each of the four main constructs and sub-constructs.

6 VALIDATION OF THE MEASUREMENT MODEL

6.1 Introduction

Prior to assessing any proposed structural model to investigate the relationships between constructs, the validation of the measurement models is required. The measurement model evaluates the relationship between measures and constructs by assessing the reliability and validity of the scale measures. In particular, the convergent and discriminant validity of the measurement models of the exogenous (independent) and endogenous (dependent) latent variables were tested. The procedure advocated by Hulland (1999) in evaluating PLS models, which provides a separate analysis of the measurement model and structural model, was followed. This procedure will ensure that only reliable and valid measures of constructs are being used to obtain conclusions regarding the nature of the relationships among constructs (Barclay *et al.*, 1995; Hulland, 1999).

This chapter presents the large-scale instrument validation results on each of the four main constructs: SCM practices (SCMPs), Management Accounting Practices (MAPs), SCM Performance (SCPERF) and Organizational Performance (OPERF). The objective of this chapter is to describe the process by which the measurement model validation requirements of the Partial Least Squares (PLS) statistical approach were satisfied for each of the items used in the study. This empirical study used an existing two-stage methodology for scale, variable and constructs development and validation. The first stage is to establish constructs using Exploratory Factor Analysis (EFA) using Statistical Package for Social Sciences (SPSS). The results from EFA were subsequently used in the second stage to assess the reliability and validity of these scales, variables and resultant constructs using Partial Least Squares (PLS) analysis (PLS-Graph Version 3). Once confidence has been gained in relation to the validity and reliability of all of the items and constructs used in this study, the structural model dimension of the PLS approach can later be attempted.

In this study, a second-order factor model approach was applied (Chin, 1998a) to SCMPs, MAPs and SCPERF constructs, whereby the model is constructed from various indicators from the first-order factor model. The composite dimensions reflect the given latent constructs. These dimensions derived from the second-order factor model were later used in the structural model (Chapter 7). Therefore the validation of the second-order factor is also discussed in this chapter.

6.2 SCM practices construct

As the primary focus of this study relates to the impact of SCM practices upon MAPs of firms within the consumer and industrial products sector, the development of credible SCM practices constructs was imperative, although the items have been validated and tested in the SCM literature (Li *et al*., 2005; Koh, 2007).

The SCM practices (SCMPs) construct was initially represented by six dimensions and 35 items; strategic supplier partnership (SSP) (7 items), customer relationship (CR) (7 items), information sharing (IS) (7 items), information quality (IQ) (5 items), internal lean practices (ILP) (5 items) and postponement (POS) (4 items).

6.2.1 Factor analysis

The analysis began with purification using reliability analysis and Corrected-item Total Correlation (CITC) analysis. The recommended initial analysis of a domain of variables is with Exploratory Factor Analysis (EFA); therefore an EFA was subsequently conducted in an attempt to achieve data reduction in that items that do not load properly are dropped and the instrument thereby purified.

The CITC for each item, its corresponding code name and Cronbach's alpha value for each dimension are shown in Table 6.1 as follows:

Table 6.1: Data purification for SCMPs

Variables	Item Code	Survey items	CITC	Cronbach's Alpha
Strategic Supplier Partnership (SSP)	SSP1	Quality as number one criterion in selecting suppliers.	0.458	0.816
	SSP2	Long-term relationships with our suppliers.	0.442	
	SSP3	Solve problems jointly with our suppliers.	0.536	
	SSP4	Help suppliers to improve their product quality.	0.710	
	SSP5	Continuous improvement programs with key suppliers.	0.830	
	SSP6	Include key suppliers in planning and goal-setting.	0.512	
	SSP7	Involve key suppliers in new product development processes.	0.470	
Customer Relationship (CR)	CR1	Evaluate the formal and informal complaints of customers.	0.686	0.903
	CR2	Interact with customers to set reliability, responsiveness and other standards.	0.770	
	CR3	Follow-up with our customers for quality / service feedback.	0.751	
	CR4	Measure and evaluate customer satisfaction.	0.733	
	CR5	Determine future customer expectations.	0.720	
	CR6	Facilitate customers' ability to seek assistance from us.	0.754	
	CR7	Evaluate the importance of our relationship with our customers.	0.614	
Level of Information Sharing (IS)	IS1	Share business units' proprietary information with trading partners.	0.634	0.906
	IS2	Inform trading partners in advance of changing needs.	0.590	
	IS3	Trading partners share proprietary information.	0.753	
	IS4	Fully informed about issues that affect business.	0.764	
	IS5	Trading partners share business knowledge of core business processes with us.	0.713	
	IS6	Exchange information that supports business planning.	0.768	
	IS7	Keep each other informed about events or changes that may affect the other partners.	0.839	
Level of Information Quality (IQ)	IQ1	Information exchange is timely.	0.847	0.953
	IQ2	Information exchange is accurate.	0.908	
	IQ3	Information exchange is complete.	0.892	
	IQ4	Information exchange is adequate.	0.860	
	IQ5	Information exchange is reliable.	0.848	
Internal Lean Practices (ILP)	ILP1	Targets the reduction of set-up time.	0.647	0.824
	ILP2	Continuous quality improvement.	0.400	
	ILP3	Pull production system.	0.699	
	ILP4	Pushes suppliers for shorter lead-times	0.767	
	ILP5	Streamlines ordering, receiving and other paperwork from suppliers.	0.610	
Postpone-ment (POS)	POS1	Products are designed for modular assembly.	0.807	0.904
	POS2	Production process modules can be re-arranged so that customization can be carried out later.	0.753	
	POS3	Delay final product assembly activities until customer orders have actually been received.	0.726	
	POS4	Delay final product assembly activities until the last possible position in the supply chain.	0.852	

Table 6.1 shows the CITC scores for all items were all well above 0.40, a cut-off value suggested by Hair *et al*. (2010). The alpha values for all dimensions were also well above 0.7 (ranging from 0.816 to 0.953), the minimum level required for an established construct. Therefore it was decided to retain all items.

An exploratory factor analysis (EFA) was then conducted using Principal Component analysis (PCA) and Varimax as method of rotation. A pooled-sample factor analysis for all items belonging to each of SCM dimensions was performed.

Factors related to sample size

It is recommended that there be at least five observations per estimated parameter or items to perform an EFA (Hair *et al*, 2010). Since this is a pooled-sample factor analysis, the ratio of respondents to items for SCM practices is less than 5:1 (82/35 = 2.34) and thus, does not meet the general guideline. However, research has demonstrated that the general rule of thumb of the minimum sample size is not always valid and useful (MacCallum *et al*., 1999; Preacher and MacCallum, 2002). It is hard and too simplistic to say whether absolute sample size is important or the sample to variable (STV) ratio is important in factor analysis. The minimum level of N (sample size) was dependent on other aspects of design such as communality of the variables, degree of over-determination of the factor and size of the loading, all of which are discussed as follows:

Communality of the variables

MacCallum *et al*. (1999 p.96) suggested communalities should all greater than 0.6, or the mean level of communality to be at least 0.7. If communalities are high, recovery of population factors in sample data is normally very good, almost regardless of sample size, level of over-determination, or the presence of model error (MacCallum *et al*., 2001, p.636). This is supported by the following quotation:

> *"As long as communalities are high, the number of expected factors is relatively small, and model error is low (a condition which often goes hand-in-hand with high communalities), researchers and reviewers should not be overly concerned about small sample sizes".*
> (Preacher and MacCallum, 2002, p. 160).

Degree of over-determination of the factor (or number of factors)

A minimum of 3 variables per factor is critical. A factor with fewer than three times is generally weak and unstable while six or seven indicators per factor and a rather small number of factors is considered as high over-determination (Costello and Orborne, 2005).

Size of loading

According to Costello and Osborne (2005), item loading magnitude accounted for significant unique variance in the expected direction in all but one case, and in most cases was the strongest unique predictor of congruence between sample and population. The sample to population pattern fit was very good for the high (0.80) loading condition, moderate for the middle (0.60) loading condition, and poor (0.40) for the low loading condition. If components possess four or more variables with loadings above 0.60, the pattern may be interpreted whatever the sample size used. In this study, for each of the SCM related items and constructs used, the 0.70 loading threshold was deemed necessary as all items had been subject to similar testing procedures in previous studies. It was also felt that this decision would augment the integrity of previous research by using these constructs for comparability purposes.

Based on the above justifications, a pooled-sample factor analysis for all SCM practices items was performed. Both the Bartlett test of sphericity (significant at p=0.000) and the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO =0.768, exceeding the recommended value of 0.6) supported the factorability of the correlation matrix. There were also sufficient inter-item correlations within the data for performing factor analysis. Item communalities are shown in Table 6.2 as follows:

Table 6.2: Item communalities for SCMPs

Variables	Item Code	Survey items	Communalities
Strategic Supplier partnership (SSP)	SSP1	Quality as number one criterion in selecting suppliers.	0.475 (removed)
	SSP2	Long-term relationships with our suppliers.	0.545 (removed)
	SSP3	Solve problems jointly with our suppliers.	0.661
	SSP4	Help suppliers to improve their product quality.	0.779
	SSP5	Continuous improvement programs with key suppliers.	0.857
	SSP6	Include key suppliers in planning and goal-setting.	0.748
	SSP7	Involve key suppliers in new product development processes.	0.716
Customer Relationship (CR)	CR1	Evaluate the formal and informal complaints of customers.	0.797
	CR2	Interact with customers to set reliability, responsiveness and other standards.	0.845
	CR3	Follow-up with our customers for quality / service feedback.	0.863
	CR4	Measure and evaluate customer satisfaction.	0.709
	CR5	Determine future customer expectations.	0.864
	CR6	Facilitate customers' ability to seek assistance from us.	0.839
	CR7	Evaluate the importance of our relationship with our customers.	0.735
Level of Information Sharing (IS)	IS1	Share business units' proprietary information with trading partners.	0.774
	IS2	Inform trading partners in advance of changing needs.	0.604
	IS3	Trading partners share proprietary information.	0.797
	IS4	Fully informed about issues that affect business.	0.785
	IS5	Trading partners share business knowledge of core business processes with us.	0.696
	IS6	Exchange information that supports business planning.	0.786
	IS7	Keep each other informed about events or changes that may affect the other partners.	0.852
Level of Information Quality (IQ)	IQ1	Information exchange is timely.	0.834
	IQ2	Information exchange is accurate.	0.885
	IQ3	Information exchange is complete.	0.866
	IQ4	Information exchange is adequate.	0.854
	IQ5	Information exchange is reliable.	0.807
Internal Lean Practices (ILP)	ILP1	Targets the reduction of set-up time.	0.798
	ILP2	Continuous quality improvement.	0.564 (removed)
	ILP3	Pull production system.	0.681
	ILP4	Pushes suppliers for shorter lead-times	0.785
	ILP5	Streamlines ordering, receiving and other paperwork from suppliers.	0.710
Postpone-ment (POS)	POS1	Products are designed for modular assembly.	0.865
	POS2	Production process modules can be re-arranged so that customization can be carried out later.	0.785
	POS3	Delay final product assembly activities until customer orders have actually been received.	0.727
	POS4	Delay final product assembly activities until the last possible position (or nearest to customers) in the supply chain.	0.863

Table 6.2 shows item SSP1, SSP2 and ILP2 had communalities below 0.6 and were then removed. The process of examining communalities was repeated until the communalities of all variables are above 0.6; resulting in item SSP3 being removed from the list at this stage (where item communality is 0.470). (Note: the table for this result is not provided in order to avoid duplication of tables).

PCA with Varimax rotation was conducted on the remaining 31 items, where the mean value of all communalities is 0.779, well above the recommended cut-off point of 0.70 for small samples (MacCallum *et al*., 1999). The initial factor results are shown in Table 6.3 below. For simplicity, only loadings above 0.7 are displayed.

Table 6.3: Initial Exploratory Factor Analysis for SCMPs

Construct	Item	Component							Communalities	
		1	2	3	4	5	6	7*		
Information Sharing (IS) / Information Quality (IQ)	IQ2	0.917							0.883	
	IQ3	0.905							0.865	
	IQ4	0.885							0.858	
	IQ1	0.854							0.830	
	IQ5	0.810							0.806	
	IS4	0.795							0.721	
	IS7	0.775							0.848	
	IS3	0.738							0.723	
	IS5								0.665	removed
	IS6								0.774	removed
	IS1								0.685	removed
	IS2								0.613	removed
Customer Relationship (CR)	CR3		0.897						0.874	
	CR1		0.883						0.815	
	CR2		0.867						0.848	
	CR4		0.718						0.688	
Postponement (POS)	POS1			0.924					0.863	
	POS2			0.871					0.781	
	POS4			0.858					0.813	
	POS3			0.750					0.723	
Internal Lean practices (ILP)	ILP4				0.835				0.798	
	ILP1				0.794				0.783	
	ILP3				0.750				0.698	
	ILP5				0.702				0.609	
Strategic Customer Relationship (SCR)**	CR5					0.811			0.880	
	CR7					0.752			0.787	
	CR6					0.740			0.813	
Strategic Supplier Partnership (SSP)	SSP5						0.844		0.859	
	SSP4						0.843		0.821	
	SSP6						0.723		0.740	
	SSP7								0.695	removed
Eigenvalues		9.967	3.946	3.917	2.031	1.692	1.371	1.234		
% of variance		32.123	12.730	12.636	6.553	5.458	4.423	3.981		
Cumulative % of variance		32.123	44.883	57.520	64.072	69.531	73.954	77.936		

Note:
K-M-O Measure of Sampling Adequacy = 0.797
Bartlett Test of Sphericity is significant at p.=0.000
Only loadings above 0.7 are displayed and variables are sorted by highest loadings.
*The 7th factor displays no items with significant loadings and will later be dropped.
**A new factor emerged (and named Strategic Customer Relationship) which is explained later.

The Bartlett's test finds that the correlations when taken collectively are significant at p= 0.001 level with overall K-M-O measure of sampling adequacy value in the acceptable range (above 0.6). Kaiser's criterion (only components that have an eigenvalue of 1 or more) is used to determine how many components (factors) to extract. Seven factors emerged from the factor analysis, of which the last factor had no loading above 0.70 and was then dropped. The six components retained explain a total of 73.9% of the variance. Based on the analysis of the correlation matrix and these various tests, factor analysis was considered appropriate for the 82 cases.

After the first iteration, item loadings were examined and items that did not meet the loading cut-off or loaded significantly on more than one factor were eliminated. Items IS1, IS2, IS5, IS6 and SSP7 all had loadings below 0.7 on single factors.

After removing these five items, the remaining 26 items were submitted to the final round of factor analysis to reach a meaningful factor structure. The factor analysis revealed six factors with eigenvalue more than one. The results are shown in Table 6.4.

Table 6.4: Final Factor Analysis for SCMPs

Construct	Item	Component						Communalities
		1	2	3	4	5	6	
Information Sharing (IS) / Information Quality (IQ)	IQ2	0.925						0.876
	IQ3	0.908						0.857
	IQ4	0.879						0.792
	IQ1	0.858						0.815
	IQ5	0.816						0.753
	IS4	0.802						0.681
	IS7	0.793						0.668
	IS3	0.751						0.640
Customer Relationship (CR)	CR1		0.887					0.820
	CR3		0.886					0.869
	CR2		0.854					0.837
	CR4		0.720					0.700
Postponement (POS)	POS1			0.915				0.849
	POS4			0.875				0.832
	POS2			0.874				0.786
	POS3			0.758				0.724
Internal Lean Practices (ILP)	ILP4				0.885			0.840
	ILP3				0.776			0.699
	ILP5				0.755			0.655
	ILP1				0.740			0.629
Strategic Customer Relationship	CR5					0.841		0.902
	CR7					0.767		0.791
	CR6					0.734		0.800
Strategic Supplier Partnership (SSP)	SSP4						0.863	0.843
	SSP5						0.847	0.851
	SSP6						0.722	0.744
Eigenvalues		8.207	3.885	3.562	1.854	1.550	1.198	
% of variance		31.566	14.944	13.700	7.129	5.960	4.606	
Cumulative % of variance		31.566	46.510	60.210	67.339	73.299	77.905	

Note:
K-M-O Measure of Sampling Adequacy = 0.776; Bartlett Test of Sphericity is siginificant at p=0.000
Only loadings above 0.7 are displayed and variables are sorted by highest loadings.
Mean communalities = 0.779

The final factor analysis revealed the presence of six components with eigenvalues exceeding 1, explaining 31.5%, 14.9%, 13.7%, 7.1%, 5.9% and 4.6% of the variance respectively, which accounted for 77.9% of cumulative variance. All items loaded significantly on a single factor, with loadings above 0.7. Items for three components (SSP, ILP and POS) loaded on their respective factors. However, the EFA resulted in a situation where the dimensions of information sharing (IS) and information quality (IQ) loaded on a single construct. As a result, it was decided to merge them into one component. This factor was then renamed as 'Information Management' and coded as 'IM'.

Customer relationship (CR) revealed two distinct factors, with the first four items, CR1, CR2, CR3 and CR4 loaded on one factor and another three items, CR5, CR6 and CR7 loaded on another factor. It was thus determined that CR be split into two dimensions in the later analysis, retaining the name Customer Relationship (CR) for the first four items. As CR5, CR6 and CR7 ('Determine future customer expectations', 'Facilitate customers' ability to seek assistance from us' and 'Evaluate the importance of our relationship with our customers') represent strategic and future orientation, it was decided to name this new factor as 'Strategic Customer Relationship' and it was coded as 'SCR'. At the end of the factor analysis procedure for SCM practices, 26 items remained for subsequent reliability and validity testing.

6.2.2 Convergent and discriminant validity

After data purification and data reduction were completed, the remaining 26 SCMPs items were subject to a series of further statistical validation testing using a Partial Least Squares (PLS) approach (PLS-Graph Version 3). The measurement model was assessed by using PLS to examine internal consistency reliability and convergent and discriminant validity (Barclay *et al.*, 1995; Chin 1998a). Item loading, internal consistency reliability (also known as composite reliability) and average variance extracted (AVE) were computed from the normal PLS output using the formula shown in Table 4.5 (discussed under section 4.10.4 in Chapter 4).

For each of the SCMPs related items and constructs used in this study, the standardized individual item loadings (similar to loadings in principal components) and internal consistencies (similar to Cronbach's alpha) (Fornell and Larcker, 1981; Barclay *et al.*, 1995) greater than 0.70 was deemed necessary, as they had been subject to similar testing procedures in previous studies (Li *et al.*, 2005: 2006; Koh *et al.*, 2007). It was also felt that this decision would augment the integrity of previous research by using these constructs for comparability purposes.

Table 6.5 shows that all remaining SCMPs items exhibited high loadings; item loadings were all above 0.70, indicating that the measures share more variance with their respective constructs than with the error variance. The composite reliability (P_c) measures on each construct were at least 0.896 in all cases, exceeding the minimal reliability criteria suggested by Nunnally (1978).

Table 6.5: Reliabilities and convergent validity - SCMPs

Construct	Item code	Items	**Item loading**	**CRA (α)**	**P_c**	**AVE**
Strategic Supplier Partnership (SSP)	SSP4	Help suppliers to improve their product quality.	0.903	0.833	0.901	0.754
	SSP5	Continuous improvement programs with key suppliers.	0.915			
	SSP6	Include key suppliers in planning and goal-setting.	0.780			
Customer Relationship (CR)	CR1	Evaluate the formal and informal complaints of customers.	0.875	0.912	0.940	0.797
	CR2	Interact with customers to set reliability, responsiveness and other standards.	0.922			
	CR3	Follow-up with our customers for quality / service feedback.	0.935			
	CR4	Measure and evaluate customer satisfaction.	0.834			
Strategic Customer Relationship (SCR)	SCR1	Determine future customer expectations.	0.940	0.947	0.932	0.821
	SCR2	Facilitate customers' ability to seek assistance from us.	0.894			
	SCR3	Evaluate the importance of our relationship with our customers.	0.883			
Information Management (IM)	IM1	Trading partners share proprietary information.	0.775	0.842	0.958	0.739
	IM2	Fully informed about issues that affect business.	0.810			
	IM3	Keep each other informed about events or changes that may affect the other partners.	0.808			
	IM4	Information exchange is timely.	0.896			
	IM5	Information exchange is accurate.	0.926			
	IM6	Information exchange is complete.	0.916			
	IM7	Information exchange is adequate.	0.881			
	IM8	Information exchange is reliable.	0.854			
Internal Lean practices (ILP)	ILP1	Targets the reduction of set-up time.	0.766	0.904	0.896	0.684
	ILP3	Pull production system.	0.852			
	ILP4	Pushes suppliers for shorter lead-times	0.906			
	ILP5	Streamlines ordering, receiving and other paperwork from suppliers.	0.775			
Postponement (POS)	POS1	Products are designed for modular assembly.	0.897	0.888	0.933	0.777
	POS2	Production process modules can be re-arranged so that customization can be carried out later.	0.862			
	POS3	Delay final product assembly activities until customer orders have actually been received.	0.842			
	POS4	Delay final product assembly activities until the last possible position (or nearest to customers) in the supply chain.	0.922			

Key:
CRA = Cronbach's Alpha, P_c = Composite Reliability, AVE = Average Variance Extracted

In order to ensure convergent and discriminant validity, the AVE of each latent variable should be higher than the squared correlations with all other latent variables. Here the shared variance between any two constructs should be less than the variance extracted by either of the individual constructs. In other words, values along the diagonal of the correlation matrix (square root of the AVE for each construct) should be greater than the corresponding values in each row or column. AVE measures of 0.5 or more are considered to demonstrate adequate convergent validity (Chin, 1998a). As shown in Table 6.5, the AVE of all the SCMPs dimensions were at least 0.684, providing evidence of adequate convergent validity. The analysis of each component revealed Cronbach's alpha values between 0.833 and 0.947, suggesting that the theoretical constructs exhibit good psychometric properties and confirming that the scales employed were reliable.

Table 6.6: Square root AVE and correlations of latent variables - SCMPs

Constructs	SSP	CR	SCR	IM	ILP	POS
SSP	**0.868**					
CR	0.404	**0.893**				
SCR	0.441	0.579	**0.906**			
IM	0.276	0.236	0.346	**0.859**		
ILP	0.254	0.139	0.325	0.169	**0.827**	
POS	0.047	-0.003	0.053	0.134	0.392	**0.881**

Note: Diagonal elements (figures in '**bold**') are the square root of the variance shared between the constructs and their measures. Off diagonal elements are the correlations among constructs (dimensions). For discriminant validity, diagonal elements should be larger than off-diagonal elements.

The discriminant validity was evaluated by comparing the square roots of AVEs to the correlation between constructs, providing an assessment of the extent to which a construct shares more variance with its measures than with other constructs. This is demonstrated in the correlation of latent variables in Table 6.6, which includes correlation among constructs in the off-diagonal and the square root of AVE in the diagonal. The diagonal elements were all greater than their respective off-diagonal elements.

The factor structure matrix (Table 6.7) shows that all remaining SCMPs items exhibited high loadings (>0.7) on their respective constructs (figures shown in **bold**) and no items loaded higher on constructs they were not intended to measure, indicating adequate discriminant validity.

Table 6.7: Measurement items loading and cross-loading - SCMPs

	SSP	CR	SCR	IM	ILP	POS
SSP4	**0.903**	0.373	0.338	0.236	0.255	0.006
SSP5	**0.915**	0.433	0.380	0.215	0.247	0.030
SSP6	**0.780**	0.233	0.441	0.275	0.150	0.094
CR1	0.232	**0.875**	0.470	0.228	0.147	0.019
CR2	0.421	**0.922**	0.534	0.293	0.094	-0.012
CR3	0.354	**0.935**	0.494	0.325	0.104	-0.064
CR4	0.438	**0.834**	0.575	0.320	0.159	0.052
SCR1	0.407	0.529	**0.940**	0.287	0.339	0.008
SCR2	0.437	0.602	**0.894**	0.301	0.154	-0.001
SCR3	0.355	0.442	**0.883**	0.355	0.391	0.140
IM1	0.123	0.236	0.318	**0.775**	0.157	0.225
IM2	0.216	0.203	0.293	**0.809**	0.174	0.114
IM3	0.173	0.311	0.299	**0.808**	0.114	0.087
IM4	0.307	0.371	0.352	**0.896**	0.203	0.177
IM5	0.220	0.297	0.250	**0.926**	0.084	0.053
IM6	0.298	0.248	0.277	**0.916**	0.126	0.086
IM7	0.233	0.187	0.263	**0.881**	0.140	0.124
IM8	0.310	0.388	0.339	**0.854**	0.171	0.070
ILP1	0.184	0.229	0.369	0.155	**0.766**	0.222
ILP3	0.235	0.085	0.208	0.191	**0.852**	0.392
ILP4	0.199	0.034	0.284	0.163	**0.906**	0.317
ILP5	0.222	0.133	0.222	0.042	**0.775**	0.360
POS1	0.023	0.015	0.030	0.118	0.274	**0.897**
POS2	0.050	-0.020	0.019	0.158	0.253	**0.862**
POS3	0.023	-0.015	0.079	0.095	0.460	**0.842**
POS4	0.067	0.006	0.060	0.101	0.396	**0.922**

Table 6.7 also indicates a low correlation (loadings) of postponement (POS) to other constructs despite higher loading on its own construct; thus impacting the validation of the second order SCM construct discussed in the next section.

6.2.3 Validation of second order SCMPs construct

In this study, SCM practices were conceptualized as second-order factors. It was considered appropriate to have a higher-order measurement model for the SCMPs construct because the higher-order model is more parsimonious. Following this, SCM was measured and included in the analysis as a multidimensional construct comprising the six dimensions identified earlier in Chapter 2. Thus, SCMPs were measured as a second order construct of six first order constructs (based on the EFA results, reliability and convergent and discriminant validity of first order constructs discussed in earlier number of sections). Composite scores for each of the six constructs shown in Table 6.5, 6.6 and 6.7 were calculated for each of the 82 cases by averaging the scores of the questionnaire items associated with each construct. These composite scores became the input for the following analysis, that is, the validation of the second-order construct.

The second-order construct was measured using the method of repeated manifest variables suggested in Chin and Gopal (1995). The SCMPs construct was modelled as a second order molecular factor using PLS algorithms. The reliability of this second-order construct is evaluated using the relative path weights (loadings) of the first order constructs. If the molecular perspective (second order reflective mode) is valid, a comparison of the loadings would be an indicator of SCMPs dimension (first order) in reflecting the overall SCMPs (second order). For this purpose, the requirement is that item loading and AVE should be greater than 0.5, and Composite Reliability (Pc) should be larger than 0.7. Convergent validity in the second order construct is also shown when t-values of the outer model loadings are above 1.96 (sig. at least at p>0.05).

Table 6.8: Initial validation of second-order SCMPs construct

SCMPs constructs	Loading	Std.Error	T-value	Decision
Strategic Supplier Partnership (SSP)	0.692	0.0366	7.8840	
Customer Relationship (CR)	0.728	0.0372	8.1636	
Strategic Customer Relationship (SCR)	0.811	0.0305	11.1182	
Information Management (IM)	0.601	0.0316	7.9361	
Internal Lean Practices (ILP)	0.541	0.0724	3.1207	
Postponement (POS)	**0.273**	**0.0801**	**1.4247**	**Removed**
P_c = 0.787, AVE = **0.399**				

Key: P_c = Composite Reliability; AVE = Average Variance Extracted

Table 6.8 shows loadings, standard errors and t-values of the second-order measures of SCMPs construct. It should be noted that, with the exception of postponement; all the loadings and t-values of the measurements were significant at the 0.01 level. Postponement has a low item loading (0.273) and low t-value (1.4247), indicating that postponement might not be a strong indicator of SCM practice compared to the other five dimensions. Postponement may not be appropriate for firms at the end of a supply chain (distributors, retailers etc.) although relevant for manufacturing. For a manufacturing firm, the level of postponement may be associated with make-to order versus make-to-stock production systems. The instrument thus fits best manufacturers with a make-to-order system (Li *et al.*, 2005).

As discussed in the descriptive analysis (Chapter 5), the implementation of postponement is dependent on a firm’s market characteristics and the type of the products and therefore may not be applicable in all the situations. As a consequence, the POS dimension was removed from subsequent analysis. The testing process was repeated and the results (Table 6.9) exhibit improvement in constructs loading, t-value, composite reliability and AVE. It was then decided to retain all the other five SCM dimensions; all items were all significant at $p<0.05$ (t-values were all higher than 1.96). Since all the standardized coefficients (loadings) for all sub-constructs were statistically significant, the second-order factor was considered valid and reliable and used in the next analysis. Although AVE is a little less than 0.5, internal consistency (Pc) is sound.

Table 6.9: Final validation of second-order SCMPs construct

SCMPs constructs	Loading	Std. Error	T-value
Strategic Supplier Partnership (SSP)	0.707	0.0617	11.4631
Customer Relationship (CR)	0.756	0.0596	12.6831
Strategic Customer Relationship (SCR)	0.828	0.0420	19.7121
Information Management	0.559	0.0794	7.5449
Internal Lean Practices (ILP)	0.526	0.1452	3.3521
P_c = 0.812, AVE = 0.470			

Key:
P_c = Composite Reliability; AVE = Average Variance Extracted

6.3 Management accounting practices constructs

This section describes the process by which MAPs related items and constructs used in this study were statistically validated. Each of these items has been used in previous MA research (Abdel-Kader and Luther, 2008: 2006; Tillema, 2005; Gerdin and Greve, 2004; Chenhall and Morris, 1998). The MAPs were classified under four distinct headings, representing each stage of management accounting evolution categorized by IFAC (1998).

Following an extensive review of the relevant literature (Chapter 2), the 40 MAPs are a comprehensive measure of MAPs in the MA domain. Stage 1 (5 items) and Stage 2 (12 items) represent traditional and less sophisticated MAPs while Stage 3 (7 items) and Stage 4 (16 items) correspond to more modern and sophisticated MAPs. The MAPs elements were excluded from EFA analysis and were analysed directly using PLS analysis because their reliability had been confirmed in previous research (Abdel-Kader and Luther, 2008).

As an initial step in devising credible MA constructs, a series of descriptive statistics (e.g. mean, standard deviation) were calculated for each MA item reported. The results of these were documented in the previous chapter (Chapter 5). The descriptive statistics represent the first step in developing a series of pragmatically relevant and statistically reliable MA constructs, as well as providing valuable initial insights with regard to the data collected.

6.3.1 Convergent and discriminant validity

Within the PLS context, the measurement model for the MAPs construct was assessed by examining individual item reliability. The norm for well established items is to accept items with loadings of 0.70 or more (as SCMPs, SCPERF, OPERF constructs). Any item that fails to meet this 0.70 loading threshold is generally removed from further testing.

In endeavouring to satisfy this factor loading requirement, a comprehensive set of testing and retesting was undertaken. However, it became obvious that the 0.70 loading threshold was not sustainable given the nature of the management accounting items used in this study, despite rigorous robustness testing. The solution, therefore, in terms of the management accounting items, was to adopt the loading threshold norm used in research of an exploratory nature, that is, 0.60. According to Hair *et al*. (2010), items that load at this level are still considered to be very significant. This decision was taken to enhance the probability that a series of statistically credible and viable MA constructs would emerge from the range of MA items available.

Table 6.10 presents MAPs following IFAC Stages 1 – 4, their corresponding code and the initial individual item reliabilities.

Table 6.10: Initial reliability and convergent validity – MAPs

Code	Management Accounting Practices	Item Loading
Stage 1	**Cost determination and financial control (CDFC) P_c = 0.784; AVE = 0.424**	
CDFC1	A plant-wide overhead rate	**0.503**
CDFC2	Budgeting for controlling costs	0.740
CDFC3	Flexible budgeting	0.665
CDFC4	Performance evaluation based on financial measures	0.685
CDFC5	Evaluation of major capital investments based on payback period and/or ARR	0.637
Stage 2	**Provision of information for management planning and control (IPC) P_c = 0.895; AVE = 0.420**	
IPC1	Separation between variable and fixed/non incremental costs	**0.577**
IPC2	Departmental overhead rates	**0.583**
IPC3	Regression and/or learning curve techniques	**0.449**
IPC4	Budgeting for planning	0.722
IPC5	Budgeting with ‘what if analysis’	0.680
IPC6	Budgeting for long term / strategic plans	0.689
IPC7	Performance evaluation based on non-financial measures related to operations	0.626
IPC8	CVP analysis for major products	0.760
IPC9	Product profitability analysis	0.710
IPC10	Stock control models	0.699
IPC11	Evaluation of major capital investments based on DCF	**0.512**
IPC12	Long range forecasting	0.701
Stage 3	**Reduction of waste in business resources (RWR) P_c = 0.871; AVE = 0.493**	
RWR1	Activity-based costing (ABC)	0.701
RWR2	Quality costing	0.710
RWR3	Activity-based budgeting	0.728
RWR4	Zero-based budgeting	0.750
RWR5	Performance evaluation based on non-financial measures related to employees	**0.533**
RWR6	Evaluating the risk of major capital investments projects using probability analysis or computer simulation	0.695
RWR7	Performing sensitivity ‘what if’ analysis when evaluating major capital investments projects	0.772
Stage 4	**Creation of value through effective use of resources (CV) P_c = 0.930; AVE = 0.460**	
CV1	Target costing	0.787
CV2	Inter-organizational cost management / cost reduction programme	0.625
CV3	Open book costing	**0.466**
CV4	Performance evaluation based on non-financial measures related to customers	**0.557**
CV5	Performance evaluation based on residual income or economic value added (EVA)	0.607
CV6	Benchmarking	0.623
CV7	Joint inter-organizational performance measurement system	0.611
CV8	Customer profitability analysis	**0.593**
CV9	Evaluation of major capital investments using non-financial aspects	**0.538**
CV10	Shareholder value analysis	0.721
CV11	Industry analysis	0.828
CV12	Analysis of competitive position	0.708
CV13	Value chain analysis	0.710
CV14	Product life cycle analysis	0.770
CV15	Integration with suppliers’ and/or customers’ value chains	0.844
CV16	Analysis of competitors’ strengths and weaknesses	0.733

Key: P_c = Composite Reliability, AVE = Average Variance Extracted

As Table 6.10 illustrates, ten items revealed loading values of less than 0.60. They were CDFC1 – ‘A plant-wide overhead rate’, IPC1 – ‘Separation between variable and fixed/non incremental costs, IPC2 – ‘Departmental overhead rates’, IPC3 – ‘Regression and/or learning curve techniques’, IPC11 – ‘Industry analysis’, RWR5 – ‘Performance evaluation based on non-financial measures related to employees’, CV3 – ‘Open book costing, CV4 – ‘Performance evaluation based on non-financial measures related to customers’, CV8 – ‘Customer profitability analysis’ and CV9 – ‘Evaluation of major capital investments using non-financial aspects’ (all figures written in ‘**bold**’). These items were subsequently removed from further analysis. Further examination of Table 6.10 also shows that AVEs were all below 0.50 despite higher composite reliabilities (all greater than 0.70). The removal of these items was also expected to enhance their AVEs.

The process was repeated and resulted in four more items being dropped from further analysis; CV2 – ‘Inter-organizational cost management / cost reduction programme’, CV5 – ‘Performance evaluation based on residual income or economic value added (EVA)’, CV 6 – ‘Benchmarking’ and CV7 – ‘Joint inter-organizational performance measurement system’ with item loading 0.579, 0.593, 0.594 and 0.594 respectively.

The focus of attention then shifted from items to constructs. All 26 remaining items were tested for internal consistency (composite reliability), convergent validity and discriminant validity. Table 6.11 summarizes the results.

Table 6.11: Final reliability and convergent validity - MAPs

Construct	Item code	Items	**PLS loading**	**CRA (α)**	**P_c**	**AVE**
Cost Determination and Financial Control (CDFC)	CDFC2	Budgeting for controlling costs	0.7815	0.645	0.794	0.492
	CDFC3	Flexible budgeting	0.6836			
	CDFC4	Performance evaluation based on financial measures	0.7188			
	CDFC5	Evaluation of major capital investments based on payback period and/or ARR	0.6110			
Information for Planning and Control (IPC)	IPC4	Budgeting for planning	0.7301	0.863	0.894	0.513
	IPC5	Budgeting with 'what if analysis'	0.7234			
	IPC6	Budgeting for long term / strategic plans	0.7504			
	IPC7	Performance evaluation based on non-financial measures related to operations	0.6741			
	IPC8	CVP analysis for major products	0.7462			
	IPC9	Product profitability analysis	0.6821			
	IPC10	Stock control models	0.6725			
	IPC12	Long range forecasting	0.7452			
Reduction of Waste and Business Resources (RWR)	RWR1	Activity-based costing (ABC)	0.7188	0.826	0.875	0.539
	RWR2	Quality costing	0.7381			
	RWR3	Activity-based budgeting	0.7328			
	RWR4	Zero-based budgeting	0.7591			
	RWR6	Evaluating the risk of major capital investments projects using probability analysis or computer simulation	0.7014			
	RWR7	Performing sensitivity 'what if' analysis when evaluating major capital investments projects	0.7522			
Value creation (CV)	CV1	Target costing	0.7421	0.916	0.933	0.637
	CV10	Shareholder value analysis	0.7880			
	CV11	Industry analysis	0.8494			
	CV12	Analysis of competitive position	0.7770			
	CV13	Value chain analysis	0.7466			
	CV14	Product life cycle analysis	0.8104			
	CV15	Integration with suppliers' and/or customers' value chains	0.8768			
	CV16	Analysis of competitors' strengths and weaknesses	0.7870			

Key:
CRA = Cronbach's Alpha
P_c = Composite Reliability
AVE = Average Variance Extracted

As presented in Table 6.11, all measures were above the 0.7 loading level (except item CDFC3, CDFC5, IPC7, IPC9, and IPC10 which had loading lower than 0.70 but above 0.60) – indicating that the measures share more variance with their respective constructs than with the error variance. The composite reliability for the constructs ranges from 0.794 to 0.933; all higher than the 0.70 level suggested by Nunally (1978). Internal consistency was evaluated using both the Fornell and Larcker (1981) measure and Cronbach's Alpha. It should be noted that Cronbach's alpha shows figures slightly lower but above 0.7 (except CDFC with α=0.645). The table also shows AVEs larger than or equal to 0.50 for all constructs (except CDFC; but 0.492 was close to 0.50 and was regarded as acceptable), demonstrating evidence of adequate convergent validity (Cronin *et al*., 2000; Chin, 1998a).

Discriminant validity was evaluated by comparing the square roots of AVE s to the correlation between constructs, to provide an assessment of the extent to which a construct shares more variance with its measures than with other constructs. This is demonstrated in the correlation matrix in Table 6.12, which includes correlation among constructs in the off-diagonal and the square root of AVE in the diagonal. The diagonal elements were all greater than their respective off-diagonal elements (with the exception of CDFC), indicating adequate discriminant validity.

Table 6.12: Square Root AVE and correlations of latent variables - MAPs

Constructs	CDFC	IPC	RWR	CV
CDFC	**0.701**			
IPC	0.844	**0.716**		
RWR	0.673	0.705	**0.734**	
CV	0.651	0.712	0.701	**0.798**

Note: Diagonal elements (figures in **bold**) are the square root of the variance shared between the constructs and their measures. Off diagonal elements are the correlations among constructs (dimensions).

The factor structure matrix (Table 6.13) shows that all remaining MAPs items exhibited high loadings on their respective constructs (shown in **bold**) and no items loaded higher on constructs they were not intended to measure, indicating adequate discriminant validity.

Table 6.13: Measurement items loading and cross-loading – MAPs

	CDFC	IPC	RWR	CV
CDFC2	**0.781**	0.660	0.535	0.509
CDFC3	**0.684**	0.599	0.564	0.527
CDFC4	**0.719**	0.614	0.305	0.335
CDFC5	**0.611**	0.484	0.493	0.461
IPC4	0.769	**0.730**	0.588	0.519
IPC5	0.623	**0.723**	0.646	0.587
IPC6	0.561	**0.750**	0.539	0.584
IPC7	0.456	**0.674**	0.465	0.424
IPC8	0.592	**0.746**	0.443	0.463
IPC9	0.573	**0.682**	0.358	0.322
IPC10	0.683	**0.672**	0.554	0.580
IPC12	0.580	**0.745**	0.443	0.587
RWR1	0.438	0.445	**0.719**	0.514
RWR2	0.428	0.542	**0.738**	0.661
RWR3	0.525	0.552	**0.733**	0.466
RWR4	0.472	0.507	**0.759**	0.569
RWR6	0.454	0.440	**0.701**	0.587
RWR7	0.643	0.612	**0.752**	0.505
CV1	0.480	0.610	0.674	**0.742**
CV10	0.627	0.584	0.560	**0.788**
CV11	0.539	0.641	0.610	**0.849**
CV12	0.419	0.461	0.438	**0.777**
CV13	0.467	0.472	0.629	**0.747**
CV14	0.466	0.529	0.634	**0.810**
CV15	0.580	0.634	0.659	**0.877**
CV16	0.570	0.606	0.584	**0.787**

The composite scores for each of the four constructs shown in Table 6.11 and 6.12 were calculated for each of the 82 cases by averaging the scores of the questionnaire items associated with each construct. These composite scores became the input for the following analysis; that is, the validation of the second-order construct.

6.3.2 Validation of second order MAPs construct

Table 6.14 exhibits loadings, standard errors and t-value of the second-order measures of MAPs construct. The statistical results shown satisfied all the requirements for convergent validity, as factor loading and composite reliabilities (P_c) exceeded 0.7, AVE was greater than 0.50 and t-values of the outer model loadings were all significant (t-values at least greater than or equal to 1.96; sig. at 0.05 level). All four dimensions of MAPs were subsequently used for further analysis.

Table 6.14: Validation of second-order MAPs construct

MAPs constructs	Loading	Std. Error	T-value
Cost Determination and Financial Control (CDFC)	0.8923	0.0228	39.0538
Information for Planning and Control (IPC)	0.9157	0.0191	47.8752
Reduction of Waste and Business Resources (RWR)	0.8800	0.0369	23.8520
Value creation (CV)	0.8769	0.0335	26.1992
P_c = 0.939, AVE = 0.795			

Key:
P_c = Composite Reliability
AVE = Average Variance Extracted

6.4 Supply chain performance construct

The supply chain performance (SCPERF) was initially represented by four dimensions and 21 items, including Supply Chain Flexibility (FLEX) (7 items), Supply Chain Integration (INT) (6 items), Suppliers' Performance (SUP) (5 items) and

Responsiveness to Customers (RESC) (3 items). Scale of 1 -5 was employed to measure perceived SCM performance measured against competitors' performance within the same industry.

For each of the SCM performance items and dimensions used in this study, the 0.70 loading threshold was deemed necessary, as all had been subject to similar testing procedures in previous studies. Items which generated loading values of less than the required 0.70 were subsequently removed from further analysis. As with the SCMPs construct, SCPERF construct was also subjected to PCA using SPSS.

6.4.1 Factor analysis

Measures for SCPERF were firstly purified using CITC and Cronbach's alpha scores.

The CITC score for each item (and its corresponding code) and the initial value of Cronbach's alpha are shown in Table 6.15 as follows.

Table 6.15: Data purification for SCPERF

Constructs	Code	Measured variables	CITC	CRA (α)
Supply chain flexibility (FLEX)	FLEX1	Ability to handle non –standard orders.	0.698	0.918
	FLEX2	Ability to meet special customer specification.	0.648	
	FLEX3	Ability to produce products characterized by numerous features options, sizes, colours, etc.	0.712	
	FLEX4	Ability to rapidly adjust capacity so as to accelerate to decelerate production.	0.811	
	FLEX5	Ability to rapidly introduce product improvements / variation.	0.792	
	FLEX6	Ability to handle rapid introduction of new products.	0.818	
	FLEX7	Ability to respond to the needs and wants of the firm's target market(s).	0.775	
Supply chain integration (INT)	INT1	Communication and coordination between all functions in the firm.	0.799	0.911
	INT2	Cross-functional teams used for process design and improvement in the firm.	0.721	
	INT3	Communication and coordination between us and suppliers	0.721	
	INT4	Communication and coordination between us and customers	0.751	
	INT5	Integration of information systems in the firm.	0.817	
	INT6	Integration of activities of our firm and our trading partners.	0.768	
Suppliers performan-ce(SUP)	SUP1	Timely delivery of materials / components / products to our firm.	0.727	0.896
	SUP2	Dependability of delivery to our firm.	0.684	
	SUP3	Providing materials /components / products that are highly reliable.	0.849	
	SUP4	Providing high quality materials /components /products to our firm.	0.843	
	SUP5	Providing high quality materials /components/products to our firm at low cost.	0.649	
Responsi-veness to customers	RESC1	Fulfilling customer orders on time.	0.634	0.856
	RESC2	Shorter order-to-delivery cycle time	0.836	
	RESC3	Customer response time	0.728	

Key:
CRA = Cronbach's Alpha
CICT = Corrected Item Total Correlation

All items were retained for subsequent analysis due to high CITC score (above 0.4) and Cronbach's alpha values which were well above the acceptable 0.7 cut-off point. EFA (with Varimax rotation) was then conducted on all SCPERF items following the suggestions by MacCallum *et al*. (1999) and Preacher and MacCallum (2002) for small sample size. A pooled-sample factor analysis for all SCPERF items was performed by closely examining communality scores (sample to variable ratio = 82/21 = 3.9) as presented in Table 6.16.

Table 6.16: Initial Factor Analysis for SCPERF

Constructs	items	Component				Communalities	
		1	2	3	4		
Supply chain integration	INT6	0.760				0.685	
	INT3	0.748				0.668	
	INT5	0.743				0.746	
	INT2	0.732				0.655	
	INT4	0.729				0.728	
	INT1	0.715				0.771	
Supply chain flexibility	FLEX5		0.875			0.830	
	FLEX6		0.873			0.837	
	FLEX3		0.805			0.695	
	FLEX4		0.799			0.764	
	FLEX7					0.719	removed
	FLEX1					0.670	removed
	FLEX2					0.695	removed
Customer responsiveness	RESC2			0.784		0.810	
	RESC3			0.780		0.730	
	RESC1			0.680		0.643	**retained**
Supplier performance	SUP5					0.665	removed
	SUP2				0.786	0.737	
	SUP1				0.786	0.756	
	SUP4				0.751	0.819	
	SUP3				0.746	0.813	
Eigenvalues		10.638	2.383	1.357	1.058		
% of variance		50.656	11.349	6.461	5.036		
Cumulative % of variance		50.656	62.005	68.466	73.503		
K-M-O Measure of Sampling Adequacy = 0.887 Bartlett Test of Sphericity is siginificant at p.=0.000 Only loadings above 0.7 are displayed and variables are sorted by highest loadings							

Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Olkin value was 0.887, exceeding the recommended value of 0.6 and Bartlett's Test of Spherecity reached statistical significance at p=0.000. Item communalities were well above 0.6 with mean communalities of 0.735.

Initial factor analysis as exhibited in Table 6.16 shows that four items: SUPP5 - 'Providing high quality materials /components /products to our firm', FLEX 1 - 'Ability to handle non–standard orders', FLEX2 - 'Ability to meet special customer specification' and FLEX7 - 'Ability to respond to the needs and wants of the firm's target markets' had loadings below the cut-off point and these were removed. All factor loadings retained were all higher than 0.70 loading (except item RESC1 where it was decided to retain the item in order to keep the RESC dimension (minimum of 3 items) considering the importance of this dimension to overall SCPERF). The use of multiple indicators for each dimension/construct is desirable since this allows measuring the psychometric properties dimension under investigation (Bontis *et al*., 2007).

In the quest for a stable factor structure, an iterative procedure was followed. The remaining 17 SCPERF items were re-submitted to the PCA procedure with Varimax rotation. The iterative procedure continued with the deletion of INT4 - 'Communication and coordination between us and customers' due to item loading below 0.70. The final factor analysis is shown in the following table (Table 6.17).

Table 6.17: Final factor analysis for SCPERF

Constructs		Component				Communalities
		1	2	3	4	
Supply chain integration	INT6	0.818				0.753
	INT2	0.797				0.722
	INT5	0.766				0.783
	INT1	0.704				0.753
	INT3	0.700				0.617
Supply chain flexibility	FLEX5		0.869			0.822
	FLEX6		0.860			0.820
	FLEX3		0.837			0.752
	FLEX4		0.819			0.788
Supplier performance	SUP1			0.835		0.805
	SUP2			0.814		0.761
	SUP3			0.736		0.789
	SUP4			0.734		0.801
Customer Responsiveness	RESC3				0.813	0.795
	RESC2				0.805	0.854
	RESC1				0.727	0.691
Eigenvalues		7.950	2.140	1.247	0.975	
% of variance		49.70	13.37	7.79	6.05	
Cumulative % of variance		49.690	63.062	70.854	76.951	
K-M-O Measure of Sampling Adequacy = 0.866 Bartlett Test of Sphericity is siginificant at p.=0.000 Only loadings above 0.7 are displayed and variables are sorted by highest loadings						

Table 6.17 shows all 16 remaining items loaded on their respective factors with most of loadings greater than 0.8. The final factor analysis revealed the presence of four components: FLEX, INT, SUP and RESC (loaded on their correct factors) with eigenvalues exceeding 1, explaining 49.7%, 13.3%, 7.8% and 6.0% of the variance respectively, which accounted for 76% of the cumulative variance.

6.4.2 Convergent and discriminant validity

After EFA was completed, the rest of the methodology dealt with confirmatory analysis; convergent and discriminant validity and a reliability assessment. To do this, results obtained from PCA using SPSS were submitted to PLS. A 0.70 loading threshold was deemed necessary for individual item reliabilities and composite reliabilities. Convergent validity was also assessed using the average variance extracted (AVE).

Table 6.18 presents high individual item loading for SCPERF with the lowest loading of 0.7881; composite reliabilities (P_c) and Cronbach's alpha values were both greater than the minimum threshold of 0.70. Convergent validity was also assessed using the AVE, of which all were well above 0.70, demonstrating a more than adequate level of convergent validity.

Table 6.18: Reliability and convergent validity - SCPERF

Construct	Item code	Items	**Item loading**	**CRA (α)**	**P_c**	**AVE**
Supply chain flexibility (FLEX)	FLEX3	Ability to produce products characterized by numerous features options, sizes, colours, etc.	0.8588	0.909	0.937	0.789
	FLEX4	Ability to rapidly adjust capacity so as to accelerate to decelerate production.	0.8901			
	FLEX5	Ability to rapidly introduce product improvements / variation.	0.8954			
	FLEX6	Ability to handle rapid introduction of new products.	0.9080			
Supply chain integration (INT)	INT1	Communication and coordination between all functions in the firm.	0.8691	0.897	0.927	0.717
	INT2	Cross-functional teams used for process design and improvement in the firm.	0.8326			
	INT3	Communication and coordination between us and suppliers	0.7881			
	INT5	Integration of information systems in the firm.	0.8874			
	INT6	Integration of activities of our firm and our trading partners.	0.8528			
Suppliers' performance (SUP)	SUP1	Timely delivery of materials / components / products to our firm.	0.8676	0.900	0.930	0.769
	SUP2	Dependability of delivery to our firm.	0.8395			
	SUP3	Providing materials /components / products that are highly reliable.	0.8940			
	SUP4	Providing high quality materials /components /products to our firm.	0.9049			
	RESC1	Fulfilling customer orders on time.	0.8235	0.856	0.913	0.779
	RESC2	Shorter order-to-delivery cycle time	0.9357			
	RESC3	Customer response time	0.8849			

Key:
Key:
CRA = Cronbach's Alpha
P_c = Composite Reliability
AVE = Average Variance Extracted

For discriminant validity, items should load more strongly on constructs they are intended to measure than on other constructs in the model, as shown in Table 6.19.

The average variance shared between each construct and its measures should be greater than the variance shared between the construct and other constructs (Barclay *et al*., 1995; Fornell and Larcker, 1981; Chin, 1998a) as evidenced in Table 6.19.

Table 6.19: Square Root AVE and correlations of latent variables - SCPERF

SCPERF	FLEX	INT	SUP	RESC
FLEX	**0.888**			
INT	0.476	**0.847**		
SUP	0.370	0.656	**0.877**	
RESC	0.486	0.583	0.613	**0.883**

Note: Diagonal elements (figures in '**bold**') are the square root of the variance shared between the constructs and their measures. Off diagonal elements are the correlations among constructs (dimensions).

Table 6.19 presents the square root of the AVE of the SCPERF construct from its indicators greater than 0.707 (that is, AVE > 0.5) and exceeded that construct's correlation with other constructs. The square roots of AVEs to the correlation between constructs (the diagonal elements) were greater than their respective off-diagonal elements, indicating adequate discriminant validity. The factor structure matrix (Table 6.20) shows that all remaining SCPERF items exhibited high loadings (>0.7) on their respective constructs (figures shown in **bold**) and no items loaded higher on constructs they were not intended to measure, indicating adequate discriminant validity.

Table 6.20: Measurement items loading and cross-loading – SCPERF

	FLEX	INT	SUP	RESC
FLEX3	**0.859**	0.360	0.237	0.388
FLEX4	**0.890**	0.467	0.373	0.499
FLEX5	**0.895**	0.417	0.365	0.391
FLEX6	**0.908**	0.443	0.335	0.448
INT1	0.442	**0.869**	0.649	0.565
INT2	0.325	**0.833**	0.512	0.446
INT3	0.396	**0.788**	0.510	0.459
INT5	0.448	**0.887**	0.594	0.565
INT6	0.400	**0.853**	0.507	0.426
SUP1	0.267	0.563	**0.868**	0.451
SUP2	0.204	0.524	**0.839**	0.459
SUP3	0.412	0.602	**0.894**	0.606
SUP4	0.405	0.610	**0.905**	0.625
RESC1	0.377	0.483	0.560	**0.823**
RESC2	0.453	0.567	0.595	**0.936**
RESC3	0.454	0.489	0.468	**0.885**

Based on these analyses, the convergent and discriminat validity of the SCPERF measures are satisfactory.

6.4.3 Validation of second order SCPERF construct

As with the SCMPs construct, the SCPERF construct was also measured as a second order construct, this time of four first order constructs (based on the EFA results, reliability and convergent and discriminant validity of first order constructs discussed in sections 6.4.1 and 6.4.2). Respondent composite scores for each of the four constructs shown in Table 6.17, 6.18 and 6.19 were calculated for each of the 82 cases by averaging the scores of the questionnaire items associated with each construct. These composite scores became the input for the following analysis, that is, the validation of the second-order construct.

The SCPERF construct was modelled as a second order molecular factor using PLS algorithms. The reliability of this second-order construct is evaluated using the relative loadings of the first order constructs. If the molecular perspective (second order reflective mode) is valid, a comparison of the loadings would be an indicator of SCPERF dimension (first order) in reflecting the overall SCPERF (second order). For this purpose, the requirement is that item loading and AVE should be greater than 0.5, and Composite Reliability (P_c) should be larger than 0.7. Convergent validity in the second order construct is also shown when t-values of the outer model loadings are above 1.96 (sig. at least at p>0.05).

Table 6.21: Validation of second-order SCPERF construct

SCMPs constructs	Loading	Std. Error	T-value
FLEX	0.7000	0.1110	6.2722
INT	0.8495	0.0292	29.1271
SUP	0.8282	0.0314	26.3984
RESC	0.8376	0.0426	19.6661
P_c = 0.880, AVE = 0.649			

Key:
P_c = Composite Reliability; AVE = Average Variance Extracted

Table 6.21 shows loadings, standard errors and t-value of the second-order measures of SCPERF construct. All the loadings and t-values of the measurements were all significant at 0.01 level, indicating that the SCPERF construct has been reliably measured.

6.5 Organizational performance construct

Seven items of overall organizational performance (OPERF) were firstly subjected to EFA. The analysis began with purification using reliability analysis and corrected-item total correlation (CITC) analysis. The CITC for each item (and its corresponding code name) and Cronbach's alpha values are presented in Table 6.22 as follows:

Table 6.22: Data purification for overall organizational performance

Manifest constructs	Code	Measured variables	CITC	Cronbach's Alpha
Organizational performance	OPERF1	Return on investment (ROI)	0.845	0.920
	OPERF2	Profit margin on sales (PMS)	0.841	
	OPERF3	Total cost reduction (TCR)	0.728	
	OPERF4	Market share (MS)	0.664	
	OPERF5	Product quality (PQ)	0.813	
	OPERF6	Competitive position (CP)	0.705	
	OPERF7	Customer satisfaction (CS)	0.823	

The table shows the CITC scores for all items were all well above 0.60 and significantly high alpha value for the dimension. All items were then submitted to PCA analysis.

The K-M-O measurement of sample adequacy showed 0.830, exceeding the Kaiser criterion of minimum 0.5. The result of Bartlett's Test of Sphericity also reached statistical significance at p=0.000. Results of the factor extraction using PCA are presented in Table 6.23.

Table 6.23: Factor Analysis for organizational performance

Manifest constructs	Code	Measured variables	Factor loading	Communalities
Organizational performance	OPERF1	ROI	0.846	0.715
	OPERF2	PMS	0.856	0.733
	OPERF3	TCR	0.817	0.668
	OPERF4	MS	0.789	0.622
	OPERF5	PQ	0.779	0.606
	OPERF6	CP	0.826	0.682
	OPERF7	CS	0.861	0.742

The result revealed a one-factor solution; both financial and non-financial measures loaded significantly on the same factor with most loadings greater than 0.8. The factor explains a total of 68.1% of the total variance, with eigenvalue of 4.768. Consequently, all items were retained and were subject to further statistical validation testing in PLS.

Table 6.24: Reliability and convergent validity - OPERF

Construct	Item code	Items	**PLS loading**	**CRA (α)**	**P_c**	**AVE**
Organizational performance	OPERF1	ROI	0.8456	0.920	0.937	0.681
	OPERF2	PMS	0.8563			
	OPERF3	TCR	0.8171			
	OPERF4	MS	0.7890			
	OPERF5	PQ	0.7786			
	OPERF6	CP	0.8257			
	OPERF7	CS	0.8612			

Key:
CRA = Cronbach's Alpha
P_c = Composite Reliability
AVE = Average Variance Extracted

As presented in Table 6.24, all measures were above the 0.7 loading level, indicating that the measures share more variance with their respective constructs than with error variance. The composite reliability for the construct was 0.937, a lot higher than the minimal 0.70 level suggested by Nunally (1978). Internal consistency was also evaluated using Cronbach's Alpha. Evidence of convergent validity can be concluded when the reliability is at least 0.70. The table also shows that AVE was higher than 0.50, demonstrating evidence of adequate convergent validity.

6.6 Summary of measurement analysis

Tables 6.25, 6.26 and 6.27 summarize the reliability and validity analysis for all constructs. They confirm the existence of adequate convergent and discriminant validity at the construct level for all constructs included in this study. As Table 6.25 illustrates, all constructs apart from SCMPs (47%) and CDFC (49.2%) reached the convergent validity threshold. However, the exploratory nature of these two constructs, coupled with the fact that they have met and exceeded all other statistical validation requirements and are also reasonably close to the requisite 0.5 level, renders these results acceptable in such circumstances.

Table 6.25: Composite reliability and AVE – All constructs

	0.7	**0.5**
	Composite Reliability (P_c)	**AVE**
MAPs	0.939	0.795
SCMPs	0.812	0.470
CDFC	0.794	0.492
IPC	0.894	0.513
RWR	0.875	0.539
CV	0.933	0.637
SCPERF	0.880	0.649
OPERF	0.937	0.681

Table 6.26: Correlations of latent variables – All constructs

	MAPs	SCMPs	CDFC	IPC	RWR	CV	SCPERF	OPERF
MAPs	**0.892**							
SCMPs	0.457	**0.686**						
CDFC	0.888	0.335	**0.701**					
IPC	0.810	0.419	0.844	**0.716**				
RWR	0.881	0.367	0.673	0.705	**0.734**			
CV	0.875	0.494	0.651	0.712	0.729	**0.798**		
SCPERF	0.373	0.437	0.306	0.405	0.352	0.261	**0.805**	
OPERF	0.279	0.364	0.180	0.211	0.256	0.326	0.673	**0.825**

Table 6.26 demonstrates that values along the diagonal of the correlation matrix (square root of the AVE for each construct) are greater than the corresponding values in each row or column. It means the shared variance between any two constructs is less than the variance extracted by either of the individual constructs. Table 6.27 summarizes loadings in the form of a factor structure of loadings and cross-loadings. The table shows that the remaining items exhibited high loadings (at least items showing loading > 0.50) on their respective constructs and no items loaded higher on constructs they were not intended to measure.

Table 6.27: Measurement items loadings and cross-Loading – all constructs

	SCMP	CDFC	IPC	RWR	CV	MAPs	SCPERF	OPERF
SCMP1: SSP	**0.707**	0.254	0.290	0.223	0.375	0.322	0.359	0.281
SCMP2: CR	**0.756**	0.276	0.361	0.205	0.361	0.340	0.257	0.178
SCMP3:SCR	**0.827**	0.274	0.381	0.292	0.437	0.393	0.386	0.386
SCMP4: IM	**0.558**	0.120	0.158	0.276	0.201	0.210	0.237	0.199
SCMP5: ILP	**0.526**	0.204	0.199	0.295	0.292	0.284	0.241	0.172
CDFC2	0.283	**0.781**	0.660	0.535	0.509	0.687	0.163	0.069
CDFC3	0.223	**0.684**	0.599	0.564	0.527	0.669	0.232	0.190
CDFC4	0.153	**0.719**	0.614	0.305	0.335	0.544	0.237	-0.002
CDFC5	0.287	**0.611**	0.484	0.493	0.461	0.591	0.238	0.280
IPC4	0.265	0.769	**0.730**	0.588	0.519	0.725	0.281	0.151
IPC5	0.276	0.623	**0.723**	0.646	0.587	0.725	0.259	0.207
IPC6	0.352	0.561	**0.750**	0.539	0.584	0.682	0.338	0.248
IPC7	0.393	0.456	**0.674**	0.465	0.424	0.567	0.374	0.232
IPC8	0.328	0.592	**0.746**	0.443	0.463	0.630	0.327	0.130
IPC9	0.108	0.573	**0.682**	0.358	0.322	0.543	0.199	-0.072
IPC10	0.324	0.683	**0.672**	0.554	0.580	0.699	0.246	0.149
IPC12	0.350	0.580	**0.745**	0.443	0.587	0.663	0.292	0.155
RWR1	0.258	0.438	0.445	**0.719**	0.514	0.595	0.180	0.168
RWR2	0.298	0.428	0.542	**0.738**	0.661	0.669	0.302	0.225
RWR3	0.278	0.525	0.552	**0.733**	0.466	0.639	0.123	-0.009
RWR4	0.276	0.472	0.507	**0.759**	0.569	0.648	0.316	0.249
RWR6	0.218	0.454	0.440	**0.701**	0.587	0.617	0.332	0.263
RWR7	0.286	0.643	0.612	**0.752**	0.505	0.710	0.298	0.230
CV1	0.353	0.480	0.610	0.674	**0.742**	0.708	0.311	0.293
CV10	0.397	0.627	0.584	0.560	**0.788**	0.718	0.274	0.288
CV11	0.376	0.539	0.641	0.610	**0.849**	0.738	0.212	0.316
CV12	0.401	0.419	0.461	0.438	**0.777**	0.588	-0.013	0.161
CV13	0.367	0.467	0.472	0.629	**0.747**	0.653	0.182	0.166
CV14	0.281	0.466	0.529	0.634	**0.810**	0.685	0.173	0.222
CV15	0.504	0.580	0.634	0.659	**0.877**	0.772	0.317	0.357
CV16	0.472	0.570	0.606	0.584	**0.787**	0.718	0.200	0.262
MAP1: CDFC	0.345	0.994	0.836	0.686	0.660	**0.892**	0.311	0.205
MAP2: IPC	0.424	0.842	1.000	0.707	0.715	**0.916**	0.406	0.215
MAP3: RWR	0.367	0.671	0.704	0.999	0.749	**0.880**	0.347	0.251
MAP4: CV	0.494	0.652	0.713	0.754	1.000	**0.877**	0.264	0.325
SCPERF1: FLEX	0.185	0.152	0.249	0.283	0.090	0.213	**0.697**	0.461
SCPERF2: INT	0.460	0.376	0.442	0.402	0.410	0.462	**0.850**	0.623
SCPERF3: SUP	0.390	0.311	0.387	0.300	0.221	0.345	**0.828**	0.547
SCPERF4: RESC	0.345	0.132	0.215	0.153	0.099	0.170	**0.837**	0.530
OPERF1	0.161	0.074	0.141	0.253	0.258	0.208	0.612	**0.846**
OPERF2	0.220	0.056	0.111	0.246	0.227	0.184	0.587	**0.856**
OPERF3	0.384	0.174	0.185	0.243	0.321	0.262	0.508	**0.817**
OPERF4	0.265	0.183	0.278	0.247	0.261	0.278	0.528	**0.789**
OPERF5	0.405	0.222	0.212	0.124	0.321	0.254	0.509	**0.779**
OPERF6	0.293	0.134	0.129	0.156	0.212	0.183	0.531	**0.826**
OPERF7	0.381	0.205	0.174	0.205	0.288	0.250	0.609	**0.861**

Overall, the measurement instruments exhibited sufficiently strong psychometric properties to support valid testing of the proposed structural model. The higher-order factor model exhibits adequate fit. It predicts conceptually related constructs adequately and as expected. It also exhibits equal (if not better) predictive validity. Therefore the higher-order measurement theory is supported (Chin, 1998a; Hair *et al*., 2010). The minimum conditions for identifications and good measurement practice present in both the first-order and higher-order layers (of the measurement theory) are satisfied.

6.7 Construct-Level Correlation Analysis

To check for the preliminary statistical validity of all the 18 hypotheses presented in Chapter 3, the Pearson correlation was employed. Each construct was represented by a composite score, computed by taking the average scores of all items in a specific construct. The results are presented in Table 6.28.

All except two correlations are statistically significant at either the 0.01 level (thirteen correlations) or the 0.05 level (three correlations). The correlations between CDFC and OPERF, and IPC and OPERF were found to be not significant. It can be concluded that there are high correlations between the constructs for most hypothesized relationships; the test for multivariate relationships between the constructs using PLS will be discussed in the next chapter.

Table 6.28: Construct-level correlation analysis results

	Hypothesis	Independent Variable	Dependent Variable	Pearson Correlation
1.	H1	SCMPs	MAPs	0.460***
2.	H1a	SCMPs	CDFC	0.341***
3.	H1b	SCMPs	IPC	0.408***
4.	H1c	SCMPs	RWR	0.386***
5.	H1d	SCMPs	CV	0.491***
6.	H2	SCMPs	SCPERF	0.420***
7.	H3	SCMPs	OPERF	0.352***
8.	H4	MAPs	SCPERF	0.365***
9.	H4a	CV	SCPERF	0.299***
10.	H4b	IPC	SCPERF	0.400***
11.	H4c	RWR	SCPERF	0.353***
12	H4d	CV	SCPERF	0.251**
13.	H5	MAPs	OPERF	0.282**
14.	H5a	CDFC	OPERF	0.201 (NS)
15.	H5b	IPC	OPERF	0.216 (NS)
16.	H5c	RWR	OPERF	0.255**
17.	H5d	CV	OPERF	0.323***
18.	H6	SCPERF	OPERF	0.670***

** *Correlation is significant at the 0.01 level (two-tailed)
* *Correlation is significant at the 0.05 level (two-tailed)
(NS) Not Significant

6.8 Conclusion

The chapter has presented the validation of the measurement model with the final measures and constructs to be used in subsequent analysis. In this chapter, a comprehensive, valid and reliable instruments for assessing SCMPs, MAPs, SCPERF and OPERF were developed. The instrument was tested using rigorous statistical tests including convergent validity and discriminant validity. Regarding the measurement model, the PLS analysis confirmed the reliability and validity analyses of the variables. These constructs will now be taken forward in the following chapter for further statistical testing in a series of Partial Least Squares modelling exercises to either support or reject the series of hypotheses outlined in Chapter 3. The chapter concludes with the bivariate correlations among one dependent and one independent construct.

Although the bivariate correlations were statistically significant for most pairs of the constructs considered for the hypotheses (16 out of 18 hypotheses), it is more important to explore the significance of these hypothesized relationships when all the relationships are put together in a multivariate complex model, due to the interactions among variables. Hence, the following chapter reports the detailed output statistics of the analyses of the path coefficients in the structural model and the significance of the standardized betas that resulted from the PLS analysis.

7 ASSESSMENT OF CONCEPTUAL MODELS

7.1 Introduction

Having confirmed the reliability and validity of the measurement model in the previous chapter (Chapter 6), the next stage in Partial Least Squares (PLS) modelling is to assess the structural model (Barclay *et al*., 1995; Hulland, 1999). In order to achieve this, PLS calculates the direct and indirect effects to establish the relative importance of antecedent constructs.

This chapter, which focuses on path analysis, presents a rigorous hypothesis testing performed through PLS analysis using PLS-Graph Version 3 (Chin, 2001). The structural model and hypotheses proposed in Chapter 3 were tested by examining the path coefficients (standardized betas) and their associated t-values in two conceptual models, namely, Conceptual Model 1 and Conceptual Model 2. The significance of each path in these conceptual models and the R-squares (R^2s) of the endogenous constructs are based on a bootstrapping procedure that used 500 samples with replacement (Bollen and Stine, 1992; Chin, 1998a). In addition to the individual path tests, the explained variance in the dependent constructs was assessed as an indication of the overall predictive strength of the model.

The structural model investigates the nature of the relationship between supply chain management constructs, management accounting constructs and organizational performance. The full structural models in both Conceptual Models 1 and 2 were cascaded down into several sub-models (or individual path analyses) emphasising different paths of the impact of supply chain management and management accounting on performance. If the model fitted the data adequately, the beta (β) coefficients and t-values were evaluated to test the significance of the hypotheses. Using one-tailed test, a t-value greater than 2.33 is significant at the level of 0.01; a t-value greater than 1.65 is significant at the level of 0.05; and a t-value greater than 1.28 is significant at the level of 0.10.

7.2 Conceptual Model 1

This section reports data analysis of the first conceptual model (Figure 7.1) incorporating four key latent variables consisting of 20 final observed variables. The four latent variables are Supply Chain Management Practices (SCMPs, with five final second-order observed variables), Management Accounting Practices (MAPs, with four second-order observed variables), Supply Chain Performance (SCPERF, with four second-order observed variables) and Organizational Performance (OPERF, with seven observed variables). The SCMPs consists of five dimensions of practices after postponement was removed for further analysis following validation of second-order factor.

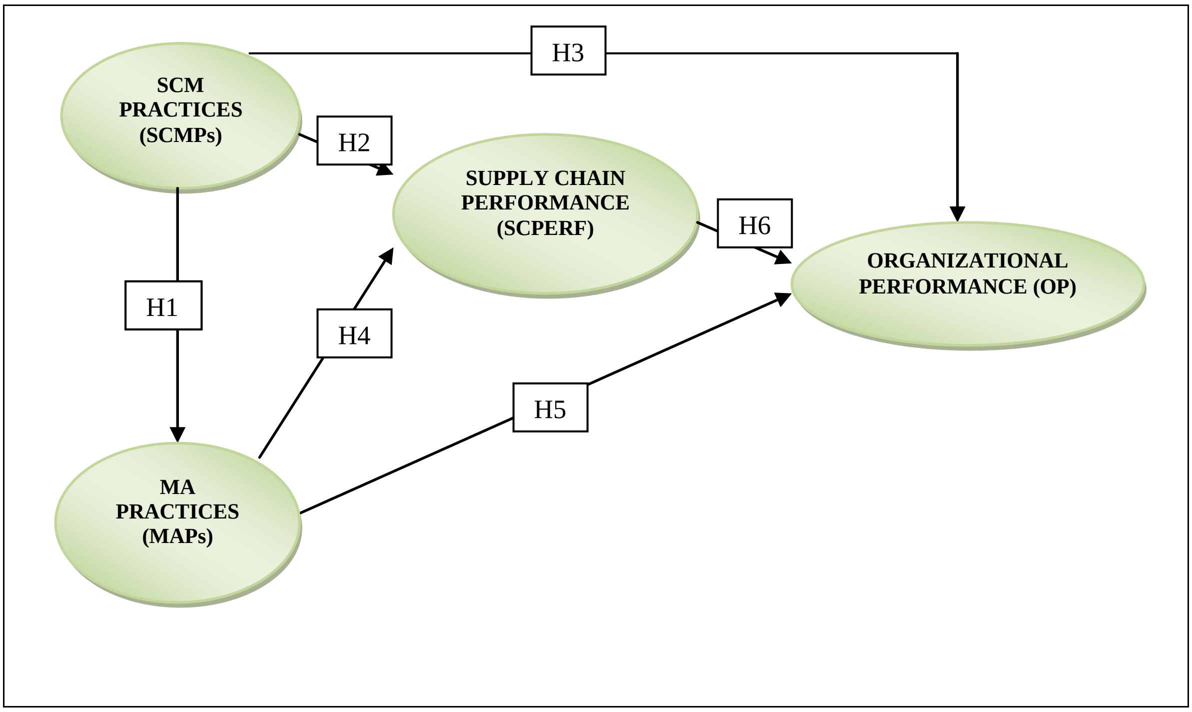


Figure 7.1: Conceptual Model 1

This model depicted in Figure 7.1 is a duplication of the conceptual framework presented in Figure 3.2 (Chapter 3). The model partly replicates a configuration proposed by Li *et al*. (2002; 2006) and Koh *et al.* (2007) containing the following constructs; SCMPs, SCPERF and OPERF. In addition it situates management accounting practices (MAPs) (composed of four sub-constructs) – within that pre-existing SCM configuration.

The Conceptual Model 1 postulates MAPs is related to SCM practices, which comprises five dimensions: Strategic Supplier Partnership (SSP), Customer Relationship (CR), Strategic Customer Relationship (SCR), Information Management (IM) and Internal Lean Practices (ILP). The proposed model conceptualized the five first-order SCMPs dimensions as reflective indicators of the second order SCMPs construct.

SCPERF is related to SCM practices and MAPs which is composed of four dimensions to reflect its different sophistication level: Cost Determination and Financial Control (CDFC), Information for Planning and Control (IPC), Reduction of Waste and Business Processes (RWR) and Value Creation (CV); and firm performance is related to SCM practice, MAPs and SCPERF. The summary of statistical testing necessary to validate the measurement items in Conceptual Model 1 is provided in Tables 7.1, 7.2 and 7.3 below.

Table 7.1: Item loading, composite reliability and average variance extracted[12]

Construct / Measures	Item loading	Standard error	*t*-Statistics
SCMPs: P_c = 0.812, AVE = 0.470			
SCMP1- SSP	0.707	0.061	11.463
SCMP2 – CR	0.756	0.059	12.683
SCMP3 – SCR	0.828	0.042	19.712
SCMP4 – IM	0.558	0.079	7.545
SCMP5 – ILP	0.526	0.145	3.352
MAPs: P_c = 0.939, AVE = 0.795			
MAP1 – CDFC	0.892	0.022	39.054
MAP2 – IPC	0.916	0.019	47.875
MAP3 – RWR	0.880	0.036	23.852
MAP4 – CV	0.877	0.033	26.199
SCPERF: P_c = 0.880, AVE = 0.649			
SCPERF1 – FLEX	0.700	0.108	6.272
SCPERF2 – INT	0.849	0.029	29.127
SCPERF3 – SUPP	0.828	0.031	26.398
SCPERF4 – RESC	0.838	0.042	19.666
OPERF: **P_c = 0.937, AVE = 0.681**			
OPERF1 – ROI	0.846	0.041	20.769
OPERF2 – PMS	0.856	0.038	22.631
OPERF3 – TCR	0.817	0.043	18.669
OPERF4 – MS	0.789	0.069	11.333
OPERF5 – PQ	0.779	0.062	12.384
OPERF6 – CP	0.826	0.041	19.918
OPERF7 – CS	0.861	0.035	24.396
CDFC: **P_c = 0.937, AVE = 0.681**			

12 These figures are from Tables 6.9, 6.14, 6.21 and 6.24 in the previous chapter.

P_c = Composite Reliability
AVE = Average Variance Extracted

Table 7.2: Discriminant validity: Correlations of latent variables[13]

	MAPs	SCMPs	SCPERF	OPERF
MAPs	**0.892**			
SCMPs	0.457	**0.686**		
SCPERF	0.373	0.437	**0.805**	
OPERF	0.279	0.364	0.673	**0.825**

Values on the diagonal represent the square root of each construct's AVE.

Table 7.3: Factor structure matrix of loadings and cross-loadings[14]

Measures	SCMPs	MAPs	SCPERF	OPERF
SSP	**0.707**	0.322	0.359	0.281
CR	**0.756**	0.340	0.257	0.178
SCR	**0.827**	0.393	0.386	0.386
IM	**0.600**	0.210	0.237	0.199
ILP	**0.541**	0.284	0.241	0.172
CDFC	0.345	**0.892**	0.311	0.205
IPC	0.424	**0.916**	0.406	0.215
RWR	0.367	**0.880**	0.347	0.251
CV	0.490	**0.877**	0.264	0.325
FLEX	0.185	0.213	**0.697**	0.461
INT	0.460	0.462	**0.850**	0.623
SUP	0.390	0.345	**0.828**	0.547
RESC	0.345	0.170	**0.837**	0.530
ROI	0.161	0.208	0.612	**0.846**
PMS	0.220	0.184	0.587	**0.856**
TCR	0.384	0.262	0.508	**0.817**
MS	0.265	0.278	0.528	**0.789**
PQ	0.405	0.254	0.509	**0.779**
CP	0.293	0.183	0.531	**0.826**
CS	0.381	0.250	0.609	**0.861**

The structural model was used in testing the hypothesised relationships between the theoretical constructs as depicted in Figure 7.1. A summary of the path coefficients (and their associated t-values) and the R^2 of the endogenous constructs is presented in Table

[13] These figures are part of the results in Table 6.26
[14] These figures are part of the results in Table 6.27

7.4 and Figure 7.2. Out of the six hypotheses in Conceptual Model 1, four were found to be significant.

Table 7.4: Conceptual Model 1 – Direct effects

	Support / Rejection of Conceptual Model Hypotheses						
Code	Constructs	Beta value	T-value	Std. Error	Sig.	Sig. level	Outcome
H1	SCMPs → MAPs	0.467	4.7790	0.0977	Yes	0.01	Supported
H2	SCMPs → SCPERF	0.349	3.3028	0.1057	Yes	0.01	Supported
H3	SCMPs → OPERF	0.084	1.0184	0.0825	No	-	Unsupported
H4	MAPs → SCPERF	0.224	1.9327	0.1159	Yes	0.05	Supported
H5	MAPs → OPERF	-0.005	0.0537	0.0931	No	-	Unsupported
H6	SCPERF → OPERF	0.642	7.7004	0.0834	Yes	0.01	Supported

Note:
Sig. – Statistical significance
Sig.level – Level of statistical significance (one-tailed)[15]

Hypothesis 1 predicted a positive relationship between SCMPs and MAPs. The structural path coefficient between the SCMPs construct and the MAPs construct is positive and statistically significant at a p-value <0.01 (β = 0.467; t = 4.7790). The SCMPs construct also yielded a statistically significant beta path co-efficient with the SCPERF construct (Hypothesis 2). The results indicate a positive direct relationship between the two constructs at a p-value < 0.01 (β = 0.349, t = 3.3028).

The possibility of indirect relationship between the SCMPs construct and the SCPERF construct through the MAPs construct was explored and the results found that SCMPs have statistically significant indirect effects on SCPERF through MAPs at a p-value < 0.05 (β = 0.1046, t = 1.7918). Table 7.5 shows both direct and indirect effects.

[15] In practice, one should use a one-tailed test when one has good reason to expect that the difference will be in a particular direction. A two-tailed test is however more conservative, i.e., it is more rigorous than a one-tailed test because a two-tailed test takes a more extreme test statistic to reject a null hypothesis.

Table 7.5: Conceptual Model 1 – Direct and Indirect effects

Panel A: Path coefficient, t-statistics and R^2				
Latent variable	Path to			R^2
	MAPs	**SCPERF**	**OPERF**	
SCMPs	H1: 0.467 (4.7790)***	H2: 0.349 (3.3028)***	H3: 0.084 (1.0184)	
MAPs	-	H4: 0.224 (1.9327)**	H5: -0.005 (0.0537)	0.218
SCPERF	-	-	H6: 0.642 (7.7004)***	0.245
OPERF	-	-	-	0.465

Panel B: Indirect effects and t-statistics (Sobel's Test)			
Latent variable	Linkages	Path to	
		SCPERF	**OPERF**
SCMPs	**SCPERF**		0.2241 (3.0344) ***
SCMPs	**MAPs**	0.1046 (1.7918)**	
MAPs	**SCPERF**		0.1438 (1.8745)**

Note:

Panel A shows the direct relationship between constructs in the theoretical model while Panel B shows indirect path relationships.

Sobel's test is used in testing the statistical significance of indirect relationship between an independent construct and a dependent construct through a mediator (Preacher and Leonardelli, 2001). The test generates t-statistics and p-values for the indirect path.

***p<0.01 (one-tailed)

**p<0.05 (one-tailed)

*p<0.1 (one-tailed)

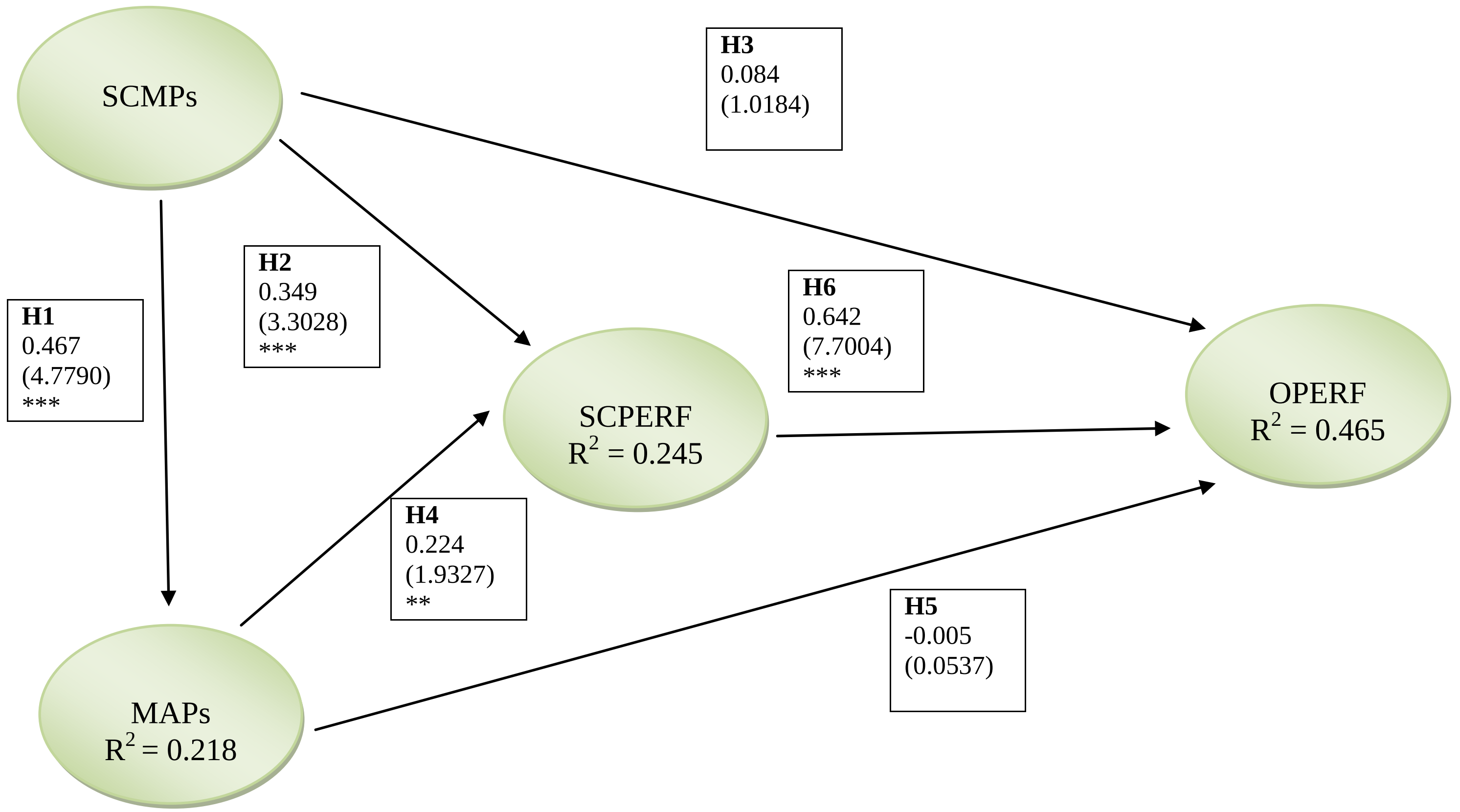
SCMPs was also hypothesised (Hypothesis 3) to be directly positively related to OPERF. Although the beta path co-efficient between the SCMPs construct and the OPERF construct is positive in this instance, it is not statistically significant ($\beta = 0.084$, $t = 1.0184$). Whether SCMPs will have an indirect effect on OPERF through SCPERF was also examined and the results indicate a statistically significant indirect effect ($\beta = 0.2241$, $t = 3.0344$) at a p-value < 0.01 (See Panel B in Table 7.5).

Hypothesis 4 predicted a positive direct relationship between MAPs and SCPERF and this was supported. The beta path coefficient linking the MAPs construct to the SCPERF construct is positive and statistically significant at a p-value < 0.05 ($\beta = 0.224$, $t = 1.9327$). However, the construct yielded a negative relationship with OPERF construct (Hypothesis 5) ($\beta = -0.005$, $t = 0.0537$). Though this suggests that there is no direct association between MAPs and OPERF, the researcher explored the possibility of an indirect relationship and found that the MAPs construct has a statistically significant indirect effect on the OPERF construct via the SCPERF construct ($\beta = 0.1438$, $t = 1.8745$) at a p-value < 0.05 (see Panel B in Table 7.5).

In Hypothesis 6, SCPERF was predicted to be positively related to OPERF. The structural model provides statistically significant results that confirm this hypothesis.
The beta path co-efficient linking the SCPERF construct to the OPERF construct is positive and statistically significant at a p-value <0.01 ($\beta = 0.642$, $t = 7.7004$).

As the primary objective of any PLS modelling exercise is the minimisation of error (Hulland, 1999), the extent to which this has been achieved can be gauged by reference to the respective R^2 values for each of the dependent (endogenous) constructs tested within a model. In terms of Conceptual Model 1, the following R^2 values were generated: MAPS (21.8%), SCPERF (24.5%) and OPERF (46.5%) (see Table 7.5 and Figure 7.2). These figures help to explain the explanatory power of the model by outlining the amount of variance that each endogenous (dependent) construct explains, similar to the role played by R^2 values within a multivariate analysis. For example, the R^2 value for the MAPs construct is 21.8% indicating that this model explains over 21% of the variance in this particular construct. Along with the other R^2 values, it can be deduced that a substantial amount of variance is explained in Conceptual Model 1.

These indices provide evidence for the existence of the relationships rather than standard statistical tests (Falk and Miller, 1992) and the individual R^2 are greater than the recommended 0.10 (Falk and Miller, 1992) for all of the predicted variables. As all of these R^2 are larger than the recommended levels, it is appropriate to examine the significance level of the paths associated with these variables.



Note: Top number is path, t-values in brackets, *** significant at p-value < 0.01, ** significant at p-value < 0.05

Figure 7.2: Conceptual Model 1 – Results

From the results in Conceptual Model 1, it is possible to determine whether the hypotheses outlined earlier have been either supported or rejected. As outlined in Table 7.4, four out of the six hypotheses have been supported, the practical implications of which are discussed in Chapter 9.

Based upon the results displayed in Table 7.4 and Table 7.5, and due to Hypothesis 3 and Hypothesis 5 being rejected, it was decided to conduct additional statistical testing to determine the reverse impact of SCMPs on MAPs and the relationships between the SCMPs construct and the MAPs construct on the OPERF construct if the SCPERF construct, as mediator, is removed. This would enable us to examine individually the impact of MAPs and SCMPs on OPERF.

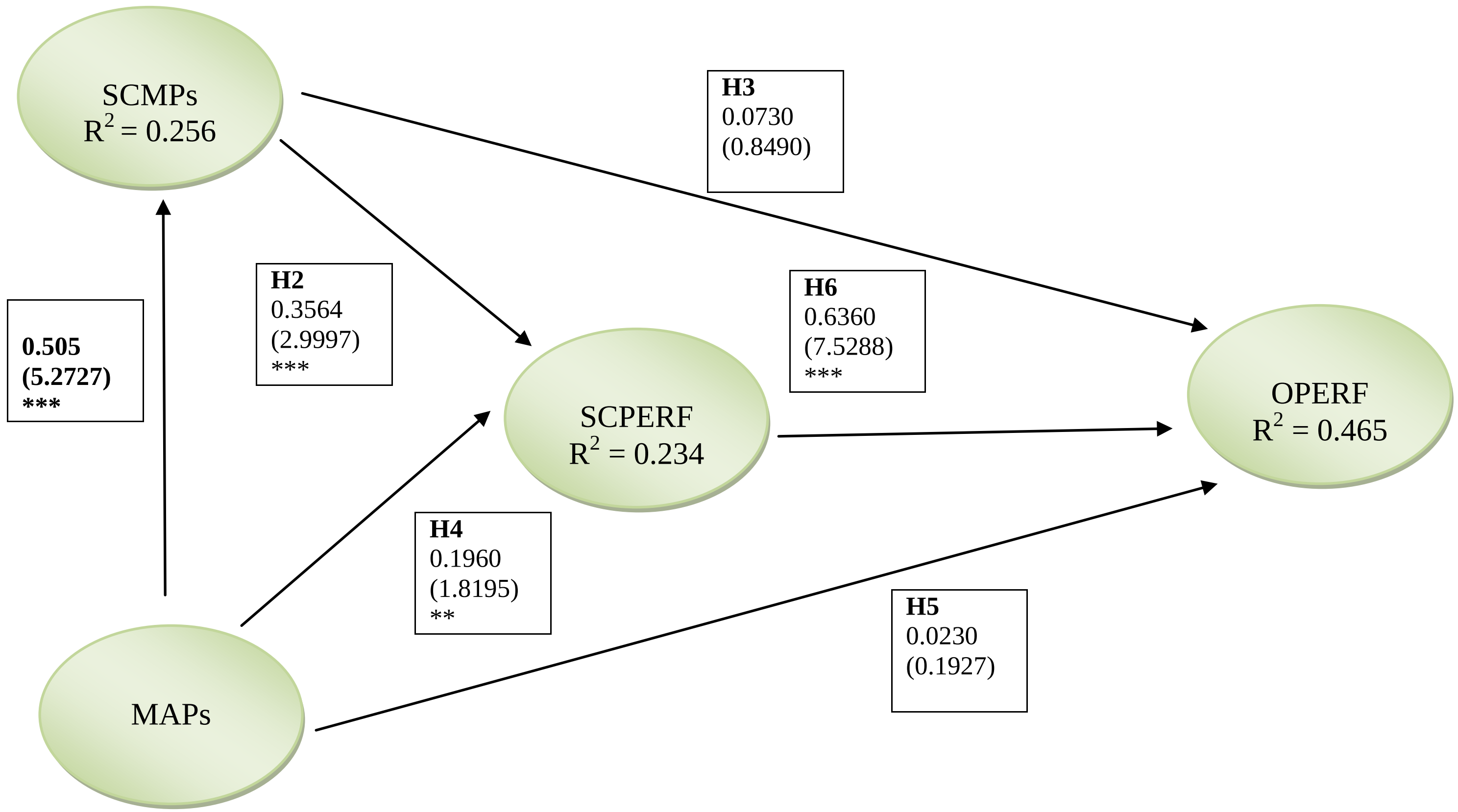
7.2.1 Conceptual Model 1 – Sub-test I

One of the main objectives of Conceptual Model 1 is to examine the impact of SCMPs on MAPs. Within this setting, it was also decided to test the path leading from the MAPs construct to the SCMPs construct to test whether a positive relationship could be established. Therefore, the aim of Conceptual Model 1 sub-test I is to examine whether MAPs is influencing SCMPs.

Interestingly, the results shown in Figure 7.3 suggest that the beta path co-efficient from the MAPs construct to the SCMPs construct is positive and statistically significant at a p-value < 0.01 ($\beta = 0.505$, $t = 5.2727$). The importance of this result is that SCMPs are not only predicted to have a direct positive relationship to MAPs but vice versa, MAPs directly influence SCMPs, which was not originally hypothesised in this study.

The beta coefficient between the SCMPs construct and the OPERF construct (H3) is again not significant (β = 0.0730, t = 0.8490). The beta path coefficient between the MAPs construct and the OPERF construct (H5), although positive, is not significant (β = 0.0230, t = 0.1927). Conversely, in Conceptual Model I, this same path was negative (β = -0.005, t = 0.0537). Consistent with the earlier results in Conceptual Model 1, both Hypothesis 3 and Hypothesis 5 are again rejected here.

All of the remaining hypotheses (H2, H4 and H6) in Conceptual Model 1 – sub-test I are supported, whilst the R^2 values, SCMPs (25.6%), SCPERF (23.4%) and OPERF (46.5%), indicate a significant amount of variance is explained in the model. The explained variance in the SCPERF construct and the OPERF construct are very similar to those attained in the earlier test (Conceptual Model 1).



Note: Top number is path, t-values in brackets, *** significant at p-value < 0.01, ** significant at p-value < 0.05

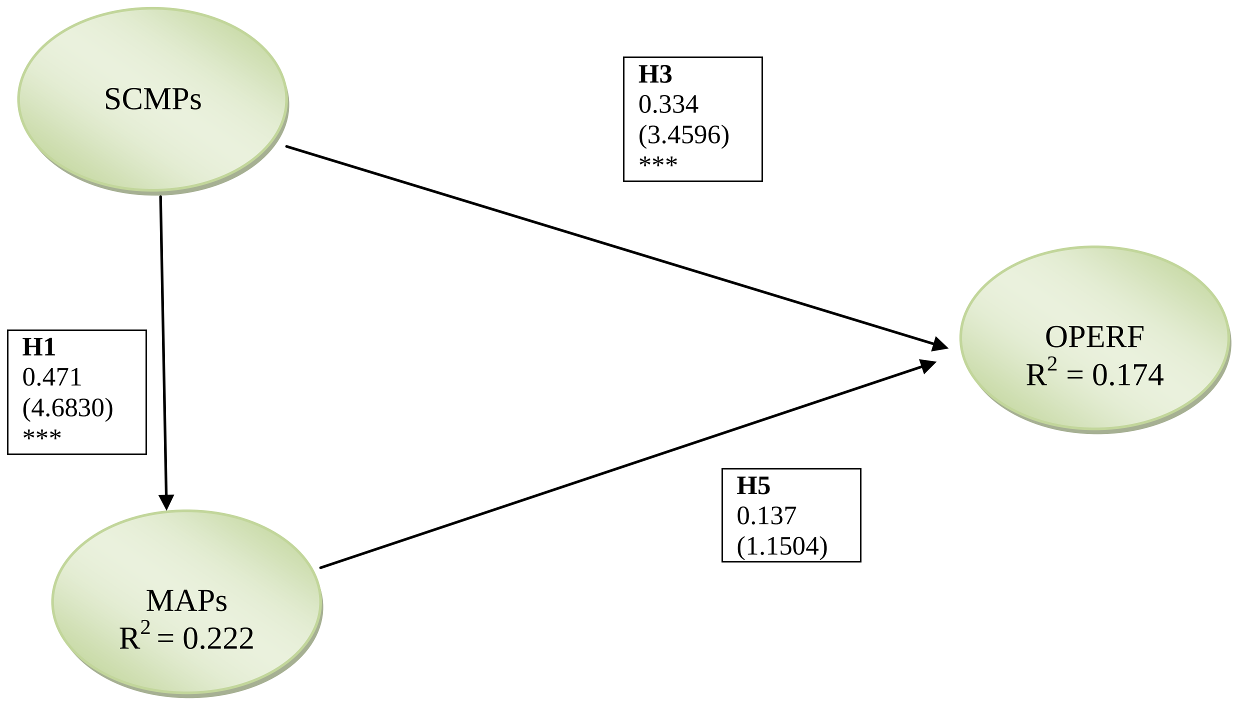
Figure 7.3: Conceptual Model 1 – Sub-test I

7.2.2 Conceptual Model 1 – Sub-test II

The significance of the SCPERF construct was observed in Conceptual Model 1. Furthermore, both MAPs and SCMPs were seen as not directly positively influencing overall firm performance, although indirectly related to performance via SCPERF and MAPs. Thus, the objective of sub-test II is to examine the impact when the SCPERF construct was removed from the model.

As regards SCMPs, the results indicate (see Figure 7.4) that the beta path co-efficient between the SCMPs construct and the OPERF construct is positive and statistically significant at a p-value < 0.01 ($\beta = 0.334$, $t = 3.4596$), thus providing partial support to Hypothesis 3. The importance of this result is that it lends some support to the view that SCM practices can impact positively on firm performance.

The relationship between the MAPs construct and the OPERF construct (Hypothesis 5) is positive ($\beta = 0.137$, $t = 1.1504$) but not statistically significant. Conversely, in Conceptual Model I, this same path was negative ($\beta = -0.005$, $t = 0.0537$). Hypothesis 5 is therefore again rejected. The remaining hypothesis (the relationship between the SCMPs construct and the MAPs construct - Hypothesis 1) in Conceptual Model 1 – sub-test I is supported ($\beta = 0.471$, $t = 4.6830$). In terms of the R^2 values, the results generated MAPs (22.2%) and OPERF (17.4%).



Note: Top number is path, t-values in brackets, *** significant at p-value < 0.01

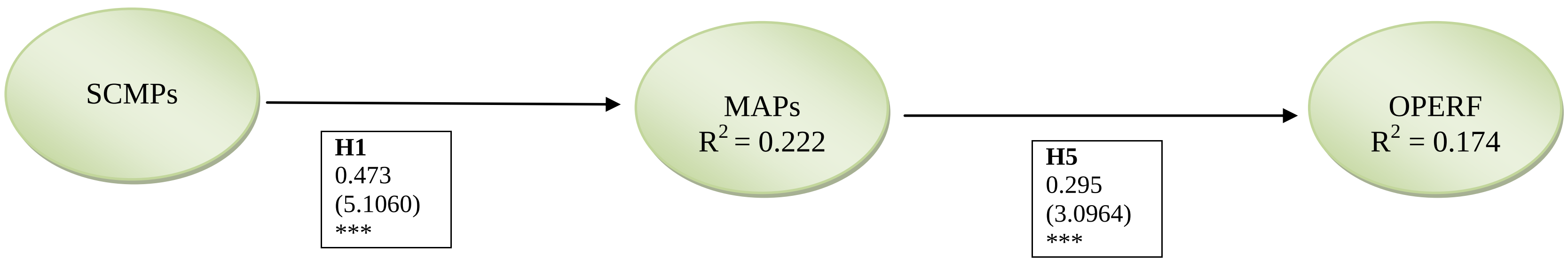
Figure 7.4: Conceptual Model 1 – Sub-test II

7.2.3 Conceptual Model 1 – Sub-test III

Based on the results in Conceptual Model 1 – sub-test II, the purpose of Conceptual Model 1 – Subtest III is to examine the individual impact of SCMPs on MAPs and subsequently MAPs on firm performance. The link between the SCMPs construct and the OPERF construct in Conceptual Model 1 sub-test I was then dropped.

As regards the MAPs construct, the results shown in Figure 7.5 suggest that the beta-path co-efficient between the MAPs construct and the OPERF construct (Hypothesis 5) is positive and statistically significant at a p-value < 0.01 ($\beta = 0.295$, $t = 3.0964$). This outcome contrasts with that achieved in Conceptual Model 1 ($\beta = -0.005$, $t = 0.0537$), Conceptual Model 1 – sub-test I ($\beta = 0.0230$, $t = 0.1927$) and in Conceptual Model 1 sub-test II ($\beta = 0.137$, $t = 1.1504$) in which the respective beta path coefficients were all statistically insignificant.

Consistent with the earlier results, Hypothesis 1, the impact of SCMPs on MAPs, is supported ($\beta = 0.473$, $t = 5.1060$). The R^2 values are again, as expected, very similar to those obtained in the earlier test.



Note: Top number is path, t-values in brackets, *** significant at p-value < 0.01

Figure 7.5: Conceptual Model 1 - Subtest III

7.2.4 Summary of Conceptual Model 1

The objective of conceptual model 1 is two-fold; first to examine the relationships between SCMPs, MAPs and performance in a contingency theory setting and secondly to position management accounting in an SCM framework and examine the impact of SCMPs on MAPs, SCPERF and OPERF and the impact of MAPs on SCPERF and OPERF.

The findings from Conceptual Model 1 strongly support four hypotheses: H1 (SCMPs and MAPs), H2 (SCMPs and SCPERF), H4 (MAPs and SCPERF) and H6 (SCPERF and OPERF) whilst two hypotheses H3 (SCMPs and OPERF) and H5 (MAPs and OPERF) are rejected. Among the four significant relationships, the two highest standardized coefficients are 0.642 (SCPERF to OPERF), and 0.467 (SCMPs to MAPs). These two paths represent the strongest links in the proposed model. On the other hand, the lowest two coefficients are 0.349 (SCMPs to SCPERF) and 0.224 (MAPs to SCPERF). This indicates even though the impact of SCMPs is strong on SCPERF and MAPs, the strengths of these impacts on performance are relatively weak.

The results from Conceptual Model 1 (see Figure 7.2) and Conceptual Model 1 sub-test I (see Figure 7.3) illustrate the positive support for the hypothesis linking all constructs to and from the SCPERF construct, which is especially welcome, indicating it as an important mediator in the research model. The result from sub-test II shows that the relationship between SCMPs and OPERF became insignificant when SCPERF was added to the model.

The SCMPs construct to the OPERF construct (H3) and the MAPs construct to the OPERF construct (H5) were not statistically significant. These outcomes suggest that firm performance is usually influenced by many factors and it is hard to see whether any one factor will dominantly determine the overall performance of an organization.

It can be concluded that the greater the emphasis on SCMPs will lead to greater emphasis on MAPs, which will in turn lead to improved supply chain performance. Improved supply chain performance will indeed enhance an organization's performance. However, increase in SCMPs does not directly influence the overall firm performance. Therefore an indirect effect using Sobel's Test was explored. Interestingly, both SCMPs and MAPs indirectly positively influence OPERF via the SCPERF construct. Based on the indirect effect test and additional tests, qualified or partial support is offered to H3 (SCMPs and OPERF) (refer Conceptual Model 1 sub-test II) and H5 (MAPs and OPERF) (refer Conceptual Model 1 sub-test III).

Whereas the findings on SCMPs and MAPs on OPERF are mixed (refer to the sub-tests), they do lend support to the suggestion that SCMPs and MAPs are partly associated with overall firm performance. In light of these results, the next section explores in greater detail the impact of SCMPs on each dimension of the MAPs construct and these dimensions on SCPERF and OPERF.

7.3 Conceptual Model 2

The centre of attention in Conceptual Model 2 is each dimension of MAPs; that is, the different stages of management accounting evolution to represent management accounting sophistication levels. For the purpose of examining the impact of different sophistication levels on performance, Conceptual Model 2 comprises Conceptual Model 2A and Conceptual Model 2B. In both models, the same constructs as those tested in Conceptual Model 1 are included. Additionally, the MAPs construct is separated into four distinct constructs following the IFAC (1998) framework: Cost Determination and Financial Control (CDFC), Information for Management Planning and Control (IPC), Reduction of Waste of Resources in Business Processes (RWR) and Creation of Value through Effective Resource Use (CV). Similar to Conceptual Model 1, direct effects are tested and indirect effects are also explored. Conceptual Model 2A explores the relationship between each dimension of MAPs and the SCPERF construct, while in Conceptual Model 2B, the impact of these different levels of MAPs on OPERF is examined.

The summary of statistical testing necessary to validate the measurement items in both Conceptual Model 2A and 2B is provided in Tables 7.6, 7.7 and 7.8 below. As noted in Chapter 6, these sub-constructs passed all relevant measurement model tests of validity and reliability.

Table 7.6: Item loading, composite reliability and average variance extracted

Construct / Measures	Item loading	Std error	*t*-Statistics
SCMPs: P_c = 0.812, AVE = 0.470			
SCMP1- SSP	0.707	0.065	10.825
SCMP2 – CR	0.756	0.059	13.293
SCMP3 – SCR	0.828	0.050	16.489
SCMP4 – IM	0.558	0.086	6.957
SCMP5 – ILP	0.526	0.166	2.919
CDFC: P_c = 0.794, AVE = 0.492			
CDFC2	0.781	0.066	11.713
CDFC3	0.684	0.110	6.196
CDFC4	0.719	0.104	6.891
CDFC5	0.611	0.136	4.485
IPC: P_c = 0.894, AVE = 0.513			
IPC4	0.730	0.068	10.609
IPC5	0.723	0.053	13.573
IPC6	0.750	0.069	10.814
IPC7	0.674	0.060	11.106
IPC8	0.746	0.059	12.584
IPC9	0.682	0.068	10.036
IPC10	0.672	0.074	9.036
IPC12	0.745	0.061	12.038
RWR: P_c = 0.875, AVE = 0.539			
RWR1	0.719	0.099	7.232
RWR2	0.738	0.067	10.988
RWR3	0.733	0.072	10.084
RWR4	0.759	0.048	15.541
RWR6	0.701	0.090	7.731
RWR7	0.752	0.057	13.053
CV: **P_c = 0.933, AVE = 0.637**			
CV1	0.742	0.064	11.526
CV10	0.788	0.050	15.642
CV11	0.849	0.025	33.967
CV12	0.777	0.042	18.491
CV13	0.747	0.078	9.494
CV14	0.810	0.056	14.308
CV15	0.877	0.024	35.465
CV16	0.787	0.048	16.110
SCPERF: P_c = 0.880, AVE = 0.649			
SCPERF1 – FLEX	0.700	0.100	6.952
SCPERF2 – INT	0.849	0.031	27.445
SCPERF3 – SUPP	0.828	0.033	25.058
SCPERF4 – RESC	0.838	0.039	20.993
OPERF: **P_c = 0.937, AVE = 0.681**			
OPERF1 – ROI	0.846	0.032	25.831
OPERF2 – PMS	0.856	0.034	24.970
OPERF3 – TCR	0.817	0.045	18.123
OPERF4 – MS	0.789	0.063	12.427
OPERF5 – PQ	0.779	0.060	12.786
OPERF6 – CP	0.826	0.039	20.833
OPERF7 – CS	0.861	0.042	20.347

P_c = Composite reliability
AVE = Average Variance Extracted

Table 7.7: Correlations of latent variables

	SCMPs	CDFC	IPC	RWR	CV	SCPERF	OPERF
SCMPs	**0.686**						
CDFC	0.335	**0.701**					
IPC	0.419	0.844	**0.716**				
RWR	0.367	0.673	0.705	**0.734**			
CV	0.494	0.651	0.712	0.729	**0.798**		
SCPERF	0.437	0.306	0.405	0.352	0.261	**0.805**	
OPERF	0.364	0.180	0.211	0.256	0.326	0.673	**0.825**

Table 7.8: Measurement items loadings and cross-loading

	SCMPs	CDFC	IPC	RWR	CV	SCPERF	OPERF
SSP	**0.707**	0.254	0.290	0.223	0.375	0.359	0.281
CR	**0.756**	0.276	0.361	0.205	0.361	0.257	0.178
SCR	**0.827**	0.274	0.381	0.292	0.437	0.386	0.386
IM	**0.558**	0.120	0.158	0.276	0.201	0.237	0.199
ILP	**0.526**	0.204	0.199	0.295	0.292	0.241	0.172
CDFC2	0.283	**0.781**	0.660	0.535	0.509	0.163	0.069
CDFC3	0.223	**0.684**	0.599	0.564	0.527	0.232	0.190
CDFC4	0.153	**0.719**	0.614	0.305	0.335	0.237	-0.002
CDFC5	0.287	**0.611**	0.484	0.493	0.461	0.238	0.280
IPC4	0.265	0.769	**0.730**	0.588	0.519	0.281	0.151
IPC5	0.276	0.623	**0.723**	0.646	0.587	0.259	0.207
IPC6	0.352	0.561	**0.750**	0.539	0.584	0.338	0.248
IPC7	0.393	0.456	**0.674**	0.465	0.424	0.374	0.232
IPC8	0.328	0.592	**0.746**	0.443	0.463	0.327	0.130
IPC9	0.108	0.573	**0.682**	0.358	0.322	0.199	-0.072
IPC10	0.324	0.683	**0.672**	0.554	0.580	0.246	0.149
IPC12	0.350	0.580	**0.745**	0.443	0.587	0.292	0.155
RWR1	0.258	0.438	0.445	**0.719**	0.514	0.180	0.168
RWR2	0.298	0.428	0.542	**0.738**	0.661	0.302	0.225
RWR3	0.278	0.525	0.552	**0.733**	0.466	0.123	-0.009
RWR4	0.276	0.472	0.507	**0.759**	0.569	0.316	0.249
RWR6	0.218	0.454	0.440	**0.701**	0.587	0.332	0.263
RWR7	0.286	0.643	0.612	**0.752**	0.505	0.298	0.230
CV1	0.353	0.480	0.610	0.674	**0.742**	0.311	0.293
CV10	0.397	0.627	0.584	0.560	**0.788**	0.274	0.288
CV11	0.376	0.539	0.641	0.610	**0.849**	0.212	0.316
CV12	0.401	0.419	0.461	0.438	**0.777**	-0.013	0.161
CV13	0.367	0.467	0.472	0.629	**0.747**	0.182	0.166
CV14	0.281	0.466	0.529	0.634	**0.810**	0.173	0.222
CV15	0.504	0.580	0.634	0.659	**0.877**	0.317	0.357
CV16	0.472	0.570	0.606	0.584	**0.787**	0.200	0.262
FLEX	0.185	0.152	0.249	0.283	0.090	**0.697**	0.461
INT	0.460	0.376	0.442	0.402	0.410	**0.850**	0.623
SUP	0.390	0.311	0.387	0.300	0.221	**0.828**	0.547
RESC	0.345	0.132	0.215	0.153	0.099	**0.837**	0.530
OPERF1	0.161	0.074	0.141	0.253	0.258	0.612	**0.846**
OPERF2	0.220	0.056	0.111	0.246	0.227	0.587	**0.856**
OPERF3	0.384	0.174	0.185	0.243	0.321	0.508	**0.817**
OPERF4	0.265	0.183	0.278	0.247	0.261	0.528	**0.789**
OPERF5	0.405	0.222	0.212	0.124	0.321	0.509	**0.779**
OPERF6	0.293	0.134	0.129	0.156	0.212	0.531	**0.826**
OPERF7	0.381	0.205	0.174	0.205	0.288	0.609	**0.861**

7.3.1 Conceptual Model 2A

The information provided by management accounting is often cited as essential for the effectiveness of the supply chain given the importance of non financial measures in the context of supply chain. Thus, alongside those already tested in Conceptual Model 1, in Conceptual Model 2A, the influence of each dimension of MAPs on SCPERF (represented by paths 4a to 4d) is examined. The Conceptual Model 2A is as shown in Figure 7.6, repeated (for convenience) from Chapter 3 (refer to Figure 3.3).

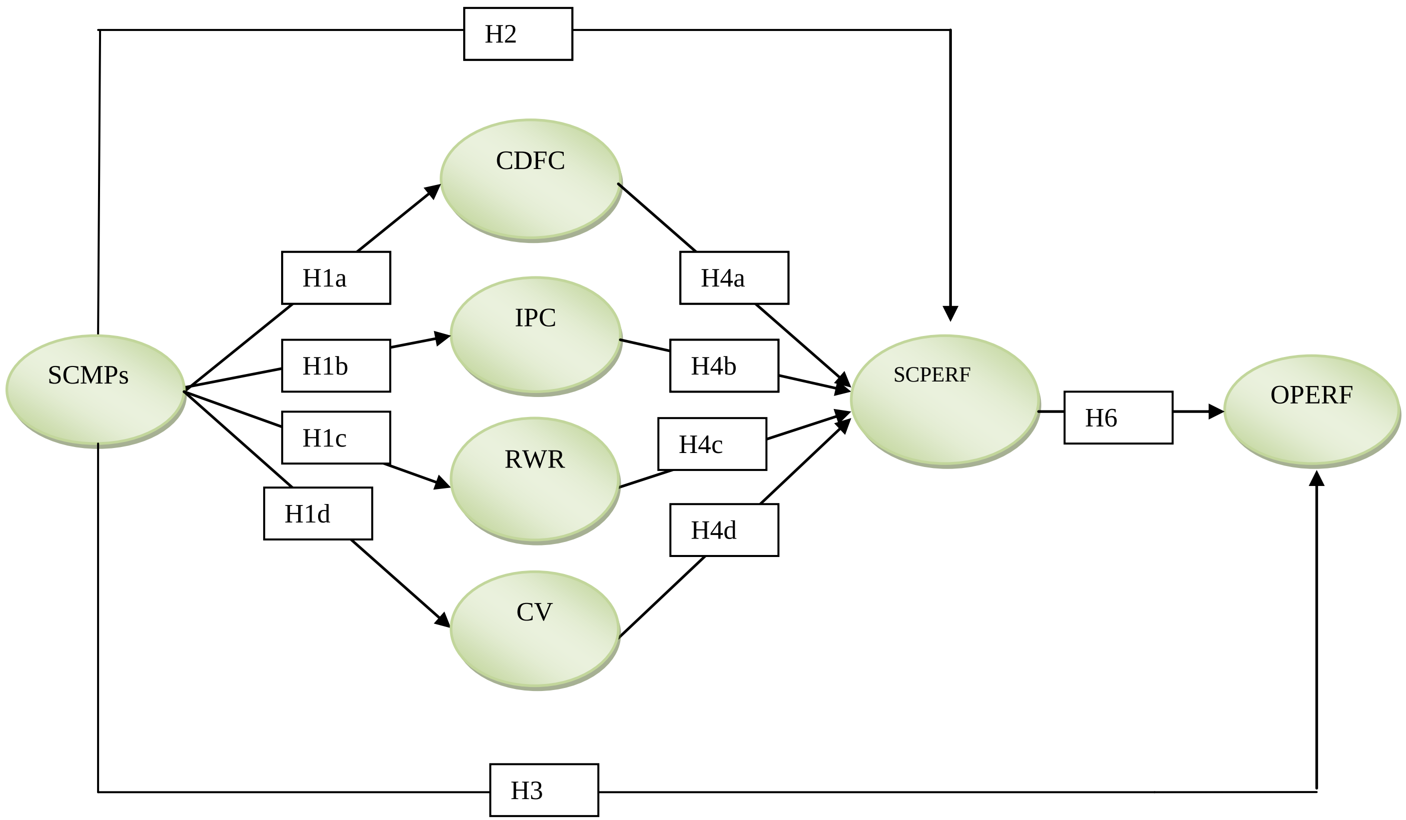


Figure 7.6: Conceptual Model 2A

As the results in Figure 7.7 show, the relationship between the SCMPs construct and the CDFC construct (Hypothesis 1a) was found to be significant at a p-value < 0.01, indicating that SCMPs has direct, positive influence on CDFC ($\beta = 0.351$, $t = 3.6125$). The path from the SCMPs construct to the IPC construct (Hypothesis 1b) was also found to be significant at a p-value < 0.01. The beta path coefficient shows a positive direct relationship ($\beta = 0.442$, $t = 4.7514$).

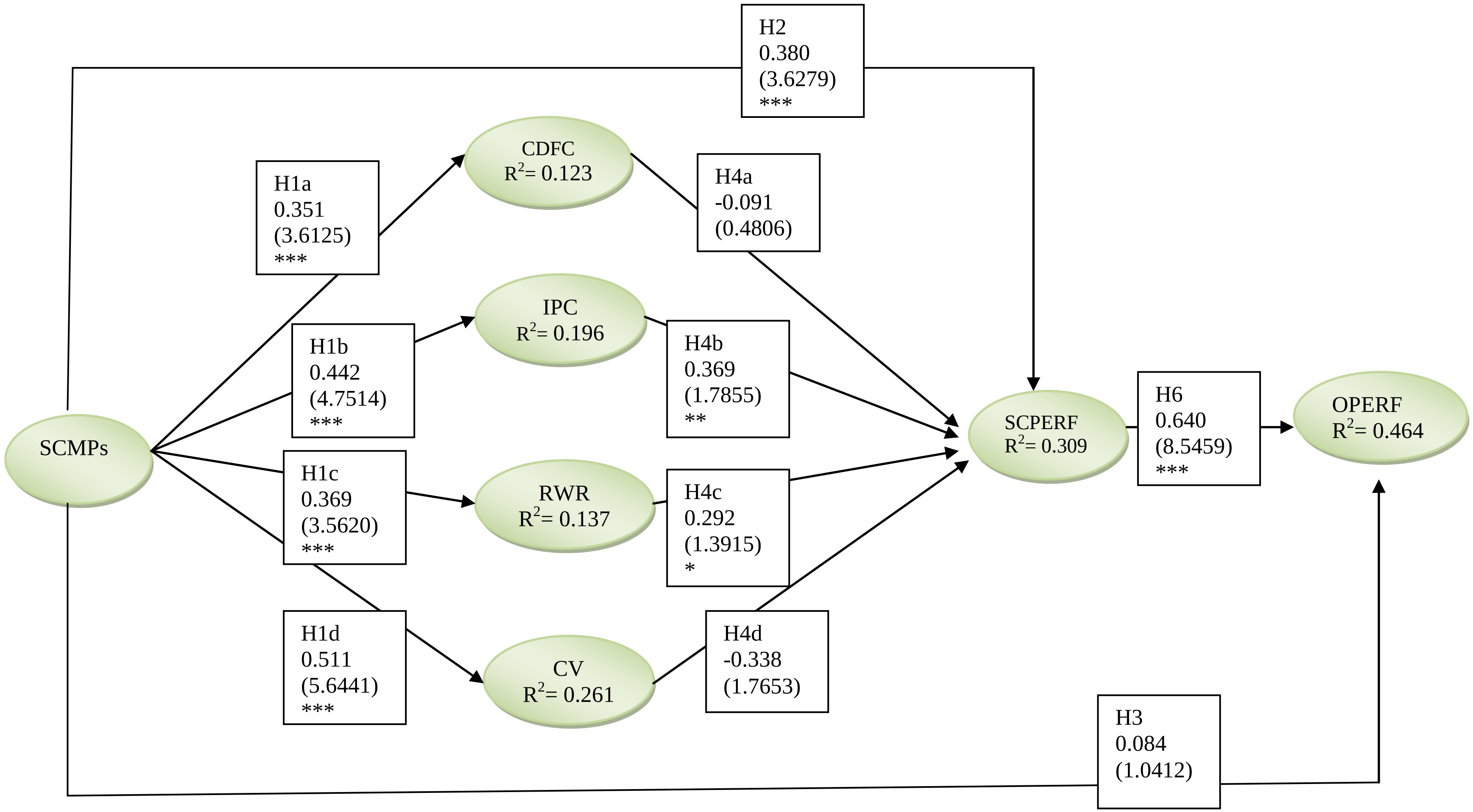
Hypothesis 1c predicted a positive direct relationship between SCMPs and RWR and this was also supported. The beta path coefficient linking the SCMPs construct to the RWR construct is positive and statistically significant at a p-value < 0.01($\beta = 0.369$, $t = 3.5620$). SCMPS was also hypothesised to be directly positively related to CV (Hypothesis 1d). Interestingly, the strongest beta path coefficient (significant at a p-value < 0.01) was found on the relationship between SCMPs and CV ($\beta = 0.511$, $t = 5.6441$). The above findings (significant relationships in H1a – H1d) give evidence of further and full support of a direct and positive relationship between the SCMPs construct and the MAPs construct (Hypothesis 1) in Conceptual Model 1.

Concerning the paths between stages of MAPs evolution and the SCPERF construct, the beta path coefficient linking these constructs (CDFC and CV) are not statistically significant. Both of the beta path coefficients connecting the CDFC construct and the CV construct to the SCPERF construct (Path 4a and Path 4d respectively) are negative and not statistically significant ($\beta = -0.091$, $t = 0.4806$ and $\beta = -0.338$, $t = 1.7653$). The results of this exercise, which are displayed in Figure 7.7, provide statistical support at a p-value < 0.05 for path 4b, connecting the IPC construct to the SCPERF construct ($\beta =$

0.369, t = 1.7855) and at p-value< 0.1 for path 4c, linking the RWR construct to the SCPERF construct (β = 0.292, t = 1.3915).

As with Conceptual Model 1, the beta path coefficient between the SCMPs construct and the SCPERF construct (Hypothesis 2) is both positive and statistically significant (β = 0.380, t = 3.6279) at a p-value < 0.01 while the path connecting the SCMPs construct with the OPERF construct (Hypothesis 3) is positive but not statistically significant (β = 0.084, t = 1.0412). Additionally, the beta path coefficient between the SCPERF construct and the OPERF construct (Hypothesis 6) is positive and statistically significant at a p-value < 0.01 (β = 0.640, t = 8.5459).

The Conceptual Framework Model 2A produces acceptable R^2 values: CDFC (12.3%), IPC (19.6%), RWR (13.7%), CV (26.1%), SCPERF (30.9%) and OPERF (46.4%). The levels of variance explained in regard to Value Creation, SC Performance and overall Firm Performance are encouraging and lend some credence to the distinctions made in this Conceptual Model. From the R^2 values, it can be deduced that a substantial amount of variance is explained in Conceptual Model 2A.



Note: Top number is path, t-values in brackets, *** significant at p-value < 0.01, ** significant at p-value < 0.05, * significant at p-value < 0.1

Figure 7.7: Conceptual Model 2A - Results

Based upon these results displayed in Figure 7.7, it is possible to determine whether the various hypotheses have been either supported or rejected. As outlined in Table 7.9, seven out of the eleven proposed hypotheses are supported. The implications arising from these results will be discussed in Chapter Nine.

Table 7.9: Conceptual Model 2A

	Support / Rejection of Conceptual Model 2B Hypotheses						
Code	Constructs	Beta value	T-value	Std. Error	Sig.	Sig. level	Outcome
H1a	SCMPs → CDFC	0.351	3.6125	0.0972	Yes	0.01	Supported
H1b	SCMPs → IPC	0.442	4.7514	0.0930	Yes	0.01	Supported
H1c	SCMPs → RWR	0.369	3.5620	0.1036	Yes	0.01	Supported
H1d	SCMPs → CV	0.511	5.6441	0.0905	Yes	0.01	Supported
H2	SCMPs → SCPERF	0.380	3.6279	0.1047	Yes	0.01	Supported
H3	SCMPs → OPERF	0.084	1.0412	1.0313	No	-	Unsupported
H4a	CDFC → SCPERF	-0.091	0.4806	0.1893	No	-	Unsupported
H4b	IPC → SCPERF	0.369	1.7855	0.2067	Yes	0.05	Supported
H4c	RWR → SCPERF	0.292	1.3915	0.2098	No	0.1	Supported
H4d	CV → SCPERF	-0.338	1.7653	0.1915	No	-	Unsupported
H6	SCPERF → OPERF	0.640	8.5459	0.0749	Yes	0.01	Supported

Note:
Sig. – Statistical Significance.
Sig.level – Level of Statistical Significance (one-tailed)

A closer look at indirect effects is necessitated. Consistent with the previous models, the results indicate that the SCMPs construct has a positive indirect effect to the OPERF construct via the SCPERF construct ($\beta = 0.243$, $t = 3.3406$) (See Panel B Table 7.10). Interestingly, via the IPC construct and the RWR construct, the SCMPs construct has positive indirect effect on the SCPERF construct ($\beta = 0.163$, $t = 1.6712$ and $\beta = 0.108$, $t = 1.2963$); significant at p-value < 0.05 and p-value < 0.1 respectively.

Table 7.10: Conceptual Model 2A: Direct and indirect effects

Panel A: Path coefficients, t-statistics and R^2							
Latent variable	Path to						
	CDFC	**IPC**	**RWR**	**CV**	**SCPERF**	**OPERF**	**R^2**
SCMPs	H1a: 0.351 (3.6125)***	H1b: 0.442 (4.7514)***	H1c: 0.369 (3.5620)***	H1d: 0.511 (5.6441)***	H2: 0.380 (3.6279)***	H3: 0.084 (1.0313)	
CDFC					4a: -0.091 (0.4806)		0.123
IPC					4b: 0.369 (1.7855)**		0.196
RWR					4c: 0.292 (1.3915)*		0.137
CV					4d: -0.338 (1.7653)		0.261
SCPERF						H6: 0.640 (8.5459)***	0.309
OPERF							0.464

Panel B: Indirect effects and t-statistics (Sobel's Test)			
Latent variable	Linkages	Path to	
		SCPERF	**OPERF**
SCMPs	**IPC**	0.163 (1.6712)**	
SCMPCs	**RWR**	0.108 (1.2963)*	
SCMPs	**SCPERF**		0.243 (3.3406)***

Note:

Panel A shows the direct relationship between constructs in the theoretical model while Panel B shows indirect path relationships.

Sobel's test is used in testing the statistical significance of indirect relationship between an independent construct and a dependent construct through a mediator (Preacher and Leonardelli, 2001). The test generates t-statistics and p-values for the indirect path.

***p<0.01 (one-tailed)

**p<0.05 (one-tailed)

*p<0.1 (one-tailed)

7.3.2 Conceptual Model 2B

In Conceptual Model 1, the structural path coefficient between the SCMPs construct and the MAPs construct (Hypothesis 1) was statistically significant and in the hypothesised direction; whilst in Hypothesis 5, the relationship between the MAPs construct and the OPERF construct was found to be non-significant. In a continuing effort to explore the impact of different sophistication levels of MAPs on OPERF, Conceptual Model 2B examines the relationships of each dimension of the MAPs construct to the OPERF construct via Hypothesis 5a to Hypothesis 5d. The model depicted in Figure 7.8 is repeated (for the sake of convenience) from the conceptual framework presented in Figure 3.4 (Chapter 3). In Conceptual Model 2B, each dimension of MAPs is hypothesized to be positively related to firm performance. With the exception of Hypothesis 5d, the paths linking each dimension of MAPs to the OPERF construct are statistically not significant.

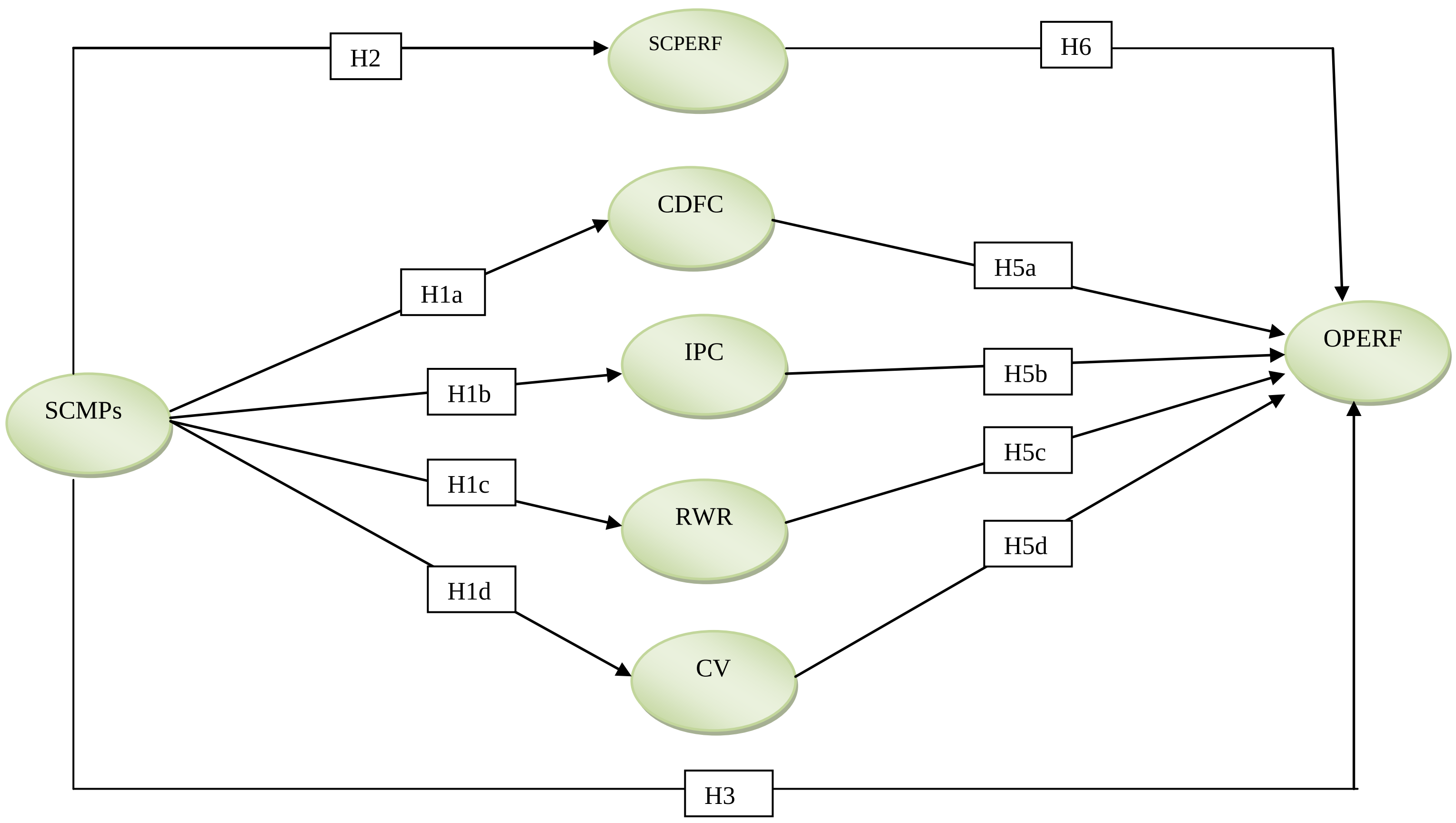


Figure 7.8: Conceptual Model 2B

As Figure 7.9 illustrates, the beta path coefficients originating from the SCMPs construct to each dimension of MAPs (Hypothesis 1a to Hypothesis 1d) are positive and statistically significant at a p-value < 0.01 as follows: CDFC ($\beta = 0.363$, $t = 3.7874$), IPC ($\beta = 0.453$, $t = 5.0465$), RWR ($\beta = 0.369$, $t = 3.4408$) and CV ($\beta = 0.511$, $t = 5.6919$). As in Conceptual Model 2A, the path from the SCMPs construct to the CV construct (H1d) gives the strongest beta path coefficient.

The beta path coefficient from the CDFC construct to the OPERF construct (Hypothesis 5a) is positive but not statistically significant ($\beta = 0.098$, $t = 0.7794$). Both the path coefficients from the IPC construct to the OPERF construct and the RWR construct to the OPERF construct are negative and not statistically significant; ($\beta = -0.354$, $t = 2.7246$) and ($\beta = -0.132$, $t = 1.0178$) respectively. Hypotheses 5a, 5b and 5c are therefore unsupported. Only the path from the CV construct to the OPERF construct (Hypothesis 5d) is positive ($\beta = 0.420$, $t = 2.9968$) and statistically significant at a p – value < 0.01. Therefore a partial support for Hypothesis 5 is offered based upon this result.

The remaining findings on other hypotheses are also in line with those of Conceptual Model 1. The path linking the MAPs construct and the OPERF construct was not significant. As Figure 7.9 illustrates, the path from the SCMPs construct to SCPERF (Hypothesis 2) construct is positive and significant ($\beta = 0.451$, $t = 5.1156$). This re-affirms the results found in Conceptual Model 1 and Conceptual Model 1 sub-test I.

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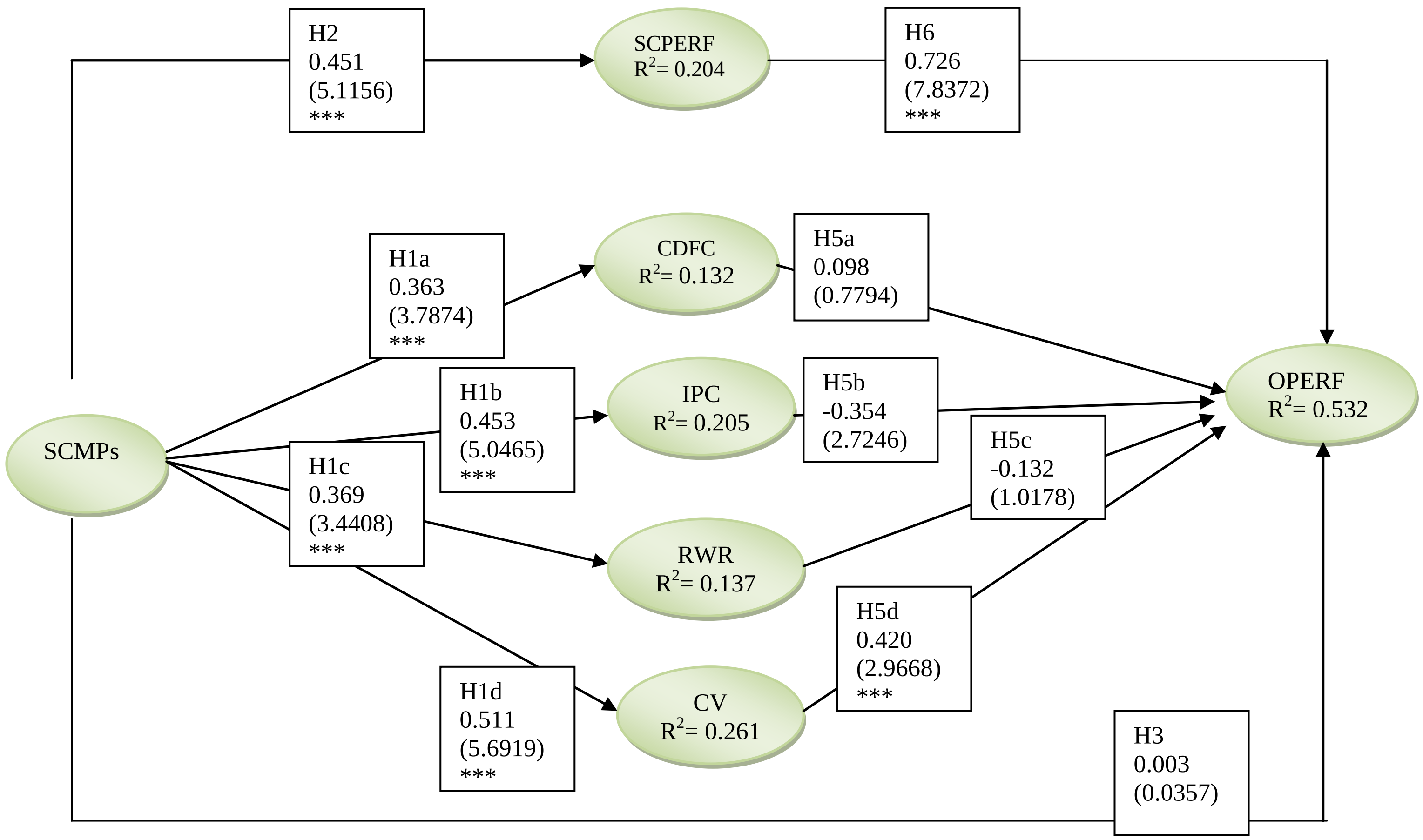

Note: Top number is path, t-values in brackets, *** significant at p-value < 0.01, ** significant at p-value < 0.05, * significant at p-value < 0.1

Figure 7.9: Conceptual Model 2B - Results

The path from the SCMPs construct to the OPERF construct (Hypothesis 3) is positive but not significant ($\beta = 0.003$, $t = 0.0357$). Therefore, Hypothesis 3 is again rejected here. A closer look at the hypotheses with indirect effects is needed. Table 7.12 shows both direct and indirect effects for Conceptual Model 2B. The possibility of indirect relationships between the SCMPs construct and the OPERF construct via the CV construct was explored. The beta coefficient for this indirect relationship is positive and statistically significant at a p-value < 0.01 ($\beta = 0.2146$, $t = 2.6302$). These results imply that the CV construct is an important mediator linking indirectly between the SCMPs construct and the OPERF construct. The path coefficient connecting the SCPERF construct to the OPERF construct (Hypothesis 6) provides a strong positive beta path coefficient ($\beta = 0.726$, $t = 7.8372$). It shows a strong direct positive relationship between the SCPERF and the OPERF.

The possibility of an indirect relationship between the SCMPs construct and the OPERF construct via the SCPERF construct was again explored and the results found that SCMPs have statistically significant indirect effects on OPERF through SCPERF at a p-value < 0.01 ($\beta = 0.3274$, $t = 3.3406$), see Table 7.12. The result further supports the findings for indirect effects via the SCPERF construct.

To summarise, the results for Hypothesis 2, Hypothesis 3 and Hypothesis 6 in Conceptual Model 2 are consistent with the findings for the identical paths in Conceptual Model 1. Tables 7.11 and 7.12 summarise the detailed output statistics of the analyses of the path coefficients in the structural model and report on the significance of the standardized β_s that resulted from this analysis (direct and indirect effects), based on a bootstrapping procedure that used 500 samples with replacement.

Table 7.4 also reports the R^2 statistics for the dependent (and mediating) variables. In terms of Conceptual Model 2, the following R^2 were generated; CDFC (13.2%), IPC (20.5%), RWR (13.7%), CV (26.1%), SCPERF (20.4%) and OPERF (53.2). These R^2 values provide re-assurance as to the credibility and predictive explanatory power of the endogenous constructs.

Table 7.11: Conceptual Model 2B – Direct effects

Support / Rejection of Conceptual Model 2A Hypotheses							
Code	Constructs	Beta value	T-value	Std. Error	Sig.	Sig. level	Outcome
H1a	SCMPs → CDFC	0.363	3.7874	0.0958	Yes	0.01	Supported
H1b	SCMPs → IPC	0.453	5.0465	0.0898	Yes	0.01	Supported
H1c	SCMPs → RWR	0.369	3.4408	0.1072	Yes	0.01	Supported
H1d	SCMPs → CV	0.511	5.6919	0.0898	Yes	0.01	Supported
H2	SCMPs → SCPERF	0.451	5.1156	0.0882	Yes	0.01	Supported
H3	SCMPs → OPERF	0.003	0.0357	0.0841	No	-	Unsupported
H5a	CDFC → OPERF	0.098	0.7794	0.1257	No	-	Unsupported
H5b	IPC → OPERF	-0.354	2.7246	0.1299	No	-	Unsupported
H5c	RWR → OPERF	-0.132	1.0178	0.1297	No	-	Unsupported
H5d	CV → OPERF	0.420	2.9668	0.1416	Yes	0.01	Supported
H6	SCPERF → OPERF	0.726	7.8372	0.0926	Yes	0.01	Supported

Note:
Sig. – Statistical significance
Sig. level – Level of statistical significance (one-tailed)

Table 7.12: Conceptual Model 2B: Direct and indirect effects

Panel A: Path coefficients, t-statistics and R^2							
Latent variable	Path to						
	CDFC	**IPC**	**RWR**	**CV**	**SCPERF**	**OPERF**	**R^2**
SCMPs	H1a: 0.363 (3.7874)***	H1b: 0.453 (5.0465)***	H1c: 0.369 (3.4408)***	H1d: 0.511 (5.6919)***	H2: 0.451 (5.1156)***	H3: 0.003 (0.0357)	
CDFC						H5a: 0.098 (0.7794)	0.132
IPC						H5b: -0.354 (2.7246)	0.205
RWR						H5c: -0.132 (1.0178)	0.137
CV						H5d: 0.420 (2.9668)***	0.261
SCPERF						H6: 0.726 (7.8372)***	0.204
OPERF							0.532

Panel B: Indirect effects and t-statistics (Sobel's Test)		
Latent variable	Linkages	Path to
		OPERF
SCMPs	CV	0.2146 (2.6302)***
SCMPs	SCPERF	0.3274 (3.3406)***

Note:

Panel A shows the direct relationship between constructs in the theoretical model while Panel B shows indirect path relationships.

Sobel's test is used in testing the statistical significance of indirect relationship between an independent construct and a dependent construct through a mediator (Preacher and Leonardelli, 2001). The test generates t-statistics and p-values for the indirect path.

***p<0.01 (one-tailed)

**p<0.05 (one-tailed)

*p<0.1 (one-tailed)

7.3.3 Summary of Conceptual Model 2

The aim of Conceptual Model 2 was to examine the impact of SCM practices on the different level of management accounting sophistication. The impact of the different level of MAPs sophistication on supply chain performance and overall firm performance was also examined. In total, six hypotheses are supported by the results of both Conceptual Models, all of which are positive and statistically significant at a p-value < 0.01 – the SCMPs construct and the CDFC construct (H1a), the SCMPs construct and the IPC construct (H1b), the SCMPs construct and the RWR construct (H1c), the SCMPs construct and the CV construct (H1d), the SCMPs construct and the SCPERF construct (H2) and the SCPERF construct and the OPERF construct (H6).

The positive and statistically significant beta path coefficients at a p-value < 0.01 in relation to H1a to H1d indicate further and full support for Hypothesis 1 in Conceptual Model 1. Furthermore, the results of H2 and H6 reconfirm the findings in Conceptual Model 1.

The findings of Hypothesis 4b (the IPC construct to the SCPERF construct), Hypothesis 4c (the RWR construct to the SCPERF construct) and Hypothesis 5d (the CV construct to the OPERF construct) are interesting. The results reveal that the beta path coefficients linking these relationships are positive and statistically significant. Due to the mixed nature of the findings, partial support is offered to Hypothesis 4 and Hypothesis 5.

The results from the indirect effects show that three constructs, namely the SCPERF construct, the CV construct and the IPC construct, are important mediators to the overall firm performance and the supply chain performance respectively. Additionally, the R^2

values applicable to the endogenous constructs in both Conceptual Model 2A and 2B are consistent with those from Conceptual Model 1. In summary, the findings on the SCM configuration are encouraging, while those concerning management accounting are mixed. Table 7.13 and Table 7.14 summarises the results from all conceptual models.

Table 7.13: Summary of hypothesis testing / additional testing

Conceptual Model 1	Additional testing	Conceptual model 2A	Conceptual Model 2B
H1: SCMPs to MAPs (***)	MAPs to SCMPs (***) – not hypothesised (CM1 sub-test I) H1: SCMPs to MAPs (***) (CM1 sub-test II and sub-test III)	H1a: SCMPs to CDFC (***) H1b: SCMPs to IPC (***) H1c: SCMPs to RWR (***) H1d: SCMPs to CV (***)	H1a: SCMPs to CDFC (***) H1b: SCMPs to IPC (***) H1c: SCMPs to RWR (***) H1d: SCMPs to CV (***)
H2: SCMPs to SCPERF (***)	H2: SCMPs to SCPERF (***) (CM1 sub-test I)	H2: SCMPs to SCPERF (***)	H2: SCMPs to SCPERF (***)
H3: SCMPs to OPERF (NS)	H3: SCMPs to OPERF (CM1 sub-test I) (NS) H3: SCMPs to OPERF (***) (CM1 sub-test II)	H3: SCMPs to OPERF (NS)	H3: SCMPs to OPERF (NS)
H4: MAPs to SCPERF (**)	H4: MAPs to SCPERF (**) (CM1 sub-test I)	H4a: CDFC to SCPERF (NS) H4b: IPC to SCPERF (**) H4c: RWR to SCPERF (*) H4d: CV to SCPERF (NS)	
H5: MAPs to OPERF (NS)	H5: MAPs to OPERF (CM1 sub-test I) (NS) H5: MAPs to OPERF (CM1 sub-test II) (NS) H5: MAPs to OPERF (***) (CM1 sub-test III)		H5a: CDFC to OPERF (NS) H5b: IPC to OPERF (NS) H5c: RWR to OPERF (NS) H5d: CV to OPERF (***)
H6: SCPERF to OPERF (***)	H6: SCPERF to OPERF (***) (CM1 sub-test I)	H6: SCPERF to OPERF (***)	H6: SCPERF to OPERF (***)

Note: *** significant at p-value < 0.01, ** significant at p-value < 0.05, * significant at p-value < 0.1
(NS) = Non-significant

Table 7.14: Summary of hypothesis testing results

Hypotheses	Results	Supported by
H1: SCMPs to MAPs	Fully supported	CM 1, CM1 sub-test II and sub-test III
H1a: SCMPs to CDFC	Fully supported	CM 2A, CM 2B
H1b: SCMPs to IPC	Fully supported	CM 2A, CM 2B
H1c: SCMPs to RWR	Fully supported	CM 2A, CM 2B
H1d: SCMPs to CV	Fully supported	CM 2A, CM 2B
H2: SCMPs to SCPERF	Fully supported	CM 1, CM 1 sub-test I, CM 2A, CM 2B
H3: SCMPs to OPERF	Partially supported (Weak)	CM 1 sub-test II
H4: MAPs to SCPERF	Supported	CM 1, CM 1 sub-test I
H4a: CDFC to SCPERF	Unsupported	
H4b: IPC to SCPERF	Supported	CM 2A
H4c: RWR to SCPERF	Supported	CM 2A
H4d: CV to SCPERF	Unsupported	
H5: MAPs to OPERF	Partially supported (Weak)	CM 1 sub-test III
H5a: CDFC to OPERF	Unsupported	
H5b: IPC to OPERF	Unsupported	
H5c: RWR to OPERF	Unsupported	
H5d: CV to OPERF	Supported	CM 2B
H6: SCPERF to OPERF	Fully supported	CM 1, CM 1 sub-test I, CM 2A, CM 2B
New path: MAPs to SCMPs	Supported	CM 1 sub-test I

Note: *CM = Conceptual Model

7.4 Conclusion

This chapter has outlined a series of statistical findings on the various hypotheses proposed earlier. The results from Conceptual Model 1 suggest a positive relationship between SCMPs and MAPs. Additionally, strong support was generally found for the SCMPs related constructs (the SCMPs construct to the SCPERF construct). Particularly pleasing was the positive support for the hypothesis connecting the MAPs construct to the SCPERF construct. The results from Conceptual Model 2 suggest that the SCMPs construct can have a positive effect upon each dimension of MAPs, whereas the CV construct can potentially impact upon a firm’s overall performance. In Conceptual

Model 2 sub-test I, the results support the hypothesis connecting the IPC construct to the SCPERF construct. As per Conceptual Model 1, support for the relationship between the SCPERF construct and the OPERF construct was also found in Conceptual Model 2. The results shown in subtest I to sub-test III in Conceptual Model 1 imply that without the interaction of other constructs, supply chain management practices and management accounting practices contribute directly to overall firm performance.

Having assessed the results of the structural model element of the research study, the next chapter presents and discusses the interview analysis as a means of triangulating the research study.

8 INTERVIEW ANALYSIS

8.1 Introduction

The central aim of this research is to investigate the impact of companies' supply chain management practices on management accounting and firm performance. To supplement the questionnaire survey, a series of research interviews was used to gather the experiences and views of selected companies. This chapter describes and analyses qualitative data gathered from the research interviews reflecting experiences and views of the respondents within the SCM process.

The aim of this chapter is to explore in greater depth the SCM practices and MAPs within firms in order to triangulate the findings in the earlier chapters. The chapter analyses similarities and differences between the firms in terms of the practice of supply chain management (SCMPs), management accounting practices (MAPs), their relationships and the impact of SCM on MAPs and firm performance. The interviews dealt with 'why' and 'how' questions (Yin, 2009). The interview questions examine whether, and in what way, managers perceive the level of SCM practices influence management accounting practices, specifically the sophistication level of management accounting. They also investigate whether such firms achieve relatively higher performance within their sector. Comparisons across organizational context are sought.

A total of six companies agreed to have their senior managers (both accounting and non accounting executives) interviewed. The sample firms included food, automotive, electronics, sugar refinery, shipping and communications. These are some of the participating companies in the survey questionnaire that were willing to take part in further interviews when asked in the survey questionnaire. The names of the companies are not revealed because the information provided is kept confidential. Senior managers interviewed include management accountants, finance director, management information system manager, procurement manager and finance risk management manager. The interviews were conducted during the months of July and August 2009. Apart from the interviews, evidence was also obtained from secondary data, such as company announcements made through their websites and bulletins, brochures or company's annual and internal reports.

To render greater reliability to the analysis, the interview transcripts were transcribed in full. The interview transcripts were then sent to interviewees (respondents) for validity and confirmation. The interviews were also conducted in English language; therefore no translation was necessary. The interviews broadly confirm the survey findings and provide valuable insights that could not be achieved through a mail survey.

8.2 Profile of companies

8.2.1 Company A (Food-based)

Company A is a food-based multinational manufacturer and distributor of food-based products. The company manufactures a wide range of food products including coffee and beverages, milk, infant nutrition, cereal, ice cream and confectionary. The first factory in Malaysia was set up in the early 1960s. Since then, the company now manufactures its products in 7 factories and operates from its head office and 6 sales offices nationwide. Today, the company employs 5,000 people and manufactures as well as markets more than 300 products in Malaysia. Worldwide, the company has grown to become the world's largest food company marketing more than 8,000 brands and 30,000 products. Company A has more than 500 factories spread over 80 countries, and employs close to 250,000 people. The company won The National Award for Management Accounting (NAFMA) in 2005. This award recognises best practices in management accounting by companies in Malaysia that lead to value creation and excellent business performance.

The interview in this company was conducted with the management accountant, who has vast experience in management accounting area as well as the company's relationship with external parties. She has been involved in the corporate level as the management accountant for more than 10 years as well as being involved in operational issues as a business controller.

8.2.2 Company B (Automotive)

The company was incorporated in 1983 to manufacture, assemble and sell motor vehicles and related products, including accessories, spare parts and other components. The company's cars are making their mark internationally as competitive and innovative automobiles. They are now being exported to 50 countries including the highly competitive United Kingdom and continental European markets.

In this company, the interview was conducted with two senior executive officers; one with 22 years of experience in sales, manufacturing, business process and accounting and finance. The session was also assisted by a financial manager who is charged with internal matters like operations and budgeting.

8.2.3 Company C (Electronics)

The company is a well established supplier of security and convenience products to some of the world's major retail and wholesale companies. The company was established in 1989 and has since grown to be a leading global supplier of motion sensors, security lighting and door entry. The majority of the customers are either involved in retail Do-It-Yourself (DIY) distribution, predominantly within the UK, European, Japanese and North American markets or they are major international electrical distribution groups supplying a broad and diverse branded product offering to both the DIY and professional trade markets.

The company offers a choice of design, manufacture or supply relationships. Customers presenting a business opportunity are offered the option of working with the company's design team to create new products on their behalf (Original Design Manufacturer (ODM)); contracting the company to manufacture their existing products on their behalf (Original Equipment Manufacturer (OEM)); or simply purchasing from the existing range of the group's products (the group's distributors). ODM is where the company designs and manufactures, the customer markets the products under their own brand. OEM on the other hand is where the customer designs, the company manufactures, and the customer markets the products under their own brand. The final option for customers is simply becoming the distributor of the company's own brand products. Its manufacturing activity is located in Malaysia and the People's Republic of China and its trading activity is located in the United Kingdom, Japan and Taiwan.

The person interviewed was the senior manager from the Finance Department, whose function is overseeing the day to day operation of accounting and finance role in the manufacturing of the Malaysian branch.

8.2.4 Company D (Sugar refinery)

The company manufactures a wide range of high quality sucrose based products that comprise refined sugar grades as well as liquid products for export, domestic and industrial purposes. The company commenced business in 1965 with an initial raw melting capacity of 150 metric tonnes a day. Today, after decades of expansion and modernisation, the refinery achieves a melting capacity of 1,500 metric tonnes a day.

The company is the first company in the Malaysian sugar industry to be awarded both the MS ISO 9002:1987 Quality Management System Certification and MS ISO 14001 Certification for Environment Management System (SIRIM QAS). As it is their vision to be the leading producer of refined sugars in Malaysia, the company is thereby committed to its quality policy in assuring satisfaction to all their customers. The interview was conducted with a senior manager, who is involved in the management information system, and a finance manager.

8.2.5 Company E (Shipping)

This company, which was incorporated in 1968, is the leading international shipping line of Malaysia. The principal business of the Corporation consists of ship-owning, ship management and other related logistics and maritime transportation services. Its main shareholder is the national oil conglomerate of Malaysia (a government linked company) of which the company is expected to benefit and further strengthen business synergies and economies of scale from related operations of its business.

Due to its massive size, the company is organized into four business segments: energy-related shipping engaged in the provision of liquefied natural gas (LNG) services, petroleum tanker services, operation and maintenance of offshore floating facilities and other shipping which offers chemical tanker services and dry bulk carrier services. The company is also involved in non-shipping activities like shipbuilding, repairing and heavy engineering works, fleet management services, marine education and training.

Through the provision of reliable, efficient and competitive services, the company has indeed become a truly international player. Its modern, well-diversified and relatively young fleet of more than 100 vessels with a combined tonnage of more than 8 million deadweight tonnes and land-based facilities managed by experienced personnel enable Company E to meet the various demands of its customers. With a strong affiliation with its parent company, Company E is fast becoming the world's leading maritime transportation and logistics provider focused on energy transportation. The company is now world renowned as the largest single owner/operator of LNG tankers. The interview was conducted with a risk management manager.

8.2.6 Company F (Communication)

Company F is Malaysia's number one provider of information communication technologies. Incorporated in 1984, the company is Malaysia's leading integrated information and communications group, and offers a comprehensive range of communication services and solutions in broadband, data and fixed-line. It was formed in1986 as a result of privatization efforts of the Malaysian government. It is a public listed company, with more than 24,000 employees throughout Malaysia.

As a market leader in the broadband and fixed-line businesses, the company is driven to deliver value to its stakeholders in a highly competitive environment. With its extensive global connectivity, the company is poised to position Malaysia as a regional Internet hub and digital gateway for South-East Asia. In line with this, the company is evolving into a Next Generation Network service provider, enabling the group to enhance its efficiency and productivity while providing enriched products and services. With the new product like video conferencing, the company claims itself to have a very high end technology. Other large companies are now beginning to use video conferencing when conducting meetings throughout the nation to keep travelling costs of staff at a minimum. As a government linked company, the company's objective is to deliver value for stakeholders by generating shareholder value and supporting Malaysia's growth and development. The interview was conducted with the company's senior procurement manager.

8.3 Supply chain management in companies

The importance of SCM could be relatively understood by how it is defined and how supply chains are managed within and outside the companies. The objective of the questions under this section is to generally understand how companies perceive the importance of SCM.

8.3.1 Companies' importance and definitions of SCM

Formal, well defined, ensuring supply to customers

Being a multi-national company, Company A has a well defined and formal SCM. In this company, SCM is described as:

> *"We define SCM as the interdependent process; it has processes and activities associated with ensuring supply of our products to customers at the right quantity, right quality and the right condition, at the right time and at the right cost."* – **Company A**

Supply chain in Company A is constantly on the move to deliver the company's key objective of ensuring supply from end to end. The company feels that a consumer products company remains profitable only if it has the right product at the right price in the right place at the right time. Emphasising the importance of the supply chain, the company is committed to ensure supply of products and delivery of these products to customers in full on time. The supply chain is, therefore, customer centric; it is about customer service, and ultimately, about doing good business. One cutting edge capability that the supply chain can offer is speed, i.e., ensuring that the company's products are made available on shelves in shortest possible time. However, this will occur when 'the entire supply chain works as one', which refers to interdependent processes and activities. SCM, as commented by the senior manager, is crucial since it provides an integrated process and operations support across the supply chain of all the businesses.

To emphasise the importance of SCM, the senior manager commented,

> *"Even though we spent millions and billions, to innovate and renovate our products but in the end if we don't invest in ensuring the supply, it defeats the purpose because ultimately those quality, value adding products need to go to the right customers."* **- Company A**

End to end, fully integrated but more informal definition

The concept of SCM as an end to end process is also increasingly widespread, not only involving purchasing of raw materials and transporting finished products but integrated with other functions within the organizations. The SCM concept, in Company B for instance, was established from the commencement of the business. This is evidenced in the opinions given by the management of Company B.

> *"Supply chain management is already in the company. When we start the company, the concept is already established. We did not mention it as supply chain system. What we have is the end to end; end customer and end supplier. So all 'the end to end' is in a way communicated a link to the system; from order to pay to order to delivery to manufacturing process and CRM (Customer Relationship Management). It is about fully integrated end to end visibility of the value chain."* – **Company B**

Being a national car manufacturer, the company is undeniably involved with complex parts and processes, hence effective SCM is mandatory to the company. The senior manager of Company B further commented:

> *"Without the supply chain, it will not work especially in this environment. So, it is highly important and mandatory. I do not know about the text book terms and it is not about benefit. Without the supply chain, we (will) fail. So, it's a failure border rather than benefits. With JIT, the communication with vendors is a must. We have to plan, (because) some vendors have 1 hour lead time, some 5 hours, some a day, some for months. National vendor like steel has four months lead time. So with that lead time, our production must be firm. It is not talking about benefits; it's something that we have to have them."* **- Company B**

Similarly, Company D also uses the concept of integration between functions to define SCM. Interestingly, the company also employs the integration of SCM to handle customers' complaints.

> *"In a business process, SCM means there is a chain between the suppliers of raw materials and all other components of production. May it be labour, or finance. It basically involves almost all departments"* – **Company D**

"When dealing with customer complaints, all the departments concerned will form an ad-hoc committee. People from sales, quality, accounts, and production will form a committee to find out the cause, investigate the cause and visit the customers" – **Company D**

However, unlike Companies A, B and D, Company C indicated that they have a less complicated supply chain. The management of this company, for instance, is not fully involved in the sourcing of the main raw materials as indicated.

"Well, we get our resources, our raw materials from local and overseas. We deal directly with our overseas supplier on some of the components. The other part is through our Taiwan representative office. They will help to source (because they are the sourcing company) for the three manufacturing plants (one in Malaysia and two in China). You may say centralized procurement on certain components." **- Company C**

In the case of Companies E and F, due to their large business units, and hence extensive activities in both firms, they were unable to provide a formal definition of SCM. In their view, it is not appropriate to have one single unit of SCM, but rather SCM in every business unit. As a global player in the international shipping industry, the manager from Company E commented:

"Because of the organization structure (business units and services units), we do practice supply chain management, (but more at a respective business units and services units because of the way we segregate different lines of business. So, we think that it is not practical to have single supply chain unit to represent all lines of businesses but it is broken down into businesses, and also sub services unit so that they have smaller supply chains."- **Company E**

The procurement manager from Company F also noted:

"Every department is involved in SCM. (Because this company is very big) In procurement only, we have about 200 people. Nationwide, we have 24,000 staff. So, we have to focus. In this department, we have integrated procurement." – **Company F**

8.3.2 Management of companies' supply chains

Supply chain leadership and people development

The management of SCM is formalised in Company A by having its own supply chain division led by a supply chain director. Because of the emphasis on supply, the company embarks on what they call supply chain leadership. The manager revealed that due to the company's size and huge number of food products manufactured, the company has no choice but to have its own supply chain division to oversee all supply chain management matters. This, as claimed by the management, is an improvement to the company's supply chain.

> *"We have our own team; we called it the supply chain division. He is the Director. He reports straight to the MD (Managing Director). Our business is worldwide and in terms of list of product (ranges of products), in terms of customers' that set up, product channel, we cannot afford not to have it. We always all the while have the supply chain division. We also have a supply chain controller now."* – **Company A**

In the supply chain division, Company A also has supply chain managers and a supply chain controller whose main responsibilities are centred to handling costing for the company's distribution centres (Distribution costing). Throughout the country, Company A has a number of official distribution centres. The main function in distribution costing, as claimed by the management, is to improve cost transparency and accuracy of distribution cost information and support the period and closing process in all the company's distribution centres.

Even though SCM is present all the while, the management believes that SCM must be communicated to all levels of employees due to its great importance. To show that the company places emphasis on employees, the management carries out people development.

> *"The other thing is the people development. You need to have a good mix of management. If you do not develop the people, they will not be focused to ensure that everything is in tandem. The management wants such people development. Developing the people is another area in supply chain itself."*
> **- Company A**

People development remains a conscious focus to ensure the company's build and grow internal core competence and supply chain leadership in tandem with the business. Because of the nature of the industry itself, SCM is especially critical for the food industry because of the ease of spoilage. The efforts of supply chain in Company A, for instance, are focused on ensuring supply of stocks via the 'shortest route to availability', ensuring delivery of stocks to customers in full on time, targeting competitive costs for services rendered, innovating and renovating supply chain 'services' and 'products' to maximize productivity and empowering and growing functional and management skills.

Managing supply chain with IT integration tools

Unlike Company A, the other companies do not have their own supply chain division. SCM, to them, is then the management of linkages between functions and between organizations. To achieve this, in all the other companies, the supply chain is generally managed through effective use of information technology (IT) integration tools.

Effective SCM is not possible without IT systems designed to provide readily accessible and accurate information to all supply chain participants. Since the emphasis is on the visibility of the supply chain, the management of Company B, for instance, built up supply portals so that all customers and suppliers may communicate through the portals with the support of information technology (IT) integration tools. The SCM integration is highlighted with the development of Electronic Data Interchange (EDI) as the integration tool while the most popular application software to integrate the functions of the company across different departments such as sales, finance, distribution, logistics, inventory, production, and human resource is the Enterprise Resource Planning (ERP). This is described by Company B as follows:

> *"Every year, we improve our linkages to ensure the visibility from the customer end to the supplier end. We have to be visible in our relationship with suppliers. Indeed we do have integration with all the vendors through the system, ICT system. ERP and EDI is the integration tool. We also built up portals (Supply portals). So we communicate through portals. As we grow, we use manual and individual DO (Delivery Order) and PO (Purchase Order), but now as we are using the same portal system, all must be done through the system."* – **Company B**

The importance of IT integration tools is also shared and supported by the management of Companies D, E and F. It is believed that even though the companies do not have their own supply chain division, with fully integrated systems, communication between all trading partners would not pose any difficulty. The following statements by Companies D, E and F respectively indicate the use of IT integration tools to simplify communications with their trading partners.

> *"We use IT infrastructure to interact with suppliers and customers. I myself (as Management Information System Manager) involve directly with customers and suppliers. Most of our suppliers are beginning to use the IT infrastructure. We believe (SCM) exist from the very beginning people start business. Things become formalized when IT comes into place. Before 1980's, not much is said about CRM (Customer Relationship Management), SCM. All these come with IT."*
> *"* - **Company D**

> *"We provide to various users using integrated systems."* – **Company E**

> *"I have to set up this centralised, and at that time we embarked with the new system SAP (System Analysis and Programme). So far everything in this department (procurement) we do it through the system."* **- Company F**

8.4 Dimensions of SCM practices

To reach an opinion about the level of companies' SCM (classified as high or low SCM), the six dimensions of SCM practices are explored. The dimensions are companies' relationships with suppliers and customers, information management and internal lean and postponement.

8.4.1 Relationships with suppliers and customers

The interview sought to find out how companies manage their relationships with their suppliers in order to achieve significant ongoing benefits to each party. It is also to identify how they build long term relationships with customers and improve customer satisfaction.

According to the management of Company A, in relation to their relationships with suppliers (domestic as well as foreign suppliers), the aim is to deal only with reputable suppliers who are willing to apply the company's quality standards. Key suppliers with whom the company has a contractual relationship are audited in order to ensure that they comply with the company's corporate business principles or that they are working actively to achieve compliance. Whenever instances of non-compliance are brought to the company's attention, the company will demand that corrective measures be initiated.

Being an international food manufacturer and a consumer-driven company, the company is also committed to meeting consumer preferences. Quality, freshness of products and short shelf life are amongst the elements most emphasized.

> *"I think the most important thing about our product is (what customer perceive) quality and easy to handle (when you stack and when you place on shelf) and fresh. We ask what actually the consumer wants. Consumer wants this price, consumer wants it to be in hypermarket or consumer wants it to be in provisions. It is always started with the consumer and how the consumer wants it to be. More sugar, less sugar, big pack, small pack. That is how we work backwards innovation and renovation of the product. Then we have to go back to the sourcing supplies, the quality assurance and short shelf life. The most is two years but most of our products are less than a year."* **Company A**

The company is very conscious of its role in communicating responsibly to consumers, particularly as it influences following a healthy diet and lifestyle. The manager further noted:

> *"This industry is sensitive towards (food) nutrition. Our company has to portray nutritional aspects of life. So, we cannot have something contradictory or jeopardizing with what we propagate. We always talk about good food, good life. So our products must meet what we propagate for good health, good for heart."* **-Company A**

Interestingly, the company also carries out extensive consumer testing on their products to make sure that consumers will prefer their products to those of their competitors'. This test is known as the 60/40 test as the objective is to ensure that at least 60 percent of customers would prefer the company's products compared to competitors' products when they are blind-folded. It is hoped that every product will meet this 60-40 test. Additionally, the company also tailors its products to suit local tastes.

To maintain freshness and to speed the process of ensuring products reach consumers (market) in the quickest time, the company engages with its own official main distributors.

> *"We have our long term partners. They are our main distributors because this company sells only to our specific distributors. They will handle certain region. At the same time, we do have internal teams to serve retailers (e.g. coffee shops or any grocers) they will make orders through our distributors."* **- Company A**

The emphasis on strategic supplier partnership is also very obvious in Company B which has over 200 major suppliers (vendors). According to the management, the company is committed to working even more closely with the suppliers in order to improve their capability, efficiency and efforts in reducing the cost of components of making cars. The manager noted:

> *"The automotive industry actually is complex. We have product complexity, part complexity and process complexity. So we have to manage these complexities and since this complexity is so huge, so we need tools. In the manufacturing practice, we are end to end (from scrap metal to auto metal until complete car)."* **- Company B**

The company continues to be highly stringent in its surveillance and monitoring processes to ensure that the components received from suppliers met the requirements. Technical indicators such as incoming quality checks, as well as the number of warranty claims and audit ratings, provided the company with clear indications on the performance of the suppliers. Suppliers who fail to meet specifications are made to work closely with the company's guidelines to improve. The manager commented:

> *"We also measure our vendors (e.g. the impact on our cost.) With 200 vendors operating Just-in-Time, we cannot afford to have production breakdowns. If one vendor is problematic, so the whole chain (will be) affected. When it creates a loss, (the loss) is quite great. That is how we have to monitor, not only measure, daily. So any vendor who create such a problem; we will calculate (the cost) and charge them.* **- Company B**

The management of Company B continuously monitors the performance of suppliers (with on-going quality audits and where necessary, request for improvements and provision of guidance) in order to maintain customers' satisfaction.

> *"Customer satisfaction is always our first priority. Our aim has always been to supply customers with quality cars at affordable prices. We take great pride in our preparation and after sales with emphasis on customer satisfaction. It's all customers' driven. In moving forward, we try to enhance our processes to get the customers closer to us or suppliers' closer to us. Even though they are far, but through IT, through internet, web portal and all that, our vendor is within reach."* **- Company B**

The managers further emphasised that strong customer orientation and competitively priced products are the foundation of the business and essential to their success. In relation to producing competitively priced cars to sell abroad, the company is shifting from the Completely Built-Up (CBU) system (traditionally exporting fully-assembled cars) to the Completely Knocked-Down (CKD) system, where components of cars are exported in parts and the cars assembled locally. The consolidation of the company's vendor network enables the company to build stronger, more meaningful relationships with capable and competent vendors. In addition, vendors are encouraged to participate in the vehicle conception stage. The impact of the vendor network was described by the management as follows:

> *"Part of enhancing the country's economic growth, the agenda is to develop more local vendors. So this company actually plays a significant role in developing local vendors. So from day one you can see the trend. Initially it was a few numbers of local vendors but along the years we have developed more than 200 vendors (for raw materials). At the same time we have spin off impact to the economy as a whole. Not only related to manufacturing cars, but other related industries. Plastic and metal industries are developing including corporate core activities like event organizers. Now the vendors are not only supplying to our company, but they also become exporters. They supply to other car manufacturers too because they have grown up.* **- Company B**

Similarly to Company A, the cars produced and assembled in Company B are distributed systematically through the company's dealers (main distributors). The network, as summarized by the manager:

> *"We have modular, direct components, local and international suppliers and distributors. We also have dealer, sub dealer and branches."* - **Company *B***

It is also possible to work more effectively with a few important suppliers who are willing to share responsibility for the success of the products. This is the case of Company C, which has a lower number of customers and suppliers, unlike Company A and B. The home security products of Company C are primarily manufactured for exports to largely Europe and North America. The majority of Company C's customers are ODM customers, while the majority of the raw materials (for instance the electronic components) are from imports which are mostly done by the Taiwan representative office.

The senior manager of the Group Company noted:

> *"We have full support from management. This is part of our strategic direction to work closely with our suppliers and sub-suppliers. In fact we don't have many of them. We do not really get one supplier to compare against or to use it to suppress the price supplied by this supplier. In fact we work with them in a partnership manner. We try during (especially during) this economic downturn. This tends to be the better strategy. So we would rather go for a few suppliers. You can actually have either preferential price or if they are not able to support you in terms of the cost, then at least you can expect a better quality of your order given to them. These are the few things that we are currently relying on."* – **Company C**

Apart from dealing with a few reliable suppliers, the group also enjoys long-term business relationships with its customers. According to the management, the average length of relationship between the group and its top 20 customers is 11 years, with 95%

of these customers dealing with the group for 3 years or more. The two longest-standing customers have been dealing with the group for 19 years. The manager explained:

> *"We work with our customer and partner with them to introduce new products from time to time. I would say the evidence (of close relationships with customers) is they keep on working with us to introduce new products. In fact the company does not really have many customers. We believe in the long term partnership. In fact since we founded, we still have a few customers whom we are still working with now. So we deal with these, major customers."* - **Company C**

According to the management, the company's research and development (R&D) is a major investment centre within the Group, where new and innovative product solutions are planned up to 3 years ahead. This commitment to product development not only ensures the availability of a steady stream of new ideas to their customers but allows the company to refine and constantly improve the quality, reliability and value for money of the existing product offering. When asked about their customers' satisfaction, the manager commented:

> *"The feedback from them is in terms of quality. On the other hand, in terms of pricing, they have been having quite a huge pressure from their end user as well. That is why we are complementing with our China plant. Once our product matures in this Malaysian plant, we are able to control because we are familiar with the characteristics of the product, have mastered the processes. Then it will be time for us to consider transferring it to the China plant. That is how eventually we can give a better pricing to our customers."* - **Company C**

Company D, which is involved in the sugar industry, has a different business environment. The products, according to the management, are less complicated as the main raw material is basically raw sugar. The raw sugars are largely imported from Queensland, Cuba and Brazil. It is interesting to note that the company's position as the main supplier of sugars (raw materials for many other food industries in the country) makes it deal with fewer suppliers but many close major customers. Through IT tools and appropriate systems, they communicate effectively with their trading partners. The company's senior manager commented:

> *"We do not have many suppliers because our product is (only) raw sugar. But our major customers include large food manufacturers and those big hypermarkets and retailers. With our customers, we communicate almost every day, in fact, every hour."* **– Company D**

In assuring satisfaction to their customers, according to the management, the company is committed to producing high-quality refined sugar at competitive costs (even though the price of sugar is government-controlled) and achieving zero customer complaints and on-time delivery. As the price of the company's products is fixed, the focus on customers' satisfaction lies on the quality and service availability.

> *"We have to maintain our continuity in our own way. That is why I believe, although not in a formal way, through an informal way, we do communicate with our suppliers with regards to material that we buy. We do maintain certain level of standard or quality and certain level of stocks that customers need."* **– Company D**

Due to its nature of business, Company E is segregated into a number of huge and diverse business activities. The main business at the moment is petroleum business where the majority, if not all, stream of revenue comes from long term contracts. The suppliers for this company are largely oil companies where the primary source of the contract from petroleum comes from its parent company. Customers for this petroleum business, according to the manager, would be other users downstream. For other types of business, the manager added:

> *"The traditional business of the company has grown into other maritime based. It is no longer traditional shipping business. The volume of customers and suppliers depends on which line of business."* **- Company E**

Through its strategic partnerships and people-to-people relationships, according to the manager, the company's products and services continue to meet and exceed the demands and expectations of their customers. This is evidenced when customers have repeat services with the company. Additionally, the management strongly agreed that to deliver quality products and services to their customers, they rely on the quality they received from their long term suppliers. The manager commented:

> *"We do have business considerations when we negotiate for contracts. When we consider our list of suppliers from various aspects, most important is quality aspects that meet our standards. We have to ensure the services we provide meet expectation of our customers so naturally we have to fall back on our quality and product and services we get from suppliers. Secondly is the best or most comparative cost suppliers can offer because that is part of management targets to each year have more efficient way to control costs; that would be some of major aspects when negotiating for contracts. I would say quality and cost are the main ones."*-

In relation to their customers, the manager added:

> *"Most of the time, because of our long term relationship with our customers, they do have repeat services that they require from us probably because of our reputation being a national shipping company with good financial background."* **- Company E**

As with Company E, there are many activities involved in Company F. The procurement manager added that due to the large number of suppliers, it is essential to have long term partner relationships with all their suppliers. Relationships with suppliers are managed by the company's own supplier management unit. She commented:

> *"We have a lot of suppliers because we have so many commodities. Too many, in our data base; we have 13,000 suppliers, locals and overseas. Even in procurement, we have strategic and operations divisions. (So)We must have strategic partner relationship. We have one special unit to handle all suppliers; that is, the Supplier Management Unit. In our KPI (key performance indicator), one of the criteria is our suppliers. In terms of benchmarking and evaluation, internal customer and external customer (i.e.*

> *our suppliers) will evaluate us. We work together with our customer (internal) until we appoint the supplier."* - **Company F**

With regard to external customer (users of telecommunications services) of the group, according to the management, they definitely do place emphasis on continuing customer service quality enhancements and innovations where the service they provide is all towards customer service excellence and satisfaction.

8.4.2 Information sharing

The research interview seeks to identify types of information shared between firms' trading partners and the extent to which information is communicated. While the majority of companies recognised that they have to a large extent a strategic supplier partnership and close customer relationship, in terms of level of information shared with their trading partners, they differ.

Of the six companies interviewed, Company B and Company F have most information shared between their trading partners. In Company B, because of the emphasis on visibility of their relationships with suppliers and customers, and the manufacturing concept of Just-in-Time (JIT), communication and sharing of information with trading partners are unavoidable and crucial. All these can be done, according to them, through effective IT integration tools.

> *"We share information and documentations with our vendors. Because our concept is JIT, the communication with vendors is a must. So a lot of company can learn from us because we came across all the issues first. We improvise then they learn from us and we also learn from some other companies, some ODM (Original Design Manufacturer) with similar issues."* – **Company B**

Company F is also an interesting example of how information is shared with their suppliers and customers can bring about advantages to them. From information shared with suppliers, for instance, the company gets better pricing. Information exchange with suppliers could also enhance their service to potential customers. The manager declared:

> *"To a certain extent, we do share some information. By sharing this information, it will enable our vendor to provide their views on how best the customers can be served using available technology. In terms of purchasing, we get a good price and actually this is proven because when we do a comparison on the same products that we procure, with others, we get a good price. In our procurement, we have our sourcing unit who does the market intelligence[16]. –*
> **– Company F**

Apparently due to its connection with the government, all procedures must be made known to their suppliers as indicated:

> *"We do share information with our suppliers. When it involves a contract with this company, we have to tell them everything inside the contract. If anything happens and we want to charge them LD (Liquidated of Damages) they are clear about that, because if they are late it will affect our business. They also share information with us (for example) on specifications we required. If there is something new in the market, they will also advise us."*
> **– Company F**

All the other companies interviewed admitted that they only share a limited amount of information with their trading partners, largely attributable to the nature of their business environment and the products they are producing. Company A, for instance, explained that because the nature of industry is itself extremely competitive, they do not

[16] Market intelligence is a given market where internal and external data can be collected. Market intelligence focuses particularly on competitors, customers, consumer spending, market trends and suppliers. In its broadest sense, market intelligence is the capturing of information relevant to a company's market.

share much information with their trading partners. When asked whether the company do share information with their trading partners, the manager commented:

> *"It is a very competitive business; so not all information is shared. Things that we do not share are for example our recipe. If we want to introduce our new products after doing a lot of research we do not want the information to leak to our competitors especially when our competitors have smaller base who work faster than us."* **- Company A**

Similar to Company A, the level of information shared by Company C is quite limited. Company C only shares information that is widely available. The manager of Company C commented that:

> *"We share our information in a very restricted manner. In fact, customers always came back and wanted to see even our detail costing of our products. We share the detail components with them but we are very selective in terms of sharing our product cost with them. For major or key electronic components imported from overseas our customers could get the information from overseas and they could compare.* **- Company C**

The reason for less information being shared in Company E is mainly due to its position as a subsidiary to a parent company, to which all business affairs associated with the parent company must be referred.

> *"Most of the long term contracts secured from our parent company business affair are projects that our parent company ventures (like offshore, spill-over from ventures). Not only that we do opt for our own negotiations but we also have to refer to them (parent company). It is rather a high level of securing business."* **- Company E**

It is interesting also to note that not much information is shared in Company D because of the control the government imposes on the products. Regarding the nature of the product and the fact that it is government controlled, the manager noted:

> *"We are very cost sensitive because our product is straight forward and simple. Price is fixed and is government controlled. (This is because) The product is basic necessity for the population. Our ranges of products are differences in colour and size but the basic ingredient is only sucrose. We cannot do anything because rightfully the price is fixed. When we buy our*

> *main raw materials, of which it is from the commodity exchange, the price is determined by the market."* **– Company D**

When asked about the type of information shared, the manager added:

> *"The only information we share is availability. We do send samples to them (customers). For every product that we send out, there is a COA (Certificate of Analysis) that comes out with it. So, our quality department will issue the certificate with regards to that specific batch of production."* **- Company D**

8.4.3 Internal lean practices and postponement

The research interviews also aimed to explore the extent of practice with regard to two other dimensions of SCM practice, namely companies' internal lean practices and postponement. The lean system is the practice of driving out the unnecessary cost, time and other waste from the entire supply chain, while postponement is the practice of moving forward one or more operations or activities (making, sourcing and delivering) to a later point in the supply chain as far as possible. Postponement, the technique of delaying final product configuration until the actual order is in, should enable a company to respond more quickly to market demand while lowering inventory costs. Despite these powerful benefits, only Companies B and D have pursued this strategy. The adoption of postponement is generally low in the other companies. As far as internal lean activities are concerned, the majority of companies have implemented these practices to some extent.

In view of Company B's commitment to improvement, its manufacturing division has long started implementing the techniques to reduce costs and set-up time and to improve the quality through continuous quality improvement programme. According to the management, their intensive improvement activities continues with the implementation of '*Kobetsu Kaizen'*, which means focus on improvement and the usage of Overall Equipment Efficiency (OEE) as the parameters to measure equipment efficiency. Additionally, they have also implemented the world-renowned practice of 'Genba Kanri', another Japanese term which means 'shopfloor control'. This is to reflect how the company is continuously improving itself by benchmarking the company against world-class industry players. The manager commented:

> *"We implement the Just-in-Time (JIT), continuous quality program system, continuous program 'kaizen' from the Japanese, they are all in place already. 'Kaizen', 'Genba Kanri', 'Yokoten, all started from day one and we enhance the integration between the suppliers."* – **Company B**

The JIT implementation, as claimed by the manager, is a means of cutting costs through low raw materials and work in process inventory, less inventory space, greater financial benefits as a result of a decrease in inventory investments. The lower level of inventory will induce further cuts in labour costs. Machine set up and break down time should also be short.

According to the manager of Company B, their products are designed for modular assembly, one important element of postponement practices as he stressed:

> *"Our products are on modular basis, supplied to the assembler. We develop our own R&D (Research and Development) and we develop our own modular parts."* **– Company B**

Companies recognised that by implementing internal lean practices and removing non-value added activities, costs can be managed for better productivity. In Company D, where both internal lean practices and postponement are being implemented, the manager declared:

"Our Just-in-Time system and pool production, obviously lead to optimizing the cost. You save cost on warehousing and logistic activities for example stacking. You do not have to use extra pallet, and to a certain extent, your packaging material. For different customer or different market sector, we use is a different signage or coding for packing." – **Company D**

In terms of postponement practice, according to the manager, the production process is arranged so that customization can be carried out according to customers' orders.

"We do provide customization to our customers based on a certain level of colour. There is a unit of measurement for sugar colour and they call it ICUMSA (International Commission for Uniform Methods of Sugar Analysis)." – **Company D**

Unlike Company B and Company D, Company C has entirely different manufacturing practice. Due to the nature of the production process, where it produces 'high mix low volume' products, the company does not implement internal lean practices. The company, instead, practices the 'cell' system, where the whole production process is completed in that cell; hence one operator performs multiple tasks. The manager explained:

"We do not implement Just-in-time because of the business situation, high mix, low volume; high mix means one model but many colours. For one product range, you will have good, better, best classification. So when you have this high mix, definitely the volume of each model would be low. Six years ago we set up cell lean management manufacturing processes (instead of the long conveyor belt production processes). Each cell has about 6-8 operators to do the whole processes. That means the operation is multi tasking." – **Company C**

In the case of Company A, the manager indicated that the company has in place all the practices that lead to reduction of waste and set-up times (for instance, JIT, pull production systems and continuous quality programme) but it does not employ any postponement practices. Interviews with Company E and F revealed that these two dimensions of SCM are less relevant in the service companies. When asked whether the companies implement internal lean practices and postponement, the manager of Company E commented:

> *"Those (internal lean and postponement) activities are not that relevant in the way we do our business. It is because of the nature of the business itself."* - **Company E**

8.5 Management accounting practices and SCM

The research interview was intended to uncover the adoption of management accounting practices (MAPs) in these selected companies. The extent of their MAPs and whether the companies generally employ traditional MAPs or contemporary MAPs were then investigated. The interview questions specifically focused on the extent to which these companies implement management accounting techniques in relation to the SCM context, namely, activity based costing, target costing and inter-organisational cost management, and open book costing. The aim of this section is not only to confirm the survey findings but also to explore explanations and implications.

8.5.1 Perceived importance of MAPs

Generally the provisions and use of management accounting information is to provide managers within the organizations the basis to make informed business decisions that will allow them to perform better in their planning, decision making and control functions. As expected, all companies view management accounting as a very vital tool to the companies.

All the interviewees are of the same opinion that they use management accounting information for analysing the recent past performances of the business and study elements that look to the future of the company as well. This can include looking at profit forecasts, cash flows and sales. Company A, for instance, places great emphasis on management accounting as the backbone of its planning process especially viewing it as the tool for products innovation. The manager of Company A stated that:

> *"We value management accounting as the backbone of our planning process as it is obviously the key to value creation. This is especially true when we launch new products for innovation."* **– Company A**

The manager added that the company's management accounting system is very dynamic, solid, professional and flexible to meet the ever-changing and challenging business environment. Examples of tasks are operations research, customer profitability analysis and most importantly the development of new product costing. She said:

> *"It is our key tool basically to decide whether we launch products or not. All our decisions on innovation, consumer communication, and availability of products are all based on cost. It is the right tool to provide the right decision and plan for the future."* **- Company A**

For the manager of Company D, management accounting provides, at all times, up to date information of the status of the cash flows and profitability, an element that is crucial for decision making. Additionally, the activities management accountants provide, including forecasting and planning, performing variance analysis, reviewing and monitoring costs inherent in the business, are ones that have dual accountability to both finance and the business team. This is supported by the notion given by Company E's manager.

> *"I think with the strong financial information across the organization, certainly it will be helpful to decision makers to do business, people within the company to achieve their targets, to grow the business, to compare and to measure against what is budgeted and projected. Obviously, for instance, forecast cash flows are very useful for decision making and monitoring purpose."* **– Company E**

According to Company F, the information gathered for the management accounting is usually broken down so that the performance of different parts of the company can all be measured separately to ensure that they are all working to the best of their abilities. An example of this is that a specific product could be monitored in order to see how well it has done across different outlets. The information that has been gathered for management accounting tends to be broken down so that the productivity of separate parts of the business can be monitored. The manager noted:

> *"With current competitive environment in telecommunication industry in Malaysia, the management accounting is in need of the management report which is beyond the financial statutory reporting. For example, management report by states (location based performance reporting), segment based performance reporting i.e. consumers, government, SME (small medium enterprises, customer centric reporting and infrastructure based performance reporting."* – **Company F**

The manager from Company C relates the use of management accounting information with the provision of IT system. A function of management accounting in organizations is undoubtedly to work closely with the IT department.

8.5.2 Contemporary MAPs in relation to SCM context

More contemporary management accounting practices were found to be implemented in three out of six interviewed companies[17]. The more modern MAPs emphasized are the techniques related to the SCM context, namely, activity based costing, target costing and inter-organizational cost management, and open book costing.

8.5.2.1 Activity based costing

It appears that costing systems in three companies (Company A, B and E) have developed from traditional costing systems to more modern costing systems such as activity-based costing (ABC). The technique, according to the management of these

[17] When companies mentioned that they implemented more contemporary MAPs, it does not imply that they have disregarded the more traditional MAPs, but instead they enhanced the traditional practice with the new MAPs.

companies, has gained increasing attention as a tool to help allocate overheads with greater degree of accuracy especially with regard to SCM context. Respondents agree that SCM requires more accurate cost data concerning all activities and processes within the organizations. It is suggested that ABC can significantly contribute to SCM by providing more accurate, detailed and up-to-date information on all activities and processes in organizations. The traditional accounting approach, where cost allocation is based on labour hours or machine hours, is said to rarely reflect the true cause and effect relationship between indirect costs and individual products.

When asked on its costing system, the manager of Company A prompted:

> *"It is all on activity based. We have been implementing activity based costing for quite some time and we are still improving on it. Be in it on all areas (e.g.in HR (human resource) and especially in supply chain."* – **Company A**

The manager said that in comparison to the traditional cost approach, ABC offers substantially better information for SCM because its cost information is capable of supporting and monitoring the supply chain strategy. More importantly, it partially integrates customer requirements into the analytical procedures used to establish the value of an activity. According to Company A, activity based model not only supports product profitability analysis but also customer profitability analysis and benchmarking.

Although Company B did not adopt a formalized ABC procedure as per text books, the management, where relevant, use appropriate cost drivers that relates to business activities. The manager of Company B said:

> *"It (ABC) is not strictly per book definitions but we do have certain attitude to activity based. Where relevant we apportion to that activities (for*

example like body assembly shop). So we have also taken certain kind of apportionment based on activities." **– Company B**

The respondent from Company F nevertheless admitted that the selection of appropriate cost drivers in implementing ABC is not a straightforward task. The manager pointed out that:

> *"It is quite a complex task since majority of cost incurred is centralized and finding the most relevant cost drivers to allocate the cost is really a big challenge especially the level of acceptance on the assumptions and the availability of the required data."* **– Company F**

8.5.2.2 Target costing and inter-organizational cost management

In search of opportunities to create customer value and to better reflect customers' true requirements, these companies have also begun adopting target costing. They viewed target costing as more process oriented and customer centred, while traditional costing systems were regarded as internally focused. Due to the shift of market power from "producers" to "customers", target costing places customer requirements at the heart of the companies' efforts to develop and deploy product strategies. Cost is also viewed as an end result while customer requirements are viewed as binding competitive constraints. Under target costing, the supply chain incurs whatever costs are necessary to satisfy customers' expectations for quality, functionality, and price.

From the perspective of Company A, target costing provides the company with a competitive edge as it offers continuous improvement both at the design and production stages. The manager detailed how target costing is implemented in the company and how the technique supports the analysis of competitors' costs:

> *"We implement target costing; it works this way in this company. We ask what actually consumer wants. That is how we work backwards until we come to a point of, consumer wants this price, this big, consumer wants it to*

be in hypermarket or consumer wants it to be in provisions. It is started of the consumer and how consumer wants it to be. More sugar, less sugar, big pack, small pack. We work backward to innovation of the product, renovation of the product, the sourcing supplies and the quality assurance. We then set our cost and at the same time set what would be the price because we also have competitors in the market. How can competitors price at much lower price and how can we match the competitors' selling price. We start to analyze what the competitors' cost is."- **Company A**

Additionally, according to the manager the technique may, when associated with a customer perspective and adopted early in the product life cycle, lead to large cost reductions. This is because a large amount of a product's costs are initially committed in the development and design phase. When design is outsourced, functional analysis and target costing can become important parts in inter-organizational management control. With target costing the company developed its cost management systems that help initiate cost-reduction activities across the entire life cycle of the firms' products'. Negotiations with suppliers were carried out as part of cost reduction programmes for lowest possible cost.

"The company has its purchasing group division. They will update us on the price of commodities, what is the price of major materials, packaging materials, so they will let us know if there is any short supply or oversupply of packaging, raw materials which will affect the prices. The group handles all purchases and will do all the negotiations with suppliers. It (negotiation) is part of the cost reduction program. We want to meet our target cost because customers will pay only at this price. So, we go backwards to meet our target cost." **Company A**

In Company B, the interviewee viewed the role of target costing as to support the planning and control functions within the organization. The manager noted:

"We use standard costing and for new products, we use target costing. From the budgeting cycle, we move on to track the actual performance. We use variance analysis within the budget expenditures. We have quarterly reporting to 5-year plans." – **Company B**

The manager added that cost analysis is carried out to determine an actual cost and identify the extent of, and develop plans for, the cost reduction required to achieve target cost. The company found that the strength of target costing is as an overall framework for cost improvement and efficiency. As in Company A, negotiations with company's suppliers were performed as part of the inter-organizational cost management. The manager said:

> *"For our suppliers, we have a contractual yearly price negotiation so it will be revised every year. The purchasing department will be going to this exercise of negotiating to get the lowest cost possible."* **– Company B**

For Company F, due to the huge size of the organization, internal recharge was applied mostly between the group business units. The technique is also used to monitor the performance of the company's internal customer and suppliers.

> *"For the transactions involving different Strategic Business Units (SBUs) within the company, our practice is known as transfer pricing or internal recharge which is basically involved charging the users for services rendered by the suppliers. No element of profit should be considered for internal recharge. For the transactions involving holdings and subsidiaries, the charging principle must be at arm's length as required by the Inland Revenue Board (IRB) with certain acceptable margin between both parties involved (transfer pricing). It is beneficial in a way, especially to monitor the performance of the users and suppliers."* **– Company F**

While this technique is used as a tool to evaluate performance of business units, she nevertheless pointed out that managers may be high performers individually but fail to put together their activities to create peak performance for the organization. She commented:

> *"Lots of operational issues need to be resolved which is very time consuming and creating 'silo' mentality where everybody is trying their best to make sure that individual KPI's are achieved without focusing on total group benefit."* **– Company F**

8.5.2.3 Open book costing

Open book costing and target costing help to develop inter-organizational controls to establish relationships with trading partners. To create a new form of transparency and new opportunities for control, companies must have highly developed sense of trust and inter-dependencies between parties. Although some interviewed companies do implement limited open book costing, surprisingly no single company implements a full open book costing system. It seems that the companies are not prepared to reveal costing information (the cost make up of a product and how they approach cost allocation) to other parties.

It is interesting to note that even though Company A had adopted more contemporary MAPs and high levels of SCM practices, the company did not implement open book costing. The company only disclosed costing information to their affiliates (group companies in other countries worldwide) where profitability is not the business concern. The manager responded:

> *"We do not implement open book costing system here. The open book costing is only applicable to our affiliate companies in other countries. We do not make money with our affiliate companies. This is why we have to be very transparent; what cost have I built in and due to charge the group finance."* **– Company A**

In order for open book costing to work effectively the company must be prepared to be completely open with their trading partners and be prepared to reveal information which under traditional circumstances would be unheard of due to the sensitivity of the data. In the case Company A, open book costing was not being implemented due to its position in the strictly competitive environment as global food manufacturer and hence confidentiality of the costing data. The manager of Company A explained:

> *"We do not share the costing, because this is a very competitive environment. But once you are in the industry, it is also your job to estimate the costing information of your competitor. (For example) information on sourcing company. By having that particular information, my competitor can easily estimate what my costing would be like."* – **Company A**

The interviewee from Company F said that they manage to obtain costing information from their trading partners but the company itself implemented a restricted open book costing

> *"Yes for our market intelligence for example if we want to have a benchmark in terms of pricing. We request for proposal, we can search information (from the trading partners) through the internet; they are willing to help so far."* – **Company F**

The manager added and gave his personal remark on open book costing:

> *"If it involves sharing of costing information for the purpose of regulator, yes we do practice but depending on cases. Different cases require different treatment and cost assumptions (e.g. long run incremental cost, margin cost, average cost etc.). Personally, I don't really agree with open book costing but if need be; only certain limited information can be made available."* **- Company F**

According to Company B, although they claimed that they have open book costing in practice, no one in the company knows or could acquire all information available in the open book system. The manager of Company B commented:

> *"No one in this company knows the whole end to end because it is provided with authorization profile."* – **Company B**

8.5.3 Traditional management accounting tools

The use of traditional management accounting techniques remains strong in both Company C and D. It appears that the use of a plant wide rate while apportioning overheads is still widely used. From the interview, the managers from these two companies also revealed that traditional techniques such as standard costing and variance analysis, traditional budgeting and cost-volume-profit (CVP) analysis were predominantly used and thus there was very limited use of contemporary management accounting tools. The contemporary MAPs were not seen as absolutely central to them, while traditional methods appeared more suitable. The need for more sophisticated IT systems, high costs of implementations and the nature of product and business environments were among the main reasons for not implementing more modern MAPs.

The following statements were given by the respondents from Company C and Company D respectively when asked about their MAPs in terms of costing systems:

> *"We are still practising standard costing. Activity based was quite a great emphasis, I think 10 years ago. It actually lost its theme for the last 5 years because of its complication and higher cost of implementation. For that one definitely have to have a very complete or complicated ERP (Enterprise Resource Planning) system. On top of that, you are running into a very high cost of ownership. We are still using standard costing because of the older version of MRP (Material Requirements Planning) system we have."* **- Company C**

> *"We do not use ABC here. For activities, we listed them under manufacturing, SND (selling and distribution) and admin. It is quite simple here in this company because the price is already set. Our focus is mostly to maintain the cost low and the large portion of it would be from raw sugar. And even that is mostly contracted by the government. So, as for segregating variables and fix cost, we don't really go to that in the accounting system. So, it's mostly (separating costs) into SND cost, administration cost and manufacturing cost."* **- Company D**

Due to IT limitations, Company C continues to implement traditional budgeting but the manager admitted that due to that drawback, they experienced some constraints in disseminating information within and outside the firm. Both Companies C and D did not apply all MAPs related to SCM (target costing and inter-organizational cost management and open book costing). The manager from Company D stressed that the product is government-controlled and the fact that they purchased the raw material from the commodity exchange means the sharing of costing information becomes irrelevant.

> *"We do not share costing information with our suppliers. The fact is that the price is fixed. We bought the main raw materials from commodity exchange. They are not concerned with what our cost is."* – **Company D**

8.5.4 Measures of performance evaluation

Managers found that relying on accounting related (financial) measures is rarely enough. Subsequently, all companies employed both financial and non financial measures. Financial measures like profit margin, sales growth, earnings before interest and tax, market share, benchmarking and use of key performance indicators (KPIs) are amongst the common profitability measures used by the participating firms. Company A favoured long-term business development, but recognised the need to generate a healthy profit each year in order to maintain the support of shareholders, the financial markets, and to finance investments. The company, unlike others, emphasized organic growth because this involves long term and solid commitment to building the business.

> *"We deal with organic growth all the time and in this company the emphasis is more of real internal growth (RIG[18]). Our RIG is the target for the company, at the same time our target is our EBIT (Earnings before interest and tax). Market share is our main concern too."*- **Company A**

Apart from profitability measures, Companies A, B and D also emphasized non-financial measures, particularly customers' satisfaction and their competitive position. It is interesting to note that Company B highlighted the use of supplier performance and supply chain flexibility as the non financial measures on top of customers' satisfaction and competitive position. The managers noted respectively:

[18] RIG refers to growth achieved by internal investments of the company: the company expanding its business through the use of its own resources. Growing organically means a company expands without the use of mergers, acquisition or other takeovers.

> *"Our customer base has built up over the year. We have attained great customer loyalty. Our sales consisting of at least 50% repeat business. We measure our supplier performance as well where we measure the impact on our cost. We have 200 vendors, with just-in-time, we cannot afford to have production breakdown. We measure not only their supply ability, but also their financial strength. If they don't have enough cash to buy the raw materials, they will be unable to supply us. It is not easy to find another supplier. In terms of system flexibility, if the international suppliers are unable to supply us out of a sudden, we have to change the production plans. That needs to be arranged in such a way so that it won't affect the subsequent production. To the fullest extent, we try to accommodate with all the problems."* **– Company B**

> *"We measure both in terms of financial and non-financial measures. Non-financial measures are for instance quality policy, customers' satisfaction."*
> **- Company D**

In the view of Company C, with no local competitors and not expanding the local market, the performance measures used are more straightforward. The manager of Company C then commented:

> *"The first thing that we look at is the profit after tax. And then we talk about the profit margin especially in terms of the gross profit margin and into the performance of each individual customer as well as the individual product.*
> *The major non-financial measure is the overall quality. The company is a very small player in the market actually so we don't really talk about market share because the economy downturn is not really affecting us very much in that sense because we are not a big player so that is the good part of it. So it is still manageable in that sense. Having said that, being not a big market player when the recovery is on its way, we may be threatened by global competitors. That is why we are expanding more into the mainland China to come out with a better pricing to our customers. In fact to be frank, we won't be expanding much the Malaysian operation."* – **Company C**

In these service organizations, measures used to evaluate performance are very similar to those in manufacturing companies. The managers from Company E and Company F gave details on how performance was measured, including benchmarking, KPIs and market share:

> *"Performance are categorically measured into two ways, one, we measure with our players within industry; second, we compare with companies which may not be in our industry. Being a larger shipping company in Malaysia having no apple to apple competitors, we need to also compare ourselves with players from other industries. But internally the way that we measure performance would be obviously our KPI (for different business units and services units and also for individuals in the company). So we measure that against targets set, the budgets and projections that we produce every year. I think that helps us to always be on track, and see whether we are off the mark. Of course we also have to be realistic with the external factors like economic climate and financial indicators. Our long term earnings that we self secured in major lines of business, petroleum, chemicals, LNG, it is still rather stable locally and internationally. Market share is also reflected from having that kind of stability."* ***– Company E***

Similar to Company E, Company F also applied both financial and non financial measures as the manager noted:

> *"We use either the published financial statutory reporting or some benchmarking on similar industry players. Measuring our performance against competitors financially as usual, the earnings before interest, tax, depreciation and amortization, profit after tax, market capitalization etc. In terms of non financial they are quality of services (e.g. line services) and delivery in time. Non financial measurement involved number of subscribers, number of complaints etc. often done on quarterly basis."* **– Company F**

8.5.5 The impact of SCM on MAPs

From the interviews, it was revealed that companies have diverse views of whether SCM influences the way they adopt MAPs. Companies A, B, D and F to a certain extent agreed that SCM influenced their MAPs, although they emphasized different SCM dimensions. Company A emphasized the impact of their strong relationship with customers influenced their MAPs, whereas Company B stressed on their strategic partnership with suppliers. Both Companies C and E, however, said that SCM had no great impact on their MAPs.

The adoption of more contemporary MAPs in Company A is mainly due to its strong commitment to customers' preference. The food industry is a very competitive industry where they ought to portray nutritional aspects of life. Inevitably, all decisions made in this multinational company are based on customers' requirements. The manager commented:

> *"Whatever decision made by our people, for example the brand, whatever direction, whatever product that they want to introduce, as management accountant, we need to ask whether it serves the consumers. We always talk about stock cover, damage goods, and market return. As management accountant, we want to emphasise on whether it adds value to the company and to the customers."* – **Company A**

According to Company A, the changes which occur in the company's distribution environment, particularly when considering the increasing concentration, power and skills of their trading partners, force the company to react more specifically and rapidly to new market challenges in order to maintain or improve their competitive position. Furthermore, the company has to face the consequences of the diversification of its food business as well.

To respond efficiently to the business environment, the management of the company needs more accurate and realistic information on the flow of goods along the supply chain and the cost and utilization of the available resources, so as to improve the quality of the decisions concerning products as well as customers. The overall aim is the improvement of the cost transparency throughout the company in order to increase the performance of the supply chain.

> *"The use of management accounting is highly influencing because for every material and every product that we have introduced, we have a very detail costing and we know the profitability level and whether this meet customers' relation and our supplies as well."* – **Company A**

In the view of Company B, a close relationship between the manufacturers (the company) and their suppliers is a prerequisite, especially in a Just-in-Time (JIT) environment. The suppliers or vendors were fully aware of the implementation of JIT in Company B. Although there is constant contact between suppliers and the company, they thought supporting factors were also important to JIT implementation; for instance, the company should have more trust in the suppliers. When asked about their relationship with suppliers and its impact on management accounting, the manager said:

> *"They add value to the chain. That will translate to the costing, translate to our profitability and our future prices set up as well. So the pricing set up at our corporate planning must have correlation with vendors. "* – **Company B**

Unlike others, Company D claimed that its adoption of more traditional MAPs was due to product simplicity and price being controlled by the government. More importantly, its position in the supply chain has to a certain extent impacted the application of simpler MAPs. When asked how the supply chain influences its MAPs, the manager explained:

> *"The business environment is totally different. The product is a basic necessity for the population. Price is also controlled by the government. Equally important, in a food chain; other companies might be in the final part or in the middle. We are in the beginning, i.e. the basic ingredient for others in food industry. We buy our main raw materials, of which it is from the commodity exchange. In commodity exchange, the price is determined by the market."* – **Company D**

The interviewees from Company C and E had rather dissimilar views. The managers said that SCM has no great impact on MAPs. The manager of Company C said that:

> *"I would say not so much (impact) because after all the way we value our product will still be the same. Not so much in terms of accounting practices that we are using."* **– Company C**

Lack of IT integration tools, hence less information shared, is understood to be the factor influencing traditional MAPs in Company C. The management of Company C acknowledged that they still apply more traditional MAPs as the use of an IT integration system is very much limited.

> *"We are relying upon our old system which is MRP based. To a certain extent, we are still using Microsoft Excel for our day to day operation especially for production, scheduling; based on Excel simulation."* **– Company C**

The respondent from Company E believed that SCM had more effect on the financial accounting and reporting side and less on the management accounting side.

> *"It has some contribution to a certain degree. In general, those elements (supply chain management) are more towards the efficiency and the quality of service that the business or company can offer. How these elements could influence accounting practice, I think not so much in terms of the attitude, but it will be translated in terms of numbers and performance of the business to help strengthen the culture of the business or company. That influences the magnitude or the numbers we are presenting in so far as influencing the reliability or fairness of the accounting presentation, it is more on ethical values and the professionalism of accountants. Probably what is unique is how we maintain accounting practice in the maritime industries is rather unique and different from other players."* **– Company E**

8.5.6 The sophistication level of MAPs

The IFAC four-stage evolution model provides an appropriate framework to classify the sophistication of MAPs that exist across the population of contemporary organizations. With reference to the IFAC model, all contemporary MAPs discussed earlier are associated with the higher stages; reduction of waste of resources in business processes (Stage 3) and creation of value through effective use of resources (Stage 4). The traditional MAPs are associated with the lower stages of the evolution model (Stages 1 and 2). The first stage represents a lack of sophistication and the fourth stage is the highest level of sophistication.

Of the six companies interviewed, only Company A explicitly recognized that the MAPs have shifted to stage four with the emphasis on value creation. According to the manager, the company's business objective is to manufacture and market the company's products in such a way as to create value to not only shareholders and consumers, but also business partners and the large number of national economies in which the company operates. The value created is hoped to be sustained over the long term. The manager noted:

> *"We are focusing on value creation. It's a value generating kind of culture. Sometimes, we have taken strategic and operational decisions; for example product innovation, promotions, etc., which were overdriven by short term growth and superficial marketing considerations. Simultaneously, we have had to write off millions of ringgit and make painful restructuring moves. So, value generation has to become a more important part of our culture. The emphasis on value creation is the main theme now."* **– Company A**

According to the manager, the management approach that relates to value creation is Value Based Management (VBM). It is the management approach that ensures corporations are run consistently on value (normally maximizing shareholder value). She added that VBM can maximize value creation consistently, increases corporate transparency, facilitates communication with investors, analysts and stakeholders, improves allocation of resources, and streamlines planning and budgeting. The company did rely on management accounting to provide the tools to make good decisions in creating value over time. The manager added her role as management accountant:

> *"The management emphasizes on this, because it is already within the company. We talk about it all the time. Maximizing value creation also means we have to increase the transparency. It helps organization to deal with market shares, competitors' advantage, cost cutting etc. So as management accountant, we want to emphasise on whether it adds value to the company, to the customers. "* **- Company A**

8.6 SCM, MAPs and firm performance

8.6.1 Impact of SCM on performance

It appears that all participating companies agreed that SCM is not only important for the efficient running of the business but most importantly it has positive long term effects on performance. This is not surprising given the fact that they recognised the importance of SCM in the first place. It is interesting to note the performance was centred on non financial measures. However, Company C only mildly agreed on the impact of SCM on performance, which is quite evidenced in its low SCM implementation.

According to the manager of Company A, there was a significant change in the company's performance since having SCM especially with regard to speed to market by the shortest route, quickest response time, ability in offering the freshest product and be at an industry-competitive cost. Apart from that, SCM helps in dealing with the process of Score Keeping Unit (SKU) rationalization[19]. The manager explained when asked whether and how SCM impacted performance:

> *"Yes, to a certain extent, it has. We have this process of SKU (Score Keeping Unit) product rationalization. We have to product-rationalize because of a range of products available. The SKU rationalization means for product which is not adding values, the management will decide to withdraw. Sometimes the product will come in, as we want to compete with competitor, at the same time when the product doesn't give any value; we will stop producing. The management cannot continue because it is adding cost to the company. So, when you talk about value creation, product rationalization comes into picture."* **– Company A**

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[19] Rationalization can occur at the commencement of a downturn in an organization's performance or results. It usually takes the form of cutbacks intended to bring the organization back to profitability and may involve layoffs, plant closures, and cutbacks in supplies and resources. It often involves changes in organization structure, particularly in the form of downsizing.

According to the manager, product rationalization is the process of justifying continued production or sales of a given item, based on a variety of factors such as its usage in single or multiple parents, use of dedicated production facilities, margin, number of customers, complement to other products, life cycle stage and others. It requires the capability to prioritize intangibles and to identify true cost drivers. This, according to her, emerged from the way the company conducted SCM activities.

Company B believed that due to its efficient and effective SCM implementation particularly on strategic partnerships with hundreds of suppliers, the company has been for years the number one national car producer and assembler in the country. The manager claimed:

> *"This company is successful in managing because we don't have issues in the failure like downturn. Other biggest automotive companies in the world have different sets of manufacturing practice. But we are end to end; from scrap metal to the auto metal until complete car whereas other company imported engines and steel; they are only assembler. We develop our own R&D (research and development); we develop our own modular parts, from drawing shape up to complete CBU (Complete Built-up units)."* **- Company B**

The positive impact of strategic supplier partnership on performance is also true in both Companies E and F. As for the maritime company, the trading partners offer their expertise in certain areas the company is lacking; which gives an advantage for the financial growth. With successful supplier relationship, delivery and quality performance will obviously enhance customers' satisfaction as evidenced in the telecommunication company. The following are comments from managers of Companies E and F respectively:

> *"Certainly it has contributed a lot to the financials of the company by having strategic partnerships because most of the partnerships that we enter into, probably all, is more to tap on the expertise various partners have in their areas, because there are areas that we specialize in and there are other areas that probably (e.g. in engineering) that our partners can offer. Rather than having a special business unit or business arm to cater for that project, we enter into this strategic partnership to grow our businesses. This is a way how we can do it more efficiently. So by opening to this ventures and channels, we are not restricting our business growth or earnings in certain areas. So far we have had successful ongoing partnerships." –* ***Company E***

> *"Yes, current relationship with suppliers impact us in terms of faster delivery of the acquired items as well better quality item delivered thus deployment to customers is faster reduced number of fault items and complaints from end customers*." **- Company F**

Performance is also viewed in terms of obtaining recognition as in the case of Company D. The high quality and strong customers' satisfaction are reflected in the quality award recognition. When asked whether SCM has significant impact on performance, the manager replied:

> *"I'm not too sure whether it has significant impact or not, but change, there is. From the time we have achieved ISO 9000, of which in 9000 the quality management system emphasize on, you know, almost everything with regards to the customers. We need to take into position what customers' wants. So, that's how we come out with customers' satisfaction reassured, with our policy. So, we do improve in the way for example our export customer. They come to us because we have all the quality system. We have all the system in place for example, HACCP (Hazard Analysis and Critical Control Point) the food safety management system. We are the first in Malaysia to achieve that certification." –* ***Company D***

However, the manager from Company C gave a dissimilar view, that SCM has little effect on the company's performance. According to the respondent, efficient SCM is considered as a business strategy to give more competitive price to customers but less so on improving business performance. Similarly, according to him, if the company had experienced problems in their SCM, it had not impacted performance too.

"It is part of the strategy, not so much impact on financial performance, but on how it can support our customer in terms of better pricing given to them. Also not so much impact on the supply chain. In fact the supply chain we know very well because as I said we work with the supplier and those suppliers that we have been working with for so many years and of course we know about the delivery time etc. I would say if delivery is due to the customer wanted the products earlier and then we have limited time. . That is something like kind of challenge but not so much of a failed delivery." – **Company C**

8.6.2 Impact of MA on performance

There were different views from the interviewees on the impact of management accounting practices on companies' performance. Company F agreed that MAPs do have some impact on their performance. On the other hand, the others viewed management accounting as more to supporting functions and helps managers to make better decision making and control and thus indirectly affecting performance.

The manager of Company F had a strong view that MAPs have a direct influence on performance. The manager said:

"Yes it does influence the performance of the company whether financially or non-financially. The management are better informed on the company performance and what action to take towards ensuring future growth. We had an increase in revenue and growth in a number of subscribers especially in focus service e.g. the broadband." – **Company F**

According to Company F, the introduction of customized service offering specifically in targeted area and the service offering is only available to the identified potential customer rather than mass market service offering. This initiative is addressing needs from specific customers which can be implemented with newly introduced MAPs of segment-based reporting. He further explained:

"For the location based reporting, it does impact the performance since effort is more focus towards ensuring customers retention and increase new

> *customers take up. However, for the other reporting initiatives, (it is) quite difficult to really measure the financial implication since it is still at the testing stage but there are some indicators which shows the positive impact."*- **Company F**

The function of management accounting is undoubtedly to help managers to make better decision making, planning and control. These are agreed by the majority of the interviewees, as reflected in the following statements:

> *"Accounting practices is more to supporting the system. Whenever management introduces a new methodology, it doesn't say that the other (old) one is failing. It just means an enhancement."* – **Company A**

> *"If we want to look at performance visibly, we have to have records on that. We have systems on that so that support system will show the impact of supply chain on that performance supported by the management accounting practices. Supply chain is the key, accounting is the support. We (accountants) are supporting the supply chain. To ensure the supply chain works, we need the data and that great details require by other areas. So management accounting is equally important."* – **Company B**

> *"No because as the finance head over here I would say much more sophisticated, integrated system will enable us to give a better recommendation to the management to a better decision. So, not so much in terms of the management accounting practices that is affecting. MAPs can support the management better in terms of decision making but not to say impacting the performance of the company."* – **Company C**

Additionally MAPs are also viewed as a tool that will improve cost transparency throughout the company beside used to optimize the incurrence of cost.

> *"Yes. To optimize cost. When we buy our raw materials, one of the things is the in foreign currency and quite number of other materials in foreign currency. The management needs to decide the currency position, the stocks, and the costing position. In fact, we do look into each costing position from last month, from the same month last year. That comparison, we do it every month."* – **Company D**

8.7 Summary of relationships between SCMPs, MAPs and Performance

Generally, all six companies agreed on the importance of both SCM and MA in business operations. With regard to SCM practices, all companies have shown to a certain extent some practices to encompass relationships with suppliers and customers and have described themselves as customer oriented. Companies have shown different levels of overall SCM practices; stronger SCM practices are found in Companies A and B, moderate levels in Companies D, E and F and a relatively low level for Company C. In terms of MAPs, Companies A, B and E showed themselves to have adopted more contemporary MAPs, Companies D and E employed less sophisticated MAPs while Company C uses largely traditional MAPs.

Table 8.1 and Table 8.2 summarise the level of companies' SCM practices and MAPs based on the research interviews.

Table 8.1: Level of companies' SCM practices and MAPs

	Company A	Company B	Company C	Company D	Company E	Company F
Dimension of SCMPs						
Supplier partnership	√√√	√√√	√	√√	√√√	√√
Customer relationship	√√√	√√√	√√	√√	√√√	√√√
Information sharing/quality	√	√√√	√	√	√	√√
Lean practices	√√√	√√√	√	√√	√	√
Postponement	√	√√	√	√√	√	√
Level of SCMPs	**HIGH**	**HIGH**	**LOW**	**MODERATE**	**MODERATE**	**MODERATE**
Dimension of MAPs						
Costing systems	√√√	√√√	√	√	√√	√√√
Budgeting	√√√	√√√	√	√√	√√	√√√
Performance evaluation	√√√	√√√	√√	√√	√√	√√√
Information for decision making	√√√	√√√	√√	√√	√√	√√√
Strategic analysis	√√√	√√√	√	√	√√	√√√
Open book costing	√	√√√	√	√	√	√√
Target costing / IOCM	√√	√√	√	√	√	√√
MAPs sophistication level	**HIGH**	**HIGH**	**LOW**	**MODERATE**	**MODERATE**	**HIGH**

Key:
√√√ high level of practice
√√ moderate level of practice
√ low level of practice

High level – scores high in at least three dimensions
Moderate level – scores moderate in at least three dimensions
Low level – scores low in almost all dimensions

Table 8.2: Companies' SCM practices and MAPs

Company	Summary of SCM practices	Summary of MAPs
A	Remarkable SCM practice and strong emphasis on SCM's importance with supply chain leadership, supply chain division, long term partners (local / international, long term partners, official distributors, branches, retailers, fully integrated system, highly implemented internal lean activities but less awareness on postponement.	Contemporary costing systems, budgeting, performance evaluation, information for decision making, strategic analysis. High level of practice of : Activity based costing, Target costing, Quality costing, activity based budgeting, budgeting for strategic plans, performance evaluation based on financial and non financial measures, benchmarking, customer profitability analysis, evaluation of major capital investments using non financial aspects, analysis of competitive position, value chain analysis, product life cycle analysis, integration with suppliers and customers value chains
B	Strong emphasis on Strategic Supplier Partnership, Effective full integrated systems with supply portals, ERP, super dealers, dealers, sub dealers, branches, impressive internal lean practices.	Emphasis is on more modern techniques and high levels of practice in almost all categories: costing systems, budgeting, performance evaluation, information for decision making, strategic analysis.
C	Low involvement in supply, less number of suppliers and customers, less integrated information system, low level of internal lean practices and postponement.	Heavily dependent on traditional MAPs (use of only a plant-wide overhead rate, budgeting for planning, Evaluation of major capital investments based on payback period and ARR), moderate practice of financial and non financial performance evaluation, product profitability analysis.
D	Fully integrated system, Close relationship with few suppliers and major customers, its position in supply chain as 'supplier' for others, moderate level of internal lean practices and postponement.	High level of traditional MAPs on; a plant wide overhead rate, Budgeting for planning and controlling and strategic plans, CVP analysis Performance evaluation use both financial and non financial measures, long range forecasting.
E	Implementation of SCM in every business unit, internal lean practices and postponement not relevant.	Moderate level on both traditional and contemporary MAPs but highly dependent on traditional approach like performance evaluation based on financial measures.
F	Strategic partner relationship (huge number of suppliers thus Supplier Management Unit), internal lean practices and postponement not relevant, little evidence on some SCM dimensions.	High levels of implementation in Activity based costing, performance evaluation using both financial and non financial measures, moderate levels in budgeting, high levels in information for decision making and strategic analysis.

Company A indicates a very impressive appreciation of SCM and its importance with a formal and systematic way of managing its SCM. With its own supply chain function and supply chain leadership theme, efforts can be focused on establishing stronger relationships with external parties. There is much evidence that this company has long term strategic supplier partnerships and close customer relationships. Freshness of food products is the key criterion in meeting customers' preferences; indicating a very time based thinking. Thus, the company emphasizes established long term partnerships with its own official distributors. The company's SCM strategy is to ensure the right products are supplied to customers in the right quantity, the right quality and the right condition, at the right time and at the right cost. To achieve stronger SCM practices, the company believes in 'Team and People development'. Commitments from all level of employees are essential so that efficient SCM can be implemented. Therefore to support the implementation of SCM, the company strongly believes that its management accounting systems must be capable of identifying costs and value adding processes across its organizational boundaries. The company thus implements more sophisticated MAPs with a value creation theme, indicating evidence of the use of more contemporary MAPs such as ABC, target costing and inter-organizational cost management

Company B has similar emphasis on SCMPs in which the company perceives the SCM application based on its IT interface. With strong commitment on strategic supplier and customer relationships, the company utilises effective and fully integrated systems with supply portals. Their impressive internal lean practices were evident in the implementation of more modern MAPs in their costing systems, budgeting, performance evaluation, information for decision making and strategic analysis.

The total involvement in supply chain management of Companies D, E and F is considered as moderate. For instance, Company D claimed its level of SCM is influenced by its single and simple product and the fact that the price of its product is fixed and controlled by the government. As these companies indicate a more moderate level of SCMPs, their MAPs are also less sophisticated compared to Companies A and B. These companies show evidence of predominantly traditional MAPs being implemented.

With low involvement in supply and thus fewer suppliers and customers and a less integrated information system, Company C is considered as practising a low level of SCM. The company is heavily dependent on traditional MAPs (use of only a plant-wide overhead rate, budgeting for planning, evaluation of major capital investments based on payback period and ARR), moderate practice of financial and non financial performance evaluation, product profitability analysis.

It is also important to note that the majority of companies do not share cost information with their suppliers and customers and this is evidenced in not implementing open book costing. This might be because information disclosure is perceived as a risk and a loss of power. Additionally, the environment in which they are operating requires them to show more trust and this has not been developed yet in all companies.

8.8 Conclusion

This chapter has discussed the results from the semi-structured interviews as an important source of triangulation. The similarities and differences between companies in terms of their practices of SCMPs and MAPs, impact of SCMPs on MAPs and subsequently both their impact on performance were explored. The final chapter discusses some of the conclusions that can be derived from the results of the data analysis phase of the research consisting of both the survey questionnaire and semi-structured interviews and the overall study in general. It outlines a number of perceived limitations of this research, while indicating areas where future research may prove fruitful.

9 DISCUSSIONS AND CONCLUSIONS

9.1 Introduction

This final chapter discusses, summarises and concludes all findings from the questionnaire survey and the interviews. The chapter provides implications of the research findings, particularly the implications arising out of the results of the hypothesis testing outlined in Chapter Seven. The tasks were performed with reference to previous academic literature surrounding the relevant issues under consideration.

This study has firstly investigated the current state of SCMPs and MAPs. Secondly, the study also examines the relationship between SCMPs, MAPs and their links to firm performance. Thus, the chapter begins with discussion of the descriptive analysis (Chapter 5) followed by discussion of the conceptual models and hypothesis testing (Chapters 6 and 7) and interview analysis (Chapter 8) at the end of which a summary of key findings is provided. Finally, the chapter puts forward major contributions, limitations of the study and recommendations for future research.

9.2 Discussion of descriptive analysis

This section discusses findings from the descriptive analysis in order to answer the first research objective, comprising two research questions;

RQ1: What is the extent of supply chain management practices in large firms?
RQ2: What is the extent of management accounting practices in large firms?

9.2.1 Supply chain management practices

The survey results generally reveal high levels of practice in companies' external relationship with suppliers (Strategic Supplier Partnership (SSP)) and customers

(Customer Relationship (CR)) and Internal Lean Practices (ILP), a moderate level of practice in information sharing (IS) and information quality (IQ) and a low level of practice of postponement (POS).

With regard to companies' practice with upstream suppliers(SSP), the findings indicate high levels of practice particularly in firms' long-term relationships with suppliers, selecting suppliers based on their quality and solving problems jointly with suppliers. The findings support previous research findings that long-term association (Monczka *et al*., 1998; Chen *et al*., 2004) supplier selection, mutual planning and problem solving efforts, have an important role in SCM (Wisner, 2003; Mahama, 2006; Lee *et al*., 2007). The findings also reveal that high levels of practice in customer relationship (CR) include handling formal and informal complaints, interacting with customers to set reliability, responsiveness and other standards and making follow-up with customers for quality or service feedback. These support the view that firms are responsive to customers' changing requirements and preferences, indicating support for prior studies (Min and Mentzer, 2004; Li *et al*., 2005; Jeong and Hong, 2007).

Consistent with Li *et al*.'s (2005) study, the findings indicate that firms in an SCM environment strongly recognize internal lean practices (ILP) through elimination of waste. Types of internal lean practices mostly implemented are 'continuous quality improvement', 'reduction of set-up time' and 'push suppliers for shorter lead-times' and 'pull production system'. This agrees with the perspective that lean practices could improve the internal process of a firm in line with the principles of JIT supply suggested by Womack and Jones (1996), Cooper and Slagmulder (1999), McIvor (2001) and Burgess *et al*. (2006).

With regard to information sharing (IS) and quality of information shared (IQ), it was found that firms on average demonstrate moderate levels of practice. The most highly adopted practices are informing trading partners in advance of changing needs, keeping each other informed about events or changes that may affect the other partners and ensuring trading partners are fully informed about issues affecting the business. The findings demonstrate the importance of information sharing in SCM emphasized by many researchers (Balsmeier and Voisin, 1996; Mentzer *et al*., 2001; Tan *et al*., 2002; Fawcett *et al*., 2007). However, the lesser level of practice in IS compared to SSP, CR and ILP is probably due to the built-in reluctance among firms to share more than minimal information (Tomkins, 2001) or the perception that information disclosure as a loss of power (Monckza *et al*., 1998; Li *et al*., 2006).

Unlike other SCM practices, firms exhibit relatively low levels of practice in postponement (POS). It appears that there is a low level of customization of products at later stages of production, probably due to issues associated with postponing, such as losing customers (Graman and Magazine, 2006). It might also be due to the inappropriateness of its adoption in conditions like high demand uncertainty and highly specialized production (Van Hoek e*t al*., 1999).

9.2.2 Management accounting practices

Generally, the analysis demonstrates some significant and interesting results; that traditional MAPs were still largely emphasized over some more sophisticated techniques. However, the interviews appeared to reveal that the more sophisticated and contemporary techniques (IFAC Stage 4) were the least emphasized. It was found that the top ten highly emphasized MAPs include three Stage 1 (Cost Determination and

Financial Control) MAPs; ‘performance evaluation based on financial measures’, ‘budgeting for controlling costs’ and ‘ a plant wide overhead rate’. Six Stage 2 (Provision of Information for Management Planning and Control) MAPs were also listed under the top ten highly emphasized practices. They are ‘product profitability analysis’, ‘separation between variables and fixed costs’, ‘budgeting for planning’, ‘CVP analysis for major products’, ‘performance evaluation based on non financial measures related to operations’ and ‘departmental overhead rates’. There was one Stage 4 (Value Creation) MAP that was listed in this category, that is, ‘performance evaluation based on non financial measures related to customers’.

The above finding is somewhat consistent with previous research, and hence the result is unsurprising. Similar findings have been reported in many countries including MAPs in developed countries. In the UK food and drinks industry, Abdel-Kader and Luther (2006b) reported that traditional MAPs were found to be more commonly adopted. Traditional MAPs were also widely adopted in Australian (Chenhall and Langfield-Smith, 1998) and New Zealand (Adler *et al*., 2000) manufacturing companies. Direct costing was widely practised and with regard to decision making, budgeting for controlling and planning purposes are still highly emphasized (Innes and Mitchell, 1995; Libby and Waterhouse, 1996; Haldma and Lääts, 2002; Hoque, 2004). When compared to prior research in emerging economies like China and India, although they have shown changes in MAPs, they are still heavily relying on traditional MAPs (Anderson and Lanen, 1999; Joshi, 2001; Yin and Lu, 2002; Wu *et al*., 2007). In south-east Asia, Sulaiman *et al*. (2004), Ghosh and Chan (1997) and Phadoongsitthi (2003) have indicated high emphasis on the use of traditional MAPs in Malaysia, Singapore and Thailand respectively.

Interestingly, the results also reveal, some MAPs related to Stage 4 are being adopted and this may be in the larger and more innovative organizations. They are ‘inter organizational cost management (IOCM)’, ‘customer profitability analysis’, ‘analysis of competitive position’ , ‘industry analysis’ and ‘benchmarking’. The above results signify the growing importance of cost management involving managing supplier and customer costs in coordinated cost reduction programmes (Cooper and Slagmulder, 1999: 2002; Kulmala *et al*., 2002). The development of IOCM that crosses the organizational boundary between buyers and suppliers with the objective of reducing costs through collaborative efforts was supported by Cooper and Slagmulder (2004) and Coad and Cullen (2006). The increased emphasis on and the growing importance of non-financial measures is consistent with earlier research including studies conducted by Ittner and Larcker (1998), Chenhall and Langfield-Smith (1998), Hoque (2004) and Hyvönen (2005). Likewise, the results are also consistent with studies on the use of non-financial measures in the supply chain environment (Gunasekaran *et al*., 2001; 2004; Fynes *et al*., 2005; Chow *et al*., 2008). The findings confirm the importance of financial measures supplemented with non-financial measures, particularly measures related to customers; an important party in the downstream side of a supply chain.

With respect to any increased emphasis on newer MAPs, Hyvönen (2005) discovers a greater emphasis on newer practices, despite the fact that financial measures like product profitability analysis and budgeting for controlling costs are still important. The findings also agree with Wu *et al*. (2007) who found that, in China, newer techniques like target costing and product life cycle are emphasized despite traditional MAPs being widely used. More importantly, this finding extends the results discovered by Abdul Rahman *et al*. (1998) and Sulaiman *et al*. (2004) in Malaysian firms; the more sophisticated MAPs are gaining favourable acceptance and there is a positive trend towards the implementation of these new techniques in the future.

The analysis also illustrates that some contemporary and more sophisticated techniques under Stage 3 (reduction of waste in business resources) and Stage 4 are less emphasized. They are 'activity-based costing' and 'activity based budgeting', quality costing, and 'target costing', 'open book costing'. This is probably true because firms may not be familiar with the value chain concept, as SCM involves the inclusion of the entire supply chain network in contrast with the internal focus typically adopted in traditional MAPs. The findings show that ABC is not widely emphasized, despite its popularity in academic research (Dekker and Van Goor, 2000; Stapleton *et al*., 2004; Askarany *et al*., 2010). This low emphasis might be due to its difficulty in practical use, lack of expertise and management support in companies and the high cost of developing and implementing it (Adler *et al*., 2000; Waldron, 2005; Chenhall and Langfield-Smith, 1998a).

Certain conditions must be present for successful implementation of Open Book Costing. The technique is most likely to work in trust-based network relationships and in long-term hierarchical networks. Therefore, the least emphasis on and low implementation of Open Book Costing are apparent from this study, probably because there is a lack of trust and communication among the parties involved (Seal *et al*., 1999; Tomkins, 2001; Kajüter and Kulmala, 2005; Free, 2008). Their lack of awareness and readiness to change the corporate culture might also contribute to this (Tomkins, 2001; Kajüter and Kulmala, 2005).

Although traditional MAPs are still in place regardless of the shift to more modern MAPs, companies are moving from Stages 1 and 2 (less sophisticated) to Stages 3 and 4 of MA evolution. It was also found, from cluster analysis, that out of 82 companies, 20 firms (24%) are believed to be in Stage 1 (CDFC), 25 firms (31%) in Stage 2 (IPC), 24 firms (29%) in Stage 3 (RWR) and 13 firms (16%) in Stage 4 (CV) of management accounting sophistication. Nearly half of the responding firms have some MAPs in either Stage 3 or Stage 4. It can be concluded that MAPs in large Malaysian firms are moving from the simple, or naive, role of CDFC towards a more sophisticated role in the creation of value through effective resource use. This is perhaps a plausible finding because as these companies implement a high level of SCMPs, their MAPs seem to shift to more contemporary ones.

Although it is observed that MAPs from Stages 1 and 2 were mostly emphasized, there are techniques from these stages that appear to be losing emphasis; they are ‘evaluation of major capital investments based on payback period’, ‘budgeting with what if analysis’, ‘evaluation of major capital investments based on DCF’, ‘flexible budgeting’, ‘regression and/or learning curve techniques’. This may be because of the lack of practical applicability of some theoretical techniques or that for some long term techniques, the data is rarely available.

In summary, the findings from current study are quite consistent with those reported in previous research in both developed and emerging economies conducted over a decade ago confirming the popularity of the use of traditional MAPs and the growing emphasis on SCM-related MAPs. There has been greater recent emphasis on Stage 4 techniques because they had not been discussed 15 years ago.

9.3 Discussion of hypothesis testing

This section discusses findings from hypothesis testing in order to answer the next four key research questions;

RQ3:	**Are supply chain management practices directly positively related to management accounting practices?**
RQ4:	**Are supply chain management practices directly positively related to supply chain performance and firm performance?**
RQ5:	**Are management accounting practices directly positively related to supply chain performance and firm performance?**
RQ6:	**Is supply chain performance directly positively related to firm performance?**

In Conceptual Model 1, the aim was to evaluate SCM practices as contingent factors influencing MAPs and performance. The model then examined linkages between SCMPs, MAPs, SCPERF and OPERF. Furthermore, the research model aimed to position management accounting within an established SCM model proposed by Li *et al*. (2006). Following on from this, the focus shifts to the series of hypotheses outlined in Conceptual Model 2A and Conceptual Model 2B which seek to explore in greater detail a series of issues surrounding the different level of MA sophistication with reference to IFAC Framework (1998) and previous MA sophistication studies (Gerdin, 2005; Tillema, 2005; Abdel-Kader and Luther, 2008). As far as the author is aware, this research study represents the first attempt at achieving such aims. The relationships between the constructs have been explored via Partial Least Squares path analysis. Chapter 7 has presented the results of the hypotheses testing performed within the context of all conceptual models outlined earlier (see Figure 7.2, Figure 7.7 and Figure 7.9).

Based on the EFA results and assessment of measures in the measurement model, all constructs and sub-constructs have adequate convergent and discriminant validity.

Some measures, nevertheless, were removed in the validation of measurement model stage due to low loadings. The future orientation and importance of customer relations (Gunasekaran *et al.*, 2008; Chow *et al*., 2008; Wisner, 2003; Tan *et al*., 1998) are evidenced, in that its measurement items were split into two distinct variables; Customer Relationship and a new factor named as 'Strategic Customer Relationship' (SCR). Interestingly, the findings show that the measurement items for distinct variables, Information Sharing (IS) and Information Quality (IQ), are merged into one factor, which was later renamed as 'Information Management'. The variables are not treated as independent constructs, contrary to Li *et al*.'s (2005) findings. The POS construct was also removed after it did not meet the prerequisite for second order validity testing. The assessment of the measurement model for this practice also shows that the variable is not a strong indicator of SCM practice compared to the other five dimensions, consistent with Li *et al*. (2006, p.115). As a result, the dimension was subsequently removed from further analysis.

The study has shown that SCM practice forms a second-order construct composed of the first-order constructs of SSP, CR, SCR, IM and ILP; they are considered as major components of SCM practice in this study. These results confirm that these SCM practices form the essence of SCM dimensions (Tan *et al*., 1998; Chen and Paulraj, 2004; Li *et al*., 2005; 2006; Koh *et al*., 2007; Chow *et al*., 2008).

9.3.1 SCMPs and MAPs

Strong empirical support for the relationship between SCMPs and MAPs (H1) was found in Conceptual Model 1 ($\beta = 0.467$; $t = 4.7790$) which indicates that the extent of emphasis on SCM practice is directly positively associated with the emphasis on MAPs.

This finding is further supported by Conceptual Model 1 sub-test II ($\beta = 0.471$; $t = 4.6830$, see Figure 7.4) and Conceptual Model 1 sub-test III ($\beta = 0.473$; $t = 5.1060$, see Figure 7.5). In all tests, this hypothesis was supported at p-value < 0.01. In line with prediction, the findings indicate that the higher the extent of emphasis on SCM practice, the greater the emphasis on MAPs. This result confirms the impact of SCMPs in influencing the adoption, importance and thus emphasis of MAPs as documented in previous research.

Berry *et al*. (1997), Seal *et al*. (1999), Dekker and Van Goor (2000), Caglio and Ditillo (2008) and Askarany *et al*. (2010) in their studies, for instance, reported that management requires accurate and timely information on supply chain activities and costs. As networking places a number of demands on cost management, this information is crucial for firms to determine how best to allocate these costs among suppliers, customers, products, services and other important cost objects, including information about efficiency and quality of tasks performed. Furthermore, in an SCM environment, more detailed MA information is required to reduce the costs of the supply chain; this is dependent on the ability of the firm to trace costs accurately to specific products, customers, supply chain and other logistics activities. Cost information plays a role in strategic sourcing decisions (SSP) and will also influence the ongoing management of partnerships. The detailed cost analysis is important for the buyer to understand the cost structures of their suppliers. Agndal and Nilsson (2009) reveal the importance of suppliers' management accounting in earlier activities in inter-organizational cost management processes, including supplier selection, joint product design and joint manufacturing process development.

Likewise, the finding implies that MA information is required to build collaborative networks to coordinate and integrate the supply chain (Seal *et al.*, 1999: 2004; Sahay, 2003; Ramos, 2004; Seuring, 2006). A cost management system could be structured to coordinate activities in the chain with the aim of reducing cost (Kulmala *et al*., 2002) and improving other factors (Mouritsen and Thrane, 2006) such as improving the ability of the supply chain to serve its customers better and focus on customer satisfaction. Cost reductions could be done through improved product design, improved efficiency in the manufacturing process and increased efficiency of the interface between buyers and suppliers (Cooper and Slagmulder, 2003). Increasing complexity as a result of close relationship with firms' suppliers and customers requires additional reporting on supply chain issues. Therefore, there is a need to integrate accounting information, specifically MA information (Cooper and Slagmulder, 2004). Consequently, MA instruments need to be applied in SCM to manage and control the chain, which eventually enables closer ties between firms.

Management accounting is also part of management control mechanisms and processes used to support, plan, measure and assess the supply chain activities (Van der Meer-Kooistra and Vosselman, 2000; Mouritsen *et al*., 2001; Dekker, 2004; Coad and Cullen, 2006; Chua and Mahama, 2007). The need to integrate accounting with other functions in organizations implies that SCM practices are associated with the emphasis on MAPs.

The sophistication level of MAPs was also explored in greater detail in Conceptual Models 2A and 2B (tested via Hypotheses 1a – 1d). It was predicted that the extent of emphasis on SCMPs is positively associated with MAPs which support CDFC (H1a), IPC (H1b), RWR (H1c) and CV (H1d). The findings provide support for these relationships. The results indicate that the extent of emphasis on SCMPs has a positive association with all MAPs regardless level of sophistication (in Conceptual Model 2A, H1a : $\beta = 0.351$; $t = 3.6125$; H1b : $\beta = 0.442$; $t = 4.7514$; H1c : $\beta = 0.369$; $t = 3.5620$; H1d: $\beta = 0.511$; $t = 5.6441$; in Conceptual Model 2B, H1a : $\beta = 0.363$; $t = 3.7874$; H1b : $\beta = 0.453$; $t = 5.0465$; H1c : $\beta = 0.369$; $t = 3.4408$; H1d: $\beta = 0.511$; $t = 5.6919$). Although these suggest significant direct relationships between the SCMPs construct and all levels (Stage 1 to 4) of MA evolution, interestingly, the impact on most sophisticated MAPs (CV) was the strongest, indicated by the highest / strongest beta path coefficient (H1d: $\beta = 0.511$; $t = 5.6919$). It might imply that the traditional cost management, as suggested by Kulmala *et al.* (2002) and Seuring (2006), is limited in scope and not fully able to take into account the supply chain perspective.

Various researchers have previously published results supporting this perspective. The emphasis on more modern MAPs was documented in a number of SCM writings. For instance, value-chain analysis and activity-based information can provide relevant information about activities across the entire chain of value-adding activities (Dekker and Van Goor, 2000; Axelsson *et al.*, 2002; Dekker, 2003; Agndal and Nilsson, 2007; Askarany *et al*., 2010). Value chain analysis in the SCM framework exploits linkages with suppliers and customers and the entire set of linked activities from raw material suppliers to ultimate customers (Dekker, 2003). In the value chain analysis, the strategic questions are asked for each value activity.

More specific control mechanisms, more modern MAPs, cost and accounting information exchanges as potential channels for partners control appear to be contained within the value chain analysis (Dekker, 2003) and the inter-organizational cost management methodologies (IOCM) (Cooper and Slagmulder, 2004; Coad and Cullen, 2006) including target costing (Ellram, 2002). Management accounting should take advantage of the cost reduction synergies that exist across the supply chain achieved by coordinating the cost reduction activities (Cooper and Slagmulder, 1998) as the aim of IOCM is to find lower-cost solutions than would be possible if the firm and its buyers and suppliers attempted to reduce costs independently. Kajüter and Kulmala (2005) and Agndal and Nilsson (2010) also suggested that there is a necessity for open book accounting. Openness is needed if customers and suppliers are to share profit. Creating mutually accepted management accounting principles is one of the challenges partnership posed for cost management. This implies that differences in MA sophistication could be significantly explained by SCMPs.

It was revealed that the reverse impact (relationship between MAPs to SCMPs) (β = 0.5605; t = 5.2727) was also significant. The findings highlight the growing importance of the management accounting system's role in influencing and supporting SCM (Berry e*t al*., 1997; Ramos, 2004). Thus, management accountants are being challenged to create SCM measures for these value chain activities. This challenge is also an opportunity to expand MAPs (specifically activity-based management (ABM) metrics to include supply chain activities). It implies that accounting is part of the network (accounting exists not only as a set of techniques, but also important is how accounting influences interactions in the network (Mouritsen *et al*., 2001). This perspective is also consistent with Seal *et al*. (1999), who reveal that the specification and sharing of cost data can play a central role in inter-organizational negotiations. Both sides in a manufacturing partnership learn about and respect each other's financial and commercial constraints and objectives. Both in inter and intra-organizational environments, accounting may play a constitutional role in the establishment and management of trusting and collaborative business relationships (Tomkins, 2001; Dekker, 2004).

In summary, the results provide strong support for Hypothesis 1, thereby supporting the suggestion that in Malaysian large firms, SCMPs can potentially have a positive influence on MAPs. Consequently firms must ensure they develop appropriate MAPs capable of providing such information as and when required by management. The comparison of the research findings with those of previous studies indicates that examination of the effect of the individual dimensions of SCMPs on MAPs was not sufficient.

9.3.2 SCMPs and SCPERF

Hypothesis 2 proposed that SCMPs has a positive association with supply chain performance and was tested on four separate occasions (see Table 7.13). The relationship between SCM practices and supply chain performance (H2) was found to be significant in Conceptual Model 1, ($\beta = 0.349$; $t = 3.3028$) and further supported in Conceptual Model 1 sub-test I ($\beta = 0.36564$; $t = 2.9997$), Conceptual Model 2 ($\beta = 0.451$; $t = 5.1156$) and Conceptual Model 2 sub-test I ($\beta = 0.380$; $t = 3.6279$). In each instance the hypothesis was supported at p-value < 0.01. The positive and consistent results from these tests empirically confirm the theoretical notion that a well-managed and well-executed supply chain directly leads to improved supply chain performance.

Consistent with previous research, the implementation of various SCM practices such as SSP, CR, IM and ILP may lead to improved supply chain flexibility (Beamon, 1998:

1999; Gunasekaran *et al*., 2004; Fynes *et al*., 2005), supply chain integration (Frohlich and Westbrook, 2001; Cagliano *et al*., 2006), supplier performance (Beamon, 1998; Tan *et al*., 1998; Gunasekaran *et al*., 2001) and customer responsiveness (Van Hoek *et al*., 1999; Chan *et al*., 2003; Chen *et al*., 2004). Information sharing and adoption of internal supply chain activities such as lean production model have a strong influence on integration, leading to improved supply chain integration (Li, 2002; Wisner, 2003; Cagliano *et al*., 2006; Fawcett *et al*., 2007; Gunasekaran *et al*., 2008).

This perspective is also supported by Fynes *et al*. (2005), who claim that by developing and engaging in deep partnership types of supply chain relationships, suppliers could improve integration and supply chain flexibility. It has also been suggested that SCMPs through integration of suppliers increase supplier performance and increase the level of customer responsiveness (Gunasekaran *et al*., 2001; Chan and Qi, 2003). Common SCM practices include coordinating production and inventory policies thus by adopting a linked production schedule, different businesses can minimise their stock holdings and promote JIT manufacturing while shortening response time (Kim, 2009).

The findings indicate that firms have already identified untapped opportunities through supply chain integration with customers, suppliers and internal stakeholders. Such results provide management with innovative insights for planning and executing applicable supply chain strategy. The implication of this is that management will be able to pursue better supply chain strategies applicable directly to their business environment (Lee *et al*., 2007).

This result confirms the importance of strategic supplier partnership, customer relationship, strategic customer relationship, information management and internal lean practices (Mentzer *et al*., 2001). The importance of coordination is also emphasized, as a key to coordination of information and materials is closer relationships with suppliers and customers. Customers are demanding products consistently delivered faster, exactly on time and with no damage. This necessitates closer relationships with suppliers and distributors. Getting a defect-free product to the customer faster and more reliably than the competition is no longer seen as a competitive advantage but simply a requirement to be in the market. This suggests that to face the challenges of globalisation and to remain competitive, companies should consider implementing SCM. Building long term partnership relations with suppliers and customers also helps to improve the flexibility of the supply chain by creating mutual understanding among trading partners. As a consequence, SCM has also been considered as the most popular operations strategy for improving organizational competitiveness in this century (Wisner, 2003; Li *et al.,* 2006; Gunasekaran *et al.,* 2008).

SCMPs can lead to high levels of SCPERF dimensions. It is generally agreed that a well defined supply chain linkage has been a key determinant to improve supply chain performance across a wide range of industries. In summary, working cooperatively with suppliers, according to Tan *et al.* (1998), could lead to cost reduction by enhancing manufacturing efficiency and supporting new product development efforts (Morgan and Monczka, 1996).

The findings also reveal that SCPERF is an important mediator of firm performance. It plays a significant role as an intermediate factor in the linkage between SCM practices and firm performance and between management accounting practices and firm performance (Tan *et al.*, 1998; Li, 2002; Chan *et al.*, 2003). SCMPs have also statistically significant indirect effects on SCPERF through MAPs at a p-value <0.1 (β = 0.1046; t = 1.7918). The findings reaffirm that integrating the internal functions within firms and effectively linking them with the external operations of suppliers, customers and other trading partners directly and indirectly increases supply chain performance.

9.3.3 SCMPs and OPERF

Hypothesis 3, on the relationship between SCMPs and OPERF, was tested on five separate occasions (see Table 7.13). Four out of five hypotheses were not statistically supported in any instance above, despite positive beta path coefficients (predicted directions). The respective results of each of these four tests are as follows: Conceptual Model 1 (β = 0.084; t = 1.0184), Conceptual Model 1, sub-test I (β = 0.0730; t = 0.8490), Conceptual Model 2A (β = 0.084; t = 1.0412) and Conceptual Model 2B (β = 0.003; t = 0.0357). Hypothesis 3 is therefore not supported and SCMPs, in this particular circumstance, do not appear to have a positive association with firm performance. The finding seems unanticipated at first, since SCM practice has been widely recognized in the literature as important to the success of a firm. Indeed, numerous empirical studies (see e.g. Wisner, 2003; Fynes *et al*., 2005; Li *et al*., 2006; Koh *et al*., 2007; Chow *et al*., 2008) have argued that if managed appropriately, a firm's SCMPs can directly positively affect their business performance. Nonetheless, the results demonstrate that SCMPs has a significant positive indirect effect on OPERF through SCPERF (β = 0.2241; t = 3.0344) at a p-value < 0.01. This implies that SCPERF is an important mediator linking SCMPs and overall firm performance.

As hypothesis 3 is unsupported, this outcome implies that SCMPs do not appear to impact directly on the organizational performance of Malaysian Consumer and Industrial products Sector firms. Although this finding is at odds with previous research in this area, it does not of course provide categorical proof that a firm's SCMPs is of little or no benefit in contributing to its overall firm performance. The SCMPs construct utilised here is fairly parsimonious and it is probable that the SCMPs construct fails to capture some of the complexity of this key construct. This suggests that increase in OPERF may have been influenced directly by other factors (see section 9.3.5, results of Hypothesis 6). Fabbe-Jahre and Costes (2007) argued that SCMPs do not necessarily have a significant direct effect on firm performance.

However, the results of Conceptual Model 1 sub-test II ($\beta = 0.334$; $t = 3.4596$) was contradictory (showing a significant positive direct association) when the SCPERF construct was removed. This lends some support to the view that SCMPs can impact positively on overall firm performance (e.g. Li *et al.*, 2002; Wisner, 2003; Koh *et al.*, 2007). Based upon these collective results, partial if weak, support for hypothesis 3 could be proposed. This significant relationship indicates that in the absence of SCPERF construct, SCMPSs and OPERF alone shows a positive relationship (the one occasion in which Hypotheses 3 is supported). The results suggest that the impact of MAPs on OPERF may be stronger when not influenced by the SCPERF construct (refer Figure 7.4 and 7.5) as well as SCMPs (refer Figure 7.4). This is true as Fabbe-Costes and Jahre (2007) have cautioned that the lack of empirical evidence could not permit us to conclude SCM directly improves performance. This is because SCM, integration and performance are defined, operationalised and measured in different and limited ways. Implicitly, the precise role occupied by SCMPs and MAPs within the Malaysian

Consumer and Industrial sector requires further research, bearing in mind that OPERF is a notoriously difficult measure to capture unambiguously and this can be influenced by many variables in any economy, especially one which is developing and somewhat volatile.

9.3.4 MAPs and SCPERF

Management accounting practices have been proposed to have a positive influence on performance related to supply chain such as supply chain flexibility, supply chain integration, supplier performance and customer responsiveness. In Conceptual Model 1, the relationship was found to be significant ($\beta = 0.224$; $t = 1.9327$). The finding is also supported by Conceptual Model 1 sub-test I ($\beta = 0.1960$; $t = 1.8195$). Both relationships are significant at p-value < 0.05. The result implies that the higher the emphasis on MAPs, the higher the SCM performance.

The finding is consistent with Abdel-Maksoud (2004) and Abdel-Maksoud *et al.* (2008), who found that management accounting techniques like benchmarking of performance, ABC, Balanced Scorecard (BSC), Economic Value Added (EVA), strategic management accounting and customer profitability analysis have an impact on supply chain related performance such as flexibility, on-time delivery and efficiency. Some techniques, like target costing and ABC, are extended to suppliers to identify needs for cost reduction because it becomes the aim for both parties (Ellram, 2002). The cost reduction programme will eventually lead to supplier integration and improved supplier performance. This perspective is also supported by Kannan and Tan (2005) who proposed that approaches like JIT improve supply chain performance. Increase in MAPs usage leads to improved SCPERF (Li, 2002; Wisner, 2003; Gunasekaran *et al*., 2008; Kim, 2009).

Relating to the different sophistication levels of MAPs, the findings of the relationship connecting the IPC construct (Stage 2 MAPs) to the SCPERF construct ($\beta = 0.369$, $t = 1.7855$) and the RWR construct (Stage 3 MAPs) to the SCPERF construct ($\beta = 0.292$, $t = 1.3915$) offer some support for the hypotheses. The results indicate that IPC and RWR significantly influence SCPERF but it was found that MAPs which support CDFC (Stage 1 MAPs) and CV (Stage 4 MAPs) do not significantly influence MAPs. This finding implies that most sophisticated MAPs do not necessarily have a significant impact on SCPERF in this study.

The findings also reveal that SCMPs increases SCPERF indirectly via MAPs. Besides the direct impact of SCM practice on supply chain performance (H2), hypotheses 1 and 4 jointly suggest an indirect relationship between SCM practice and supply chain performance through MAPs. Therefore it can be concluded that SCM practice influences supply chain performance both directly and indirectly.

9.3.5 MAPs and OPERF

Hypothesis 5 proposed that MAPs has a positive direct influence on overall firm performance. However, this relationship was found to be non-significant in three tests ($\beta = -0.005$; $t = 0.0537$); Conceptual Model 1 Sub-test 1 ($\beta = 0.0230$; $t = 0.1927$), CM sub-test 2, ($\beta = 0.137$; $t = 1.1504$. Within this context, the findings illustrate that MAPs have no direct positive influence on overall firm performance. As Hypothesis 5 is rejected, this outcome implies that management accounting practices do not appear to impact directly on overall firm performance. Although prior research has reported mixed findings on the impact MAPs have on firm performance, the finding from this study is inconsistent with some management accounting studies (see e.g. Gul and Chia, 1994; Mia and Clarke, 1999; Hoque and James, 2000; Chenhall and Langfield-Smith 1998b; Adler *et al*., 2000). This may be explained by the primary role of MAPs more directly linked to planning and controlling; thus they indirectly increase performance. MAPs can be conceptualised as one of the most important parts of an organization's formal planning and control systems designed for providing information useful for managers (Chenhall, 2003; 2007). Studies conducted by Sim and Killough (1998) and Gordon and Silvester (1999), for instance, reported that MAPs showed no evidence of improved firm performance directly. The finding confirms, however, that MAPs have a statistically significant indirect effect on the OPERF construct via the SCPERF construct ($\beta = 0.1438$; $t = 1.8745$) at a p-value < 0.1.

It was found that when SCPERF and the link from SCMPs to OPERF were removed in Conceptual Model 1 sub-test III, the relationship between the two constructs was significant ($\beta = 0.295$; $t = 3.0964$) indicating some support to prior research findings that MAPs have a positive influence on firm performance, particularly in the form of a contingency framework (Mia and Clarke, 1999; Hoque and James, 2000; Luther and Longden, 2001; Hoque, 2004; Cadez, 2007; 2008; Ajibolade *et al*., 2010). Further research is thus recommended on this issue.

Further, the findings show that the most contemporary MAPs (Stage 4 Value Creation (CV)) have a strong positive association with overall firm performance ($\beta = 0.420$; $t = 2.9668$). This study found evidence in support of earlier findings (e.g. Kennedy and

Affleck-Graves, 2001; Baykasoglu and Kaplanoglu, 2008; Ajibolade *et al.*, 2010; Askarany *et al*., 2010) that the level of sophistication of MAPs will improve the overall firm performance. A body of the literature suggests that modern management accounting techniques for instance ABC can contribute to organizational performance where firms adopting ABC techniques outperform non-ABC firms (Kennedy and Affleck-Graves, 2001; Askarany *et al*., 2010). Ittner and Larcker (2001) and Baykasoglu and Kaplanoglu (2008), for instance, have reported that more modern MAPs can improve organizational performance by helping organizations to become more efficient and more effective; providing organizations with a clear picture of where resources are being spent, customer value is being created, and money is being made or lost; offering organizations a better alternative to volume-based product costing; identifying value-added activities and eliminating or reducing non-value added activities.

9.3.6 SCPERF and OPERF

Hypothesis 6 predicted that supply chain performance (SCPERF) is positively associated with overall firm performance (OPERF) and tested on three different occasions. Strong statistical support at $p\text{-value} < 0.01$ was found in all instances. The following results are applicable; Conceptual Model 1 ($\beta = 0.642$; $t = 7.7004$); Conceptual Model 1, Sub-test 1 ($\beta = 0.6360$; $t = 7.5288$); Conceptual Model 2 ($\beta = 0.726$; $t = 7.8372$) and Conceptual Model 2, sub-test I ($\beta = 0.640$; $t = 8.5459$). Hypothesis 6 is strongly supported in this analysis, indicating a positive association between the SCPERF construct and the OPERF construct. This implies that supply chain flexibility, supply chain integration, superior supplier performance and quick responsiveness to customers should enable firms to achieve high overall financial and non-financial performance.

The findings on Hypothesis 6 lend support to earlier research conducted by numerous researchers in this area (see e.g. Tan *et al*., 1998; Frohlich and Westbrook, 2001; Li, 2002; Cagliano *et al*., 2006; Koh *et al*., 2007; Kim, 2009; Flynn *et al*., 2010). The relationship of SCPERF to organizational performance can only be fully examined when all supply chain measures are considered together. Kim (2009), for instance, concluded that supply chain flexibility and supply chain integration will help firms reduce costs and enhance their performance.

SCM seeks to enhance the chain performance by closely integrating the internal functions within a company and effectively linking them with external operations of suppliers, customers and other channel members. A firm pursuing supply chain integration needs to pay particular attention to supply chain management practices.

Of particular interest in the research findings is the indirect effect of the SCPERF construct. This research reinforces the importance of SCPERF (flexibility, integration, performance of supplier, customer responsiveness) as an important mediator linking SCMPs and MAPs in improving overall performance (Li, 2002; Kim, 2009). The finding implies that the overall firm performance could only be enhanced by improving SCPERF in the first place.

In summary, based on the standardized coefficients of the six hypotheses displayed in Table 7.5, SCMPs may have a greater direct impact on MAPs ($\beta = 0.467$) than on

SCPERF (β = 0.349). The results also show OPERF is more influenced by SCPERF (β = 0.642) than by SCMPs (β = 0.084) or MAPs (β = -0.005). This indicates that it is important to improve performance in a supply chain context in order to enhance overall firm performance although in the literature, SCMPs mostly have been linked directly to OPERF. The findings of this research indicate the presence of an intermediate measure of performance (SCPERF) not only between SCMPs and OPERF but also between MAPs and OPERF. The analysis from Table 7.6 also shows that SCMPs can have an indirect positive influence on OPERF through SCPERF. Within all conceptual models and accompanying sub-tests, the range of R^2 values generated for each of the endogenous constructs is remarkably consistent and therefore provides considerable reassurance as to the amount of variance explained by the constructs.

9.4 Discussion of interview findings

The interview findings generally are to confirm the quantitative data analysis results and to attain some further qualitative insights. Generally, all cases of firms have, to a certain extent, implemented supply chain management practices related to external relationships with suppliers and customers, share information and practise some level of internal supply chain activities and management accounting practices. It was found that firms with high SCMPs have a clear vision that SCM is critical to their organisational success and this drives the contemporary MAPs that have been developed. In Company A where high SCMPs are implemented, both SCM and MAPs are supported by a strong ethos of ‘people development’. Other companies see SCM in the context of their IT systems, perhaps somewhat subservient to them and hence not achieving the same visibility in these companies. There is, therefore, a much more informal and relaxed approach to the SCM system. As a result, there has not been the same emphasis on

MAPs; contemporary MAPs have not been developed to the same extent. There is greater evidence here of a financial accounting mentality and a feedback orientation to cost control in line with the survey findings.

It appears that all participating companies agreed that SCM is not only important for the efficient running of the business but most importantly it has positive effects on performance principally supply-chain related (i.e. non financial) measures. This is not surprising given the fact that they recognised the importance of SCM in the first place. There were mixed views from the interviewees on the impact of management accounting practices on companies' performance. Firms mostly viewed management accounting as more of a supporting function and helping managers to achieve better decision making and control and thus indirectly affecting performance. This perspective is consistent with the quantitative findings from the survey.

It is clear that exactly the same extent of emphasis on SCMPs and MAPs is not appropriate in all firms. Their relative positions in the supply chain, the variability in their respective product ranges, the organisational attitude and the scope and support given to the accounting practitioners probably dictate this. It can be concluded that all company cases provide evidence to support the contingency theory framework that MAPs are contingent on environmental factors (in this study SCM practices). The theory provides an explanation of why management accounting systems vary among firms, as they are operating in different settings (Fisher, 1995; Gerdin and Greve, 2004). The theory suggests that particular features of an appropriate accounting system will depend upon the specific circumstances in which an organization finds itself (Otley, 1980). Companies in a highly emphasized SCM environment will benefit from the practice of more modern MAPs to better identify costs and value adding processes across their traditional organisational boundaries.

People development is also essential in SCM. The problems in supply chains, in most cases, are not technology issues since there are lots of tools out there to help people link to the newest technology and computer system, but are people issues. People are not changing fast enough to a new way of doing things, mentally or procedurally. They might place excessive emphasis upon the issues of information technology and not enough attention upon the real problems of SCM implementation: people-related barriers. Therefore people development is crucial in SCM relationships. The impact of globalization, intense competition and hence inter-organizational setting on the sophistication of management accounting, management accounting practices should respond positively to this changing environment.

9.5 Summary of significant findings

(1) The level of supply chain management practices (SCMPs) in Malaysian large firms from Consumer and Industrial Products Sectors is, on average, regarded as high particularly in their strategic relationships with suppliers and customers and internal supply chain activities. Firms currently are implementing a moderate level of information sharing and a relatively low level of postponement.

(2) Although traditional MAPs are still in place and largely emphasized, firms appear to be moving from Stage 2 (less sophisticated) to Stages 3 and 4 of management evolution. It can be concluded that MAPs in these firms are moving from the simple, or naive, role of cost determination and financial

control towards a more sophisticated role in the creation of value through effective resource use.

(3) SCMPs have a significant positive direct association with MAPs and firms' supply chain performance. The higher the extent of emphasis on SCMPs, the greater the emphasis firms place on MAPs, and the higher the supply chain performance (SCPERF). The positive influence of SCMPs on MAPs is regardless of the level of MAPs sophistication; the level of SCMPs is positively associated to each level of MAPs. The relationship between SCMPs and the most sophisticated MAPs (Stage 4: Creation of value through effective resource use (CV)), however, is the strongest. Significant impact was also found on the reverse impact of MAPs to SCMPs indicating the growing importance of the management accounting system role in supporting SCM.

(4) SCMPs are only indirectly, not directly, positively associated with the overall firm performance (OPERF), through SCPERF. The SCMPs are also indirectly positively associated with OPERF via MAPs particularly via the most sophisticated MAPs (CV). The relationship between SCMPs and OPERF became insignificant when SCPERF was added to the model.

(5) MAPs have a significant positive direct association with SCPERF but a non-significant relationship with OPERF. With regard to the level of sophistication, both Stage 2 MAPs (Provision for information for planning and control (IPC)) and Stage 3 MAPs (Reduction of waste in business resources (RWR)) have a positive direct and indirect association with supply chain performance.

(6) Stage 4 MAPs (CV) have a significant positive direct relationship with overall firm performance despite non-significant relationship of MAPs (aggregate) with OPERF.

(7) Supply chain performance (flexibility, integration, supplier's performance and customer responsiveness) has a strong direct association with overall firm performance. Furthermore, SCPERF is also an important mediator linking SCMPs and MAPs to overall firm performance.

(8) The survey findings, which are reaffirmed by semi-structured interview findings, are consistent with the contingency theory framework. Firm performance is a product of an appropriate fit between the structure (MAPs) and the context (SCMPs).

9.6 Conclusions

It was found that most of the hypotheses were fully supported or partially supported, broadly indicating that SCM practices are related to MAPs and they both in turn are related to performance. Specifically, by applying the contingency approach, it is found that SCMPs was directly related to both MAPs and SCPERF, that MAPs are directly related to SCPERF, and that SCPERF was directly related to overall firm performance. Although SCMPs and MAPs were not directly related to overall firm performance, they were related to overall firm performance indirectly.

Findings from Conceptual Model 1 strongly support four hypotheses, H1 (SCMPs and MAPs), H2 (SCMPs and SCPERF), H4 (MAPs and SCPERF) and H6 (SCPERF and OPERF). A substantial amount of variance is also explained in the model. A bi-directional relationship exists between the items used to assess SCMPs and MAPs. Additionally, both SCMPs and MAPs positively impact supply chain performance which in turn influences firm performance. The relationships between the SCMPs construct and the OPERF construct (H3), and between the MAPs construct and the

OPERF construct (H5) were not statistically significant. It implies that increase in SCMPs and MAPs does not directly influence overall firm performance (Sim and Killough, 1998; Gordon and Silvester, 1999; Fabbe-Costes and Jahre, 2007). Firm performance is usually influenced by many factors and it is hard to see whether any one factor will dominantly determine the overall performance of an organization. However, both SCMPs and MAPs indirectly positively influence OPERF via the SCPERF construct. SCPERF and MAPs are important mediators of the relationship between SCM practices and firm performance.

The results indicate that both factors of SCMPs and MAPs have direct positive and significant impact on supply chain SCM-related (operational) performance. Following this, firms should consider SCMPS, creating better inter-firm cooperation and integration capabilities through information sharing, reducing waste and response times throughout the supply chain and sharing future strategic plans and requirements. Managers can thus use this information to effectively create an efficient SCM environment that will lead to improved SCPERF. In conclusion, the implementation of SCMPs has a significant impact on MAPs and SCPERF in an emerging country context.

9.6.1 Theoretical and practical implications

In this research, SCM practices are predicted as potentially contingent variables. In line with existing contingency theory, environmental factors surrounding organizations can have significant impact on their accounting and control system (Otley, 1980; Fisher, 1995; Chapman, 1997; Anderson and Lanen 1999; Baines and Langfield-Smith, 2003; Waweru *et al*., 2004; Gerdin, 2005). The increase in global competition and changes in technology were among the well-known factors affecting MAPs in the participating companies. SCM emerged as a result of this competitive environment (Cigolini *et al*., 2004; Min and Mentzer, 2004; Chow *et al*., 2008) because competition no longer takes place between individual businesses but between entire supply chains. In the environment of increased competitiveness firms are forced to simultaneously reduce cost, improve quality, reduce delivery times and embrace mass customisation principles (Wisner, 2003). The inclusion of the entire supply chain network demands that management accountants become familiar with the entire value chain concept in contrast to the internal focus that is typically adopted in management accounting.

The results confirm that SCMPs should be added to the contingency theory paradigm as new variables influencing MAPs (see e.g. Luther and Longden, 2001; Haldma and Lääts, 2002; Cigolini *et al*., 2004; Gerdin, 2005; Tillema, 2005; Chenhall, 2007; Abdel-Kader and Luther, 2008; Caglio and Ditillo, 2008). It can be said that both the survey and semi-structured interviews for all cases give evidence to support the contingency theory framework. The emphasis on MAPs is contingent on the level of SCM practices and higher levels of SCMPs and greater emphasis on MAPs will lead to higher supply chain performance, which in turn will improve overall firm performance.

Firms should evaluate their supply chain management practices; and should not view the dimensions of SCMPs independently. Managers should be cognizant that increasing each dimension of SCMPs collectively influences MAPs (as represented by Hypothesis 1 and Hypotheses 1a – 1d). Companies in a highly emphasized SCM environment will benefit from the practice of more modern MAPs to better identify costs and value adding processes across their traditional organisational boundaries. The significant relationships represented by Hypothesis 2 suggest that firms seeking to improve their supply chain performance should develop efficient SCMPs (including all dimensions mentioned above) and MAPs. For instance, efficient and strategic relationships with suppliers and customers, efficient information management among trading partners can influence the MAPs.

The significant relationships represented by Hypothesis 4 and Hypothesis 6 imply that immediate and second-tier MAPs and SCPERF all impact firm performance directly or indirectly. Specifically, managers wanting to improve their market share, competitiveness, product quality and customer satisfaction should begin with improving SCMPs and MAPs. The present study provides SCM managers with a useful tool for evaluating the comprehensiveness of their current SCM practices. Managers should be cognizant of the mediating effect of SCPERF, so that firm performance could only be enhanced by improving SCPERF in the first place.

MAPs should support the SCM environment to meet the challenge of global competition. Therefore the challenge facing management accountants is to provide appropriate service for effective SCM. Management accountants will survive in this new environment if they are seen as having the relevant skills. In addition to being acknowledged experts in cost management and management accounting techniques, management accountants need to be able to work as part of a managerial team covering different disciplines. There have been increasing job offers for supply chain management accountants in larger companies recently, indicating the importance of hiring accountants with knowledge of supply chain functions.

The findings of this research thus point to the importance of SCM practices to management accounting practice. As today's competition is moving from 'among organizations' to 'between supply chains', more and more organizations are increasingly adopting SCM practice in the hope of reducing supply chain costs and enhancing firm performance. The findings of this research assure practitioners that SCM is an effective way of competing, and the implementation of SCM practice does have strong impact on management accounting practices and SCM performance.

The research identifies the key dimensions of SCM practices that an organization can adopt (external relationships, information management and internal supply chain activities). The findings demonstrate to practitioners that SCM practices should focus on building strategic supplier partnership and improving strategic customer relationship, sharing and managing high quality information with trading partners, and implementing internal lean systems. It would be worthwhile for organizations that are contemplating the adoption of, for example, SCM and MAPs to spend time and effort to build, for example, good relationships with supply chain partners.

The study also provides a set of valid and reliable measurements for evaluating an organization's level of SCM performance, and further benchmarking and comparing SCM performance across different organizations. The measurements developed in this research capture the different aspects of SCM performance and thus can be considered better measures of SCM performance.

Most sophisticated MAPs (Stage 4 MAPS on Value Creation) have a positive direct effect on company's performance. Consequently, firms have to ensure MAPs appropriately accommodate their level of SCMPs. They can provide organizations with practical information about the MAPs that others, in similar circumstances, have adopted.

Furthermore, the study will increase awareness on how management accounting adapts to inter-organizational relationships, thus, enhancing the application of MAPs in a supply chain environment. This study also contributes to the sparse literature from the developing countries in the global debate on the practice of SCM and the effectiveness of MAPs. Particularly, it provides evidence on the relationship between SCM and MAPs and their impact upon firm performance that may help in improving the performance of the consumer and industrial products sector in Malaysia.

The research also reveals that in large Malaysian firms, open book accounting in networks is still a fairly new phenomenon. For open book costing to succeed, the empirical findings suggest that open book costing in networks depends on a number of environmental and firm-specific context factors such as degree of competition and firm size. The technique is most likely to work in long-term hierarchical networks that manufacture functional products, provide a sound infrastructure for open-book practice and comprise trust-based network relationships. The management has to consider both the technical and social requirements simultaneously to achieve open-book practice. Open book accounting can be used as a tool for building trust into customer-supplier relationships.

The need for trust is important in understanding the whole philosophy of supply chain management. Sharing of cost information can be considered via open book costing, but for open book costing to work, there needs to be trust between the parties. Openness or transparency via cost data information exchange is seen as a vital element in creating a competitive inter-organizational cost management system. Information sharing allows for the construction of a whole new space for cost management as more elements can be inserted into one planning mechanism. This most likely requires a highly developed sense of trust between the parties involved.

The findings represent an ideal chance to pursue multi-disciplinary team-working both within and across organizational boundaries and change in role and management accountants' skills (Yasin *et al*., 2005; Yazdifar and Tsamenyi, 2005). Another implication for managers is a shift in the role of management accountants towards a more managerial role, working in cross functional teams and contributing to the strategic management of the supply chain.

9.6.2 Contributions of study

This study contributes to the literature in a number of ways. Firstly, this cross-disciplinary research can expand the knowledge base in both SCM and management accounting fields. Opportunities to expand the understanding of management accounting phenomena are created when researchers use the synergy that exists among research methods and across disciplines to study complementary issues. Relatively small amounts of work have been devoted to assess the impact of SCM practices on the use of management accounting. This research seeks to add to the body of knowledge by providing new data and empirical insights particularly on the current development in management accounting in inter-organizational settings in the context of firms in an emerging economy.

Secondly, a contingency model of management accounting is advanced and empirically assessed. Whilst the literature places considerable attention on firms' SCM and other contingencies within firms, less attention has so far been given to the implications of SCM (as contingent factors) on the use of management accounting. Therefore, the study will increase understanding of factors that explain management accounting sophistication particularly in a contingency framework.

Thirdly, the study provides valid and reliable measurements for the following four constructs: SCMPs, MAPs, SCPERF and OPERF. All the scales have been tested through rigorous statistical methodology including purification, factorial validity, reliability and convergent and discriminant validity (unidimensionality), and validation of second-order construct. All the scales are shown to meet the requirements for reliability and validity and, thus, can be used in future research. The conceptual framework provides a foundation for future research where more constructs may be added to complement the network of constructs.

Besides, the results highlight the critical role of SCMPs in facilitating management accounting practices and improving SCM performance. Effective SCMPs can lead to a greater emphasis on MAPs. Moreover, SCMPs can influence SCM performance directly and indirectly through MAPs. The results of the study provide empirical support and hence rationale for the implementation of SCM. It can be concluded that SCM is a very effective way of organizing in today's competing environment and may provide sustainable competitive advantage for organizations. This is a valuable finding and consistent with the contingency theory framework. Consequently, SCMPs and MAPs should receive proper attention in the organization.

Additionally, the research reveals the nature of the influence SCMPs and MAPs on overall firm performance. The research did not support Hypothesis 4 and Hypothesis 5, that is, there is direct impact of SCMPs and MAPs on OPERF. However, an interesting finding was that SCMPs and MAPs indirectly influence OPERF through SCPERF. The nature of these relationships appears to be indirect rather than direct. The empirical findings on these relationships added significantly to the current body of knowledge in the MA field. They show that the role of SCMPs and MAPs is in enhancing OPERF (the higher level of SCMPs and MAPs will not necessarily result in the higher level of firm performance, if not accompanied by other factors).

Overall, the findings verify the strategic role of SCM for an organization's survival in today's competing business environment. The implementation of various SCM practices will lead to enhanced management accounting practices. Both effective SCM practices and MAPs will produce improved SCM performance. The SCM performance will further increase firm performance. The impact of SCMPs and MAPs on overall firm performance turned out to be indirect through SCM performance.

Finally, a methodological contribution is provided in that the data was analysed via latent variable structural modelling using Partial Least Squares (PLS) path analysis. The PLS method used in this study is relatively novel within management accounting research. As such, it contributes to methodology development in the management accounting research field. However, statistical significance and model prediction are not the ultimate objectives of academic research; they are just the means to achieve the end, which is better understanding of the subject under investigation and discovery of new relationships. The results from this research can be used not only by academicians in further exploring and testing causal linkages in PLS / SEM, but also by practitioners for guiding the implementation of SCM practice and the evaluation of supply chain performance.

9.6.3 Limitations and suggestions for future research

While the current research made significant contributions from both theoretical and practical points of view, it also has some limitations which should be noted when interpreting its findings. The limitations and some possible directions for future research are discussed below.

The proposed model is an initial test of a newly formulated model that should be subjected to further testing and refinement. In particular, the focus on only some dimensions of supply chain management practices and MAPs within the consumer and industrial products sectors (though it improved the internal validity of the study) limits the extent to which the results may be generalised across other sectors. It is currently unknown how well the model and its findings will generalize beyond the specific conditions of this study. Support for the proposed model should be tested in different contexts to establish external validity. Future research could revalidate the measurement scales developed by similar reference populations, since the usefulness of a measurement scale comes from its generalizability. For instance, the 'postponement' dimension suffered from measurement issues and did not fulfil validation of a second-order requirement. Therefore, there might be a need to revise this from the measurement angle so that better construct definition and measurement items could be developed particularly for 'postponement'.

The relatively low number of responses to the questionnaire survey (82 cases) may have caused bias. Due to the small sample size, the use of Exploratory and Confirmatory Factor Analysis was undertaken on the same data set, which may impede general agreement on the use of the instrument. Additionally, two of the relationships examined in the main model were found non-significant, but might have been found significant had the sample size been larger. However, although the response rate was somewhat low, given the length, complexity and subject matter of the survey, this was considered reasonable and adequate for PLS purposes.

In this research, a single respondent in an organization was used to deal with SCM and MA issues. This was perhaps compounded by involvement of all participants along the supply chain, including upstream suppliers and downstream customers, although telephone calls were made to locate the most appropriate respondent. No person in an organization is in charge of the entire supply chain; therefore the use of a single respondent may generate some measurement inaccuracy, although it was considered impractical to have many persons responding to a single questionnaire. As an effort to improve the reliability of research findings, future studies could enhance the appropriateness of respondents through the involvement of various SCM personnel from a single organization (procurement manager, operations manager, customer relation manager, logistics) so that the discrepancies of SCM perception between the groups and the impact of such discrepancies on overall performance can thus be examined.

Furthermore, the researcher was unable to obtain objective performance measures due to the sensitive nature of such data in the context (Narasimhan and Das, 2001).

Therefore, only general perceived overall performance assessments relative to competitors were requested. Although the researcher relied on the respondents' perceptions of their companies' overall firm performance, the approach has also been adopted by other researchers and has been shown to correspond closely to objective measures of financial performance (Venkatraman and Ramanujam, 1986). Thus, future research is called for to explore these possibilities and obtain objective data on financial performance.

The use of PLS (as an alternative to SEM) has its own limitations. PLS imposes that the multidimensional construct be an exact linear combination of its dimensions, eliminating error indeterminacy by removing or ignoring the error term. As a consequence it does not eliminate measurement error bias, factor correlations tend to be underestimated and factor loadings tend to be overestimated (Dijkstra, 1983).

Future research could also examine 'Partner Relationship' and its relationship to SCPERF. Measures in this variable include trust in trading partners, commitment of trading partners and shared vision between trading partners (Li *et al.*, 2006). The extant literature has shown how difficult it is to build trust in supply chain relationships and that there can be mutually reinforcing links between the sharing of accounting information and the establishment of trusting relationships. Interactions with competitors, problems of opportunism and moral hazard are more severe by definition.

Good partnership based on trust, commitment and shared vision may not only facilitate SCM practice but also lead directly to improved SCM performance. Organizations may have failed to develop the elements of cross-organizational trust to make total supply chain improvement a reality. Hicks (1997) suggests that the involvement and commitment of the people along the whole supply chain are required for the improvement of SCM performance. Achieving supply chain integration requires a degree of trust and shared vision between all players. Future research should incorporate other factors, e.g. factors impeding the implementation of open book costing including mutual trust and mutual commitment, since the technique has received considerable attention in the literature.

Another construct that could be explored is the adoption of different IT tools which will facilitate the implementation of SCM practice, for example, the usage of EDI to support and secure information sharing between trading partners. The internet can extend the scope of SCM practice by providing a cost effective communication backbone so that information can be shared efficiently and effectively between supply chain partners (the intranet can be used to support and promote more effective internal information sharing). Information and process changes can be communicated to business partners faster and more accurately. Without the support of the IT enabler, the implementation of SCM practice is impossible. Therefore software like ERP can assist in transforming businesses by implementing the best SCM practices.

Future study can develop additional measures for the practices of internal supply chains such as employee involvement, TQM (Tan *et al.*, 2002), cross-functional coordination (Chen and Paulraj, 2004) as well as internal integration (Kim, 2006; 2009). Furthermore, inter-organizational relationships, such as trust, commitment, shared vision (Tomkins, 2001), risk and award sharing, and agreed supply chain leadership (Min and Mentzer, 2004) can also be incorporated into the SCM practices construct as they are the foundations for building an effective supply chain. Future research should expand the SCM practices construct by including the above dimensions.

As the contingency theory for management accounting applies, it should also be noted the implementation of various SCM practices may be influenced by contextual factors such as firm size (the larger the size, the higher the level of SCM practice), a firm's position in the supply chain (e.g. of ILP and POS not appropriate for firms at the end of the supply chain), supply chain length, and channel structure. For example the level of information quality may be influenced negatively by the length of a supply chain; thus the shorter the supply chain the less chance the information supplied will get distorted. Because of time limitation and to keep the model at a manageable size, this research did not consider the impact of interdependence between trading partners and organizational culture, power, conflict and trust. Future study can examine the impact of such factors on SCM practices (Sahay, 2003).

Although this study adopts a contingency theory perspective, it is generally acknowledged that the theory is not without its limitations. Contingency theory of management accounting has been subject to the same criticisms of organizational structure (Otley, 1980; Tiessen and Waterhouse, 1983; Fisher, 1995). These researchers argue that the question of the design of MA systems, when faced with contingent variables that give conflicting recommendations, has not been addressed fully. The operationalization of contingency theory has been problematic in that there is an implicit assumption that contingent relationships are symmetrical and a tendency to rely on the general linear model and correlational procedures. It is also argued that the contingency paradigm is deterministic because it is based on the premises that the environment is given, which means, organization has no possibility of influencing or controlling its environmental situation. It is therefore acknowledged that the theory lacks of explicit recognition of the fact that contingency arguments produce interactive propositions.

Additionally, the criticism is largely related to the research method commonly used in contingency theory studies; that is; the cross-sectional survey method where survey and questionnaires are predominantly used. Respondent bias and weaknesses of the survey instruments may also influence the findings. Cross-sectional surveys are also subject to criticisms due to a lack of specificity. Future studies could also investigate how dimensions of SCM practices affect MAPs via case studies; longitudinal case studies could be explored employing other theoretical bases like evolutionary theory (Coad and Cullen, 2006) or structuration theory (Seal *et al*., 2004). To minimise the problem, the researcher has included, along with each item in the questionnaire, a brief description of each MAP, thereby reducing possible misunderstandings of terms. Since cross-sectional survey has a static character, it would also be useful to expand the survey with a more longitudinal approach.

The indirect impact of SCMPs and MAPs on OPERF can be hypothesized and examined. These two relationships were not hypothesized originally, but were identified during the process of the model assessment. The test of such hypotheses will further reveal the nature and role of SCMPs and MAPs on the success of firms.

Future research should test hypothesized structural relationships at a specific performance level. Dividing the sample group into high and low SCMPs and high and low MAPs and testing for relationships within these two groups, respectively, may provide important insights into determinants of high and low SCM performers and high and low overall performers. Future research should examine the hypothesized structural relationships across industries. This would reveal either industry-specific relationships or invariance of structural relationships across industries. The same hypothesized structural relationships across countries can also be tested in the future. This will allow the comparison of SCM in different countries, the identification of country-specific SCM issues, and the generalization of common SCMPs across countries.

9.7 Concluding remarks

The current research represents one of the first large-scale empirical efforts to systematically investigate the relationships between supply chain management and management accounting and firm performance especially in a developing economy. As the concept of SCM and MAPs is complex and involves a network of companies in the effort of producing and delivering a final product, its entire domain cannot be covered in just one study. Further research using different methodologies and time frame will improve still further on insight in this fast developing topic.

REFERENCES

A

Aastrup, J. and Halldorsson, A. (2008). Epistemological role of case studies in logistics: A critical realist perspective, *International Journal of Physical Distribution & Logistics Management,* 38:10, 746-763.

Abernethy, M.A. and Guthrie, C.H. (1994). An empirical assessment of the 'fit' between strategy and management information system design. *Accounting and Finance*. 34:2, 49-66.

Abdel-Kader, M. and Luther, R. (2006a). IFAC's conception of the evolution of management accounting. *Advances in Management Accounting*. 15, 229-247.

Abdel-Kader, M. and Luther, R. (2006b). Management accounting practices in the British food and drinks industry. *British Food Journal*. 108: 5, 336-357.

Abdel-Kader, M. and Luther, R. (2008). The impact of firm characteristics on management accounting practices: A UK-based empirical analysis. *The British Accounting Review*. 40, 2-27.

Abdel-Maksoud, A. B. (2004). Manufacturing in the UK: contemporary characteristic and performance indicators. *Journal of Manufacturing Technology Management*. 15:2, 155-171.

Abdel-Maksoud, A., Dugdale, D. and Luther, R. (2005), Non-financial performance measurement in manufacturing companies. *The British Accounting Review*. 37:3, 261-297.

Abdel-Maksoud, A., Asada, T. and Nakagawa, M. (2008). Performance measures, managerial practices and manufacturing technologies in Japanese manufacturing firms: state-of-the-art. *Int. J. Business Performance Management*. 10:1, 1-16.

Abdul Rahman, I.K., Abdul Rahman, A.Z., Tew, Y.H. and Omar, N. (1998). A survey on management accounting practices in Malaysian manufacturing companies. *Paper presented in International Management Accounting Conference,* National University, Malaysia.

Adler, R., Andre, M.E. and Waldron, M. (2000). Advanced management accounting techniques in manufacturing: utilization, benefits and barriers to implementation. *Accounting Forum*. 24: 2, 131-150.

Agbejule, A. and Burrowes, A. (2007). Perceived environmental uncertainty, supply chain purchasing strategy, and the use of MAS information: An empirical study of Finnish firms. *Managerial Auditing Journal*. 22:9, 913-927.

Agndal, H. and Nilsson, U. (2007). Activity-based costing: effects of long-term buyer-supplier relationships. *Qualitative Research in Accounting and Management.* 4:3, 222-245.

Agndal, H. and Nilsson, U. (2009). Inter-organizational cost management in the exchange process. *Management Accounting Research*. 20:2, 85-101.

Agndal, H. and Nilsson, U. (2010). Different open book accounting practices for different purchasing strategies. *Management Accounting Research*. 21, 147-166.

Ajibolade, S.O., Arowomole, S.S.A and Ojikutu, R.K. (2010). Management accounting systems, perceived environmental uncertainty and companies' performance in Nigeria. *International Journal of Academic Research*. 2:1, 195-201.

Alvarado, U.Y. and Kotzab, H. (2001). Supply chain management: The integration of logistics in marketing. *Industrial Marketing Management*. 30, 183-198.

Anderson, J.C. and Gerbing, D.W. (1988). Structural equation modelling in practice: a review and recommended two-step approach. *Psychological Bulletin.* 103:3, Fall, 411-423.

Anderson, S. W. and Lanen, W. N. (1999). Economic Transition, Strategy and The Evolution of Management Accounting Practices: The Case of India. *Accounting, Organizations and Society*. 24, 379-412.

Anderson, S. W. and Young, S.M. (1999). The impact of contextual and process factors on the evaluation of activity-based costing systems. *Accounting, Organizations and Society*. 24, 525-559.

Askarany, D., Yazdifar, H. and Askary, S. (2010). Supply chain management, activity-based costing and organisational factors. *International Journal of Production Economics*. 127:2, 238-248.

Atkinson, A.A., Kaplan, R.S., Matsumura, E.M. and Young, S.M. (2007). *Management Accounting*. 5th Ed. Prentice-Hall.

Atkinson, A.A., Balakrishnan, R., Booth, P., Cote, J.M., Groot, T., Malmi, T., Roberts, H., Uliana, E. and Wu, A. (1997). New directions in management accounting research. *Journal of Management Accounting Research*. 9, 79-108.

Axelsson, B., Laage-Hellman, J. and Nilsson, U. (2002). Modern management accounting for modern purchasing. *European Journal of Purchasing & Supply Management*. 8, 53-62.

B

Baines, A. and Langfield-Smith, K. (2003). Antecedents to management accounting change: a structural equation approach. *Accounting, Organizations and Society*. 28, 675-698.

Ballou, R.H. (2007). The evolution and future of logistics and supply chain management. *European Business Review*. 19:4, 332-348.

Balsmeier, P. W. and Voisin, W. J. (1996). Supply chain management: a time-based strategy. *Industrial Management*. 38:5, 24-27.

Barclay,D., Higgins, C. and Thompson, R. (1995). The partial least squares (PLS) approach to causal modelling: Personal computer adoption and use as an illustration. *Technology Studies*. 2:2, 285-309.

Baron, R.M. and Kenny, D.A. (1986). The moderator-mediator variable distinction in social psychological research – Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*. 51:6, 1173-1182.

Baykasoglu, A. and Kaplanoglu, V. (2008). Application of activity-based costing to a land transportation company: a case study. *International Journal of Production Economics*. 116, 308-324.

Beamon, B.M. (1998). Supply chain design and analysis: models and methods. *International Journal of Production Economics*. 55, 281-294.

Beamon, B.M. (1999). Measuring supply chain performance. *International Journal of Operations & Production Management*. 19:3, 275-292.

Beattie, V. and Pratt,K. (2003). Issues concerning web-based business reporting: an analysis of the views of interested parties. *The British Accounting Review*. 35, 155-187.

Berry, T., Ahmed, A., Cullen, J., Dunlop, A. and Seal, W. (1997). The consequences of inter-firm supply chains for management accounting. *Management Accounting*. 75:10, 74- 75.

Bhimani, A. (1996). *Management Accounting: European Perspectives*. Oxford University Press, Oxford.

Bjørnenak, T. and Olson, O. (1999). Unbundling management accounting innovations. *Management Accounting Research*. 10, 325-338.

Bollen, K.A. (1998). *Structural equations with latent variables*. John Wiley & Sons, New York, USA.

Bollen, K.A. and Stine R.A. (1992). Bootstrapping goodness-of-fit measure in structural equation models. *Sociological methods & Research*. 21:2, 205-229.

Bontis, N., Booker, L.D. and Serenko, A. (2007). The mediating effect of organizational reputation on customer loyalty and service recommendation in the banking industry. *Management Decision*. 45:9, 1426-1445.

Bontis, N. (1998). Intellectual capital: an exploratory study that develops measures and models. *Management Decisions*. 36:2, 63-76.

Boone, C.A., Craighead, C.W. and Hanna, J.B. (2007). Postponement: an evolving supply chain concept: *International Journal of Physical Distribution & Logistics Management*. 37:8, 591-611.

Bromwich, M. (1990). The case for strategic management accounting: the role of accounting information for strategy in competitive markets. *Accounting, Organizations and Society*. 225-233.

Bromwich, M. and Bhimani, A. (1994). *Management Accounting: Pathways to Progress*. London. CIMA.

Bryman, A. and Bell, E. (2007). *Business Research Methods*. 2nd Edition. Oxford University Press.

Burgess, K., Singh, P.J. and Koroglu, R. (2006). Supply chain management: a structured literature review and implications for future research. *International Journal of Operations & Production Management*. 26:7, 703-729.

Burrell, G. and Morgan, G. (1979). *Sociological Paradigms and Organizational Analysis: elements of the sociology of corporate life.* Ashgate Publishing, Aldershot.

Burns, J. and Vaivio, J. (2001). Management accounting change. *Management Accounting Research*. 12, 389-402.

Byrne, B.M. (2006). Structural equation modeling with EQS: Basic concepts, applications and Programming. 2nd Ed. Lawrence Erlbaum Associates. New Jersey.

C

Cadez, S. and Guilding, C. (2008). An exploratory investigation of an integrated contingency model of strategic management accounting. *Accounting, Organizations and Society*. 33, 836-863.

Cadez, S. (2007). A configuration form of fit in management accounting contingency theory: an empirical investigation. *The Business Review*. Cambridge. 7:2, 220-227

Cagliano, R., Caniato, F. and Spina, G. (2006). The linkage between supply chain integration and manufacturing improvement programmes. *International Journal of Operations & Production Management*. 26:3/4, 282-299.

Caglio. A. and Ditillo, A. (2008). A review and discussion of management control in inter-firm relationships: Achievements and future directions. *Accounting, Organizations and Society*. 33, 865-898.

Carr, C. and Ng, J. (1995). Total cost control: Nissan and its U.K supplier partnerships. *Management Accounting Research.* 6:4, 346-365.

Caudle, M.D. (1999). *ABC applications within logistics and their effects on logistics decision making*. Ph.D Dissertation. The Ohio State University.

Chan, F.T.S. and Qi, H.J. (2003). An innovative performance measurement method for supply chain management. *Supply Chain Management.* 8:3, 209-223.

Chan, F.T.S., Qi, H.J., Chan, H.K., Lau, H.C.W. and Ip, R.W.L. (2003). A conceptual model of performance measurement for supply chains. *Management Decision*. 41:7, 635-642.

Chapman, C.S. (1997). Reflections on a contingent view of accounting. *Accounting, Organizations and Society*. 22:2, 189-205.

Chen, I.J., and Paulraj, A., (2004). Towards a theory of supply chain management: the constructs and measurements. *Journal of Operations Management*. 22:2, 119-150.

Chen, I.J., Paulraj, A. and Lado, A.A. (2004). Strategic purchasing, supply management, and firm performance. *Journal of Operations Management*. 22, 505-523.

Chenhall, R. (2007). Theorizing contingencies in management control systems research. *Handbook of Management Accounting Research*. Edited by Chapman, C.S., Hopwood, A.G., and Shields, M.D., 163-205.

Chenhall, R.H. (2003). Management control systems design within its organizational context: findings from contingency-based research and direction for the future. *Accounting, Organizations and Society*. 28, 127-168.

Chenhall, R.H. (1997). Reliance on manufacturing performance measures, total quality management and organizational performance. *Management Accounting Research*. 8:2, 187-206.

Chenhall, R.H. and Langfield-Smith, K. (1998a). Adoption and benefits of management accounting practices: an Australian study. *Management Accounting Research*. 9:1, 1-19.

Chenhall, R.H. and Langfield-Smith, K. (1998b). The relationship between strategic priorities, management techniques and management accounting: An empirical investigation using a systems approach. *Accounting, Organizations and Society*. 23:3, 243-264.

Chenhall, R.H. and Langfield-Smith, K. (2003). Performance measurement and reward systems, trust and strategic change. *Journal of Management Accounting Research*. 15, 117-143.

Chenhall, R.H. and Morris, D. (1986). The impact of structure, environment, and interdependence on the perceived usefulness of management accounting systems. *The Accounting Review*. 61:1, 16-35.

Chin, W.W. (1998a). The partial least squares approach to structural equation modelling. In *Modern Methods for Business Research.* (Ed). Marcoulides, G.A., Lawrence Erlbaum Associates Inc. Mahwah-NJ, 295-336.

Chin, W.W. (1998b). Issues and opinion on structural equation modelling. *Management Information Systems Quarterly*. 22:1, March, 1-11.

Chin, W.W. (2001). *PLS-Graph User's Guide Version 3.0*. Soft Modelling Inc. (C.T. Bauer College of Business, University of Houston, USA).

Chin, W. W. and Newsted, P. (1999). Structural equation modelling analysis with small samples using Partial Least Squares. In Hoyle, R. H. (Ed). *Statistical strategies for small sample research* (307-341). Sage Publications, Thousands Oak.

Christopher, M. (2005). *Logistics and Supply Chain Management: Creating Value-adding Networks*. 3rd Ed. Prentice Hall Financial Times.

Christopher, M., Magrill, L. and Willis, G. (1998). Educational development for marketing logistics. *International Journal of Physical Distribution and Logistics Management*. 28:4, 234-241.

Chong, V.K. (1998). Testing the contingency 'fit' between management accounting systems and managerial performance: a research note on the moderating role tolerance for ambiguity. *The British Accounting Review*. 30, 331-342.

Chow, W.S., Madu, C.N., Kuei, C., Lu, M.H., Lin, C. and Tseng, H. (2008). Supply chain management in the US and Taiwan: An empirical study. *Omega*. 36, 665-679.

Chua, W.F. (1986). Radical developments in accounting thought. Accounting Review 61. In Ryan, B., Scapens, R.W., and Theobald, M. (ed) (2003). *Research Method And Methodology in Finance And Accounting.* Thomson, London.

Chua, W.F. and Mahama, H. (2007). The effect of network ties on accounting controls in a supply alliance: field study evidence. *Contemporary Accounting Research*. 24:1, 47-86.

Churchill, G.A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Studies*. 16, 12-27.

Churchill, G.A. and Iacobucci, D. (2005). *Marketing Research: Methodological Foundations*. 9th Ed. South-Western College Publication. Boston.

Cigolini, R., Cozzi, M. and Perona, M. (2004). A new framework for supply chain management: conceptual model and empirical test. *International Journal of Operations & Production Management*. 24:1, 7-41.

CIMA. (1993). Performance measurement in the manufacturing sector. *Chartered Institute of Management Accountants,* London.

Cleary, P. (2009). Exploring the relationship between management accounting and structural capital in a knowledge-intensive sector. *Journal of Intellectual Capital*. 10:1, 37-52.

Cloud, R.J. (2000). Supply chain management: a new role for finance professionals. *Strategic Finance*. 82:2, 28-32.

Coad, A.F. and Cullen, J. (2006). Inter-organizational cost management: towards an evolutionary perspective. *Management Accounting Research*. 17, 342-369.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences.* 2nd Edition. Lawrence Erlbaum Associates. Hillsdale, N.J.

Collis, J. and Hussey, R. (2003). *Business Research: A practical guide for undergraduate and postgraduate students*. 2nd Edition. New York, Palgrave Macmillan.

Compeau, D., Higgins, C.A. and Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS Quarterly*. 23:2, 145-158.

Cooper, R. (1996). Costing techniques to support corporate strategy: evidence from Japan. *Management Accounting Research*. 7, 219-246.

Cooper, R. and Slagmulder, R. (1998). Cost management beyond the boundaries of the firm. *Management Accounting*. 79:9, 18-20.

Cooper, R. and Slagmulder, R. (1999). Supply chain management for lean enterprises: Inter-organizational cost management. *Strategic Finance*. 15-16.

Cooper, R. and Slagmulder, R., (2003). Inter-organizational costing. *Cost Management*. 17:6, 12-24.

Cooper, R. and Slagmulder, R., (2004). Inter-organizational cost management and relational context. *Accounting, Organizations and Society*. 29, 1-26.

Cooper, R. and Yoshikawa, T. (1994). Inter-organizational cost management systems: The case of the Tokyo-Yokohama-Kamakura supplier chain. *Int. J. Production Economics*. 37, 51-62.

Costello, A. B. and Osborne, J.W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment Research and Evaluation.* 10:7.

Creswell, J.W. (2009). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. 3rd Ed. Sage Publications.

Cronin, Jr.J.S., Brady, M.K. and Hult, G.T.M. (2000). Assessing the effects of quality, value, and customer satisfaction on consumer bahavioral intentions in service environments. *Journal of Retailing*. 76:2, 193-218.

Croom, S., Romano, P. and Giannakis, M. (2000). Supply chain management: an analytical framework for critical literature review. *European Journal of Purchasing & Supply Management*. 6, 67-83.

Crotty, M. (1998). *The foundations of social research: meaning and perspective in the research*. Sage Publications. London, Thousand Oaks.

Cullen, J. and Metcalf, D. (2006). Supply chain accounting. *Financial Management*. 27.

D

Da Silveira, G.J,C. and Cagliano, R. (2006). The relationship between interorganizational systems and operations performance. *International Journal of Operations and Production Management*. 26:3/4, 232-253.

Davis, H.W. (1991). Physical distribution costs. *Annual Conference Proceedings of the Council of Logistics Management*. 357-364.

Dekker, H.C. (2003). Value chain analysis in inter-firm relationships: a field study. *Management Accounting Research*. 14, 1-23.

Dekker, H.C. (2004). Control of inter-organizational relationships: evidence on appropriation concerns and coordination requirements, *Accounting, Organization and Society*. 29, 27-49.

Dekker, H.C. and Van Goor, A.R. (2000). Supply chain management and management accounting: a case study of activity-based costing. *International Journal of Logistics: Research and Applications*. 3:1, 41-52.

Denzin, N.K. and Lincoln, Y.S. (1998). *Strategies of Qualitative Inquiry*. Sage Publications. London, England.

Diamantopoulos, A. (1994). Modelling with LISREL: A guide for the uninitiated. *Journal of Marketing Management*. 10. 105-136.

Dijkstra, T. (1983). Some comments on maximum likelihood and Partial Least Squares methods. *Journal of Econometrics*. 22, 67-90.

Dillman, D.A. (1991). The design and administration of mail surveys. *Annual Review of Sociology*. 17, 225-249.

Donlon, J.P. (1996). Maximizing value in the supply chain. *Chief Executive*. 117, 54-63.

Drazin, R. and Van de Ven, A. (1985). Alternative forms of fit in contingency theory. *Administrative Science Quarterly*. 30, 514-540.

Drucker, P. (1992). “Be data literate: know what to know.” in Young, S.M. (Ed.). *Readings in Management Accounting*. 3rd Ed. Prentice-Hall, New York.

Drury, C. and Tayles, M. (2005). Explicating the design of overhead allocation procedures in UK organizations. *The British Accounting Review*. 37, 47-84.

Drury, C. (2008). *Management and Cost Accounting*. 7th Ed. South-Western Cengage Learning. London.

E

Easterby-Smith, M., Thorpe, R. and Lowe, A. (2002). *Management Research: An Introduction.* 2nd Ed. Sage Publication, London,.

Eisenhardt, K.M. (1989). Building theories from case study research. *Academy of Management Review*. 14, 532–550.

Ellram, L.M. (2002). Supply management's involvement in the target costing process. *European Journal of Purchasing and Supply Management*. 8, 235-244.

Ellram, L.M. (2006). The implementation of target costing in the United States: Theory versus practice. *Journal of Supply Chain Management*. 42:1, 13-26.

Everaert, P. (2006). Characteristics of target costing: theoretical and field study perspectives. *Qualitative Research in Accounting and Management*. 3:3, 236-263.

F

Fabbe-Costes, N. and Jahre, M. (2007). Supply chain integration improves performance: the Emperor's new suit?. *International Journal of Physical Distribution & Logistics Management*. 37:10, 835-855.

Fabrigar, L.R., MacCallum, R.C., Wegener, D.T. and Strahan, E.J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological methods.* 4:3, 272-299.

Falk, M. and Miller, N.B. (1992). *A Primer for Soft Modelling*. University of Akron Press. Akron, OH.

Fawcett, S.E., Osterhaus, P., Magnan, G.M., Brau, J.C. and McCarter, M.W. (2007). Information sharing and supply chain performance: the role of connectivity and willingness. *Supply Chain Management: An International Journal*. 12:5, 358-368.

Field, A. (2009). *Discovering Statistics using SPSS*. 3rd Ed. Sage Publications, London.

Firth, M. (1996). The diffusion of managerial accounting procedures in the People's Republic of China and the influence of foreign partnered joint ventures. *Accounting, Organizations and Society*. 21: 7/8, 629-654.

Fisher, J. (1995). Contingency-based research on management control systems: categorization by level of complexity. *Journal of Accounting Literature*. 14, 24-53.

Flynn, B.B., Huo, B. and Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of Operation Management*. 28, 58-71.

Ford, J.K., MacCallum, R.C. and Tait, M. (1986). The application of exploratory factor analysis in applied psychology: A critical review and analysis. *Personnel Psychology*. 39, 291-315.

Fornell C. and Bookstein, F.L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research.* 19:4, 440-452.

Fornell, C. and Larcker, V.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*. 18:1, 39-50.

Free, C. (2008). Walking the talk? Supply chain accounting and trust among UK supermarkets and suppliers. *Accounting, Organizations and Society*. 33: 629-662.

Frohlich, M.T. and Westbrook, R. (2001). Arcs of integration: an international study of supply chain strategies. *Journal of Operations Management*. 19, 185-200.

Fynes, B., de Burca, S. and Mangan, J. (2008). The effect of relationship characteristics on relationship quality and performance. *International Journal of Production Economics*. 111, 56-69.

Fynes, B., de Burca, S. and Voss, C. (2005). Supply chain relationship quality, the competitive environment and performance. *International Journal of Production Research*. 43:16, 3303-3320.

G

García-Dastugue, S. J. and Lambert, D. M. (2007). Inter-organizational time-based postponement in the supply chain. *Journal of Business Logistics*. 28:1, 57-83.

Garrison, R.H. and Noreen, E.W. (2000). *Managerial Accounting*. 9th Edition. Irwin McGraw-Hill. New York.

Gefen, D. and Straub, D. W. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information Systems*. 16, 91-109.

Gefen, D., Straub, D. W. and Boudreau, M-C. (2000). Structural Equation Modelling and Regression: Guidelines for Research Practice. *Communications of the Association for Information System*. 4: 7, 1-77.

Gerdin, J. (2005). Management accounting system design in manufacturing departments: an empirical investigation using a multiple contingencies approach. *Accounting, Organizations and Society*. 30, 99-126.

Gerdin, J. and Greve, J. (2004). Forms of contingency fit in management accounting research – a critical review. *Accounting, Organizations and Society*. 29, 303-326.

Gerdin, J. and Greve, J. (2008). The appropriateness of statistical methods for testing contingency hypotheses in management accounting research. *Accounting, Organizations and Society*. 33, 995-1009.

Ghosh, B.C. and Chan, Y-K. (1997). Management accounting in Singapore – well in place? *Managerial Auditing Journal*. 12:1, 16-18.

Gimenez. C. and Ventura, E. (2005). Logistics-production, logistics-marketing and external integration – their impact on performance. *International Journal of Operations & Production Management*. 25:1, 20-38.

Gordon, L. A. and Miller, D. (1976). A contingency framework for the design of accounting information systems. *Accounting, Organizations and Society*. 1:1, 59-69.

Gordon, L. and Narayanan V. K. (1984). Management accounting systems, perceived environmental uncertainty, and organizational structure: An empirical investigation. *Accounting Organizations, and Society*. 9:1, 33-47.

Gordon, L.A. and Silvester, K.J. (1999). Stock market reactions to activity-based costing adoptions. *Journal of Accounting and Public Policy*. 18, 229-251.

Graman, G.A. and Magazine, M.J. (2006). Implementation issues influencing the decision to adopt postponement. *International Journal of Operations & Production Management*. 26:10, 1068-1083.

Grant, D.B. (2004). Using structural equation modelling in logistics customer service research. *Seminar for National Institute for Transport and Logistics (NITL)*. Conference Proceedings, NITL, Dublin, May 2004.

Grant, D.B., Lambert, D.M., Stock, J.R. and Ellram, L.M. (2006). *Fundamentals of Logistics Management*. European Edition. McGraw Hill Education (UK).

Guba, E. and Lincoln, Y.S. (2005). Paradigmatic controversies, contradictions and emerging confluences. In Denzin, N.K. and Lincoln, Y.S. (eds). *Handbook of Qualitative Research*. 3rd ed. Sage Publication, Thousand Oaks. 191-215.

Guilding, C., Cravens, K.S. and Tayles, M. (2000). An international comparison of strategic management accounting practices. *Management Accounting Research*. 11, 113-135.

Gul, F.A. and Chia, Y,M. (1994). The effects of management accounting systems, perceived environmental uncertainty and decentralization on managerial performance: a test of three-way interaction. *Accounting, Organizations and Society*. 19, 413-426.

Gunasekaran, A. and Kobu, B. (2007). Performance measures and metrics in logistics and supply chain management: a review of recent literature (1995-2004) for research and applications. *International Journal of Production Research*. 45:12, 2819-2840.

Gunasekaran, A., Lai, K.H. and Cheng, T.C.E. (2008). Responsive supply chain: a competitive strategy in a networked economy. *Omega.* 36, 549-564.

Gunasekaran, A., Patel, C. and McGaughey, R.E. (2004). A framework for supply chain performance measurement. *International Journal of Production Economics*. 87, 333-347.

Gunasekaran, A., Patel, C. and Tirtiroglu, E. (2001). Performance measurement and metrics in a supply chain environment. *International Journal of Operations & Production Management*. 21: 1/2, 71-87.

Gupta, K.M. and Gunasekaran, A. (2005). Costing in new enterprise environment. *Managerial Auditing Journal*. 20:4, 337-353.

H

Haenlein, M. and Kaplan, A.M. (2004). A beginner's guide to Partial Least Squares analysis. *Understanding Statistics*. 3:4, 283-297.

Hair, J.F. Jr., Black, W.C., Babin, B.J. and Anderson, R.E. (2010). *Multivariate Data Analysis: A Global Perspective.* 7th Ed. Pearson Education. New Jersey.

Haldma, T. and Lääts, K. (2002). Contingencies influencing the management accounting practices of Estonian manufacturing companies. *Management Accounting Research*. 13, 379-400.

Håkkansson, H. and Lind, J. (2006). Accounting in an inter-organizational setting. In *Handbook of Management Accounting Research*. Edited by Chapman, C.S., Hopwood, A.G., Shields, M.D., 2, 885-902.

Hancock, G.R. and Mueller, R.O. (2006). *Structural equation modelling: A second course*. Information Age Publishing Inc.

Harland. C., Zheng, J., Johnsen, T. and Lamming, R. (2004). A conceptual model for researching the creation and operation of supply networks. *British Journal of Management.* 15, 1-21.

Harland, C.M. (1996). Supply chain management: relationships, chains and networks. *British Journal of Management*. 7 (Special issue), 63-80.

Hartmann, F. (2000). The appropriateness of RAPM: towards the further development of theory. *Accounting, Organizations and Society*. 25:4, 451-482.

Hayes, D.C. (1977). The contingency theory of managerial accounting. *The Accounting Review*. 52:1, 22-39.

Heinlein, M. and Kaplan, A.M. (2004). A beginner's guide to Partial Least Squares Analysis. *Understanding Statistics*. 3:4, 283-297.

Henseler, J., Ringle, C.M. and Sinkovics, R.R. (2009). The use of partial least squares path modelling in international marketing. *Advances in International Marketing*. 20, 277-319.

Hicks, D.A. (1997). The manager's guide to supply chain and logistics problem solving tools and techniques – Part 1: Understanding the techniques. *IIE Solutions*. 29:9, 43-47.

Hinkin, T.R. (1995). A review of scale development practices in the study of organizations. *Journal of Management*. 21:5, 967-988.

Hopper, T., Northcott, D. and Scapens, R. (2007). *Issues in Management Accounting*. 3rd Ed. Pearson Education, Harlow.

Hoque, Z. (2004). A contingency model of the association between strategy, environmental uncertainty and performance measurement: impact on organizational performance. *International Business Review*. 13:4, 485–502.

Hoque, Z. and James, W. (2000). Linking balanced scorecard measures to size and market factors: impact on organization performance. *Journal of Management Accounting Research.* 12, 1-17.

Horngren, C.T., Foster, G. and Datar, S.M. (2000). *Cost Accounting: A Managerial Emphasis*. 10th Ed. Prentice-Hall Inc., New Jersey.

Hoyle, R.H. (1999). *Statistical strategies for small sample research*. Sage Publications, Thousands Oak.

Hulland, J. (1999). Use of Partial Least Squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal.* 20:2.195-204.

Hussey, J. and Hussey, R. (1997). *Business Research: A Practical Guide for Undergraduate and Postgraduate Students*. MacMillan Press Ltd, London.

Hyvönen, J. (2005). Adoption and benefits of management accounting systems: Evidence from Finland and Australia. *Advances in International Accounting*. 18, 97-120.

I

Innes, J. and Mitchell, F. (1995). A survey of activity based costing in the UK's large companies. *Management Accounting Research*. 6:2, pp. 137-153.

International Federation of Accountants (IFAC). (1998). International Management Accounting Practice Statement (IMAP #1): Management Accounting Concept. *Financial and Management Accounting Committee*. March 1998, 85-99.

Islam, M. and Kantor, J. (2005). "The development of quality management accounting practices in China." *Managerial Auditing Journal*. 20:7, 707-724.

Ittner, C. and Larcker, D. (1998). Innovations in performance measurement, trends and research implications. *Journal of Management Accounting Research.* 10: 205-238.

Ittner, C. and Larcker, D. (2001). Assessing empirical research in managerial accounting: a value-based management perspective. *Journal of Accounting and Economics*. 32. 349-410.

Ittner, C., Larcker, D. and Rajan, M.V. (1997). The choice of performance measures in annual bonus contracts. *The Accounting Review*. 72, 231-255.

Ittner, C.D., Larcker, D.F. and Randall, T. (2003). Performance implications of strategic importance measurement in financial services firms. *Accounting, Organizations and Society*. 28, 715-741.

J

Jeong, J.S. and Hong, P. (2007). Customer orientation and performance outcomes in supply chain management. *Journal of Enterprise Information Management*. 20:5, 578-594.

Johnson, H. and Kaplan, R. (1987). *Relevance Lost: The Rise and Fall of Management Accounting*. HBS Press, Boston.

Joreskog, K.G. and Sorbom, D. (1984). *LISREL VI: Analysis of Linear Structural Relationships by the Method of Maximum Likelihood*. National Educational Resources, Chicago.

Joreskog, K.G. and Wold, H. (1982). The ML and PLS techniques for modelling with latent variables: historical and competitive aspects, in *Systems under indirect observation*, Joreskog, K.G. and Wold, H. (Eds.). Elsevier, Amsterdam, Holland.

Joshi, P.L. (2001). The international diffusion of new management accounting practices: the case of India. *Journal of International Accounting, Auditing and Taxation*. l0:1, 85-109.

K

Kajüter, P. and Kulmala, H.I. (2005). Open-book accounting in networks: potential achievements and reasons for failures. *Management Accounting Research*. 16, 179 -204.

Kannan, V.R. and Tan, K.C. (2005). Just-in-time, total quality management, and supply chain management. *Omega*. 33, 153-162.

Kaplan, R.S. (1998). Creating New Management Practice Through Innovation Action Research. *Journal of Management Accounting Research*. 10, 89-117.

Kaplan, R. and Atkinson, A. (1998). *Advanced Management Accounting*. Prentice Hall.

Kaplan, R.S. and Norton, D. (1996). *The Balanced Scorecard: Translating Strategy into Action*. Harvard Business Press, Boston, MA.

Kaplowitz, M.D., Hadlock, T.D. and Levine, R. (2004). A comparison of web and mail survey response rates. *Public Opinion Quarterly*. 68:1, 94-101.

Keating, P.J. (1995). A framework for classifying and evaluating the theoretical contributions of case research in management accounting. *Journal of Management Accounting Research*. 7, 66–86.

Kennedy, T. and Affleck-Graves, J. (2001). The Impact of Activity-Based Costing Techniques on Firm Performance. *Journal of Management Accounting Research*. 13, 9-45.

Kim, S.W. (2006). Effects of supply chain management practices, integration and competition capability on performance. *Supply Chain Management: An International Journal*. 11:3, 241-248.

Kim, S. W. (2009). An investigation on the direct and indirect effect of supply chain integration on firm performance. *International Journal of Production Economics*. 119, 328-346.

Kline, R. B. (2005). *Principles and practice of structural equation modelling*. 2nd Ed. The Guildford Press, New York.

Koh, S.C.L., Bayraktar, E., Tatoglu, E. and Zaim, S. (2007). The impact of supply chain management practices on performance of SMEs. *Industrial Management & Data Systems*, 107:1, 103-124.

Kulmala, H.I.; Paranko, J. and Uusi-Rauva, E. (2002). The role of cost management in network relationships. *International Journal of Production Economics*. 79, 33-43.

L

Langfield-Smith, K. (1997). Management control systems and strategy: a critical review. *Accounting, Organizations and Society*. 22:2, 207-232.

Lambert, D.M. and Cooper, M.C. (2000). Issues in supply chain management. *Industrial Marketing Management*. 29, 65-83.

Lambert, D.M., Cooper, M.C. and Pagh, J.D. (1998). Supply chain management: implementation issues and research opportunities. *The International Journal of Logistics Management*. 9:2, 1-19.

Lamming, R. (1996). Squaring lean supply with supply chain management. *International Journal of Operations and Production Management*. 16:2. 183-196.

Lee, C.W., Kwon, I-K.G. and Severance, D. (2007). Relationship between supply chain performance and degree of linkage among supplier, internal integration, and customer. *Supply Chain Management: An International Journal*. 12:6, 444-452.

Li, S. (2002). *An integrated model for supply chain management practice, performance and competitive advantag*e. PhD Dissertation. University of Toledo, OH.

Li, S., Rao. S.S., Ragu-Nathan, T.S. and Ragu-Nathan, B. (2005). Development and validation of a measurement instrument for studying supply chain management practices. *Journal of Operations Management*. 34, 107-124.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S. and Rao, S.S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. *Omega*. 34, 107-124.

Libby, T. and Waterhouse, J.H. (1996). Predicting change in management accounting systems. *Journal of Management Accounting Research*. 8, 137-150.

Liberatore, M.J. and Miller, T. (1998). A framework for integrating activity-based costing and the balanced scorecard into the logistics strategy development and monitoring process. *Journal of Business Logistics*. 19:2, 131-154.

Lin, B., Collins, J. and Su, R.K. (2001). Supply chain costing: an activity-based perspective. *International Journal of Physical Distribution & Logistics Management*. 31:9/10, 702-713.

Lin, Z. J. and Yu, Z. (2002). Responsibility Cost Control System in China: A Case of Management Accounting Application. *Management Accounting Research*. 13, 447-467.

Loehlin, J.C. (1998). *Latent variable models: An introduction to factor, path, and structural analysis*. 3rd Edition. Lawrence Erlbaum Associates. New Jersey.

Lohmöller, J.B. (1989). *Latent variable path modelling with partial least squares*. Heidelberg-Physica.

Luft, J. and Shields, M.D. (2003). Mapping management accounting: Graphics and guidelines for theory-consistent empirical research. *Accounting, Organizations and Society*. 28, 169-249.

Lukka, K. and Granlund, M. (1996). Cost accounting in Finland: current practice and trend of development. *The European Accounting Review*. 5: 1-28.

Luther, R. and Longden, S. (2001). Management accounting in companies adapting to structural change and volatility in transition economies: A South African study. *Management Accounting Research*. 12:3, 299-320.

M

Mabert, V.A. and Venkataramanan, M.A. (1998). Special research focus on supply chain linkages: Challenges for design and management in the 21st century. *Decision Sciences*. 29:3, 537-552.

MacCallum, R.C., Widaman, K.F., Zhang, S. and Hong, S. (1999). Sample size in factor analysis. *Psychological Methods.* 4, 84-99.

MacCallum, R.C., Widaman, K.F., Zhang, S. and Hong, S. (2001). Sample size in factor analysis: The role of model error. *Multivariate Behavioural Research*. 36, 611-637.

MacKenzie, S.B., Podfsakoff, M. and Jarvis, C.B. (2005). The problem of measurement model misspecification in behavioral and organizational research and some recommended solutions. *Journal of Applied Psychology*. 90:4, 710-730.

MacKinnon, D.P. (2008). *Introduction to Statistical Mediation Analysis*. Erlbaum, New York.

Mahama, H. (2006). Management control systems, cooperation and performance in strategic supply relationships: A survey in the mines. *Management Accounting Research.* 17, 315-339.

Mangan, J., Lalwani, C. and Gardner, B. (2004). Combining quantitative and qualitative methodologies in logistics research. *International Journal of Physical Distribution and Logistics Management*. 34:7, 565-578.

Marcoulides, G.A. (1998). *Modern Methods for Business Research.* Lawrence Erlbaum Associates Inc. Mahwah-New Jersey.

Mason, J. (2002). *Qualitative Researching*, 2nd ed. Sage Publications. London.

May, T. (2001). *Social Research: Issues, Methods and Proces*s. 3rd ed. Open University Press. Buckingham.

Maylor, H. and Blackmon, K. (2005). *Researching Business and Management*. Palgrave Macmillan. New York.

McGinnis, M. and Vallopra, R. (1999). Purchasing and supplier involvement in process improvement: A source of competitive advantage. *Journal of Supply Chain Management*. 35:4, 42-50.

McIvor, R. (2001). Lean supply: the design and cost reduction dimensions. *European Journal of Purchasing and Supply Chain Management*. 7:4, 227-242.

McKensie, G. (1997). *Understanding Social Research: Perspectives on methodology and Practice.* Sage Publication. London.

Mentzer, J.T., DeWitt, W., Keebler, J.S., Min, S., Nix, N.W., Smith, C.D. and Zacharia, Z.G. (2001). Defining supply chain management. *Journal of Business Logistics*. 22:2, 1-25.

Merchant, K.A., (1981). The design of the corporate budgeting systems: Influence on managerial behaviour and performance. *The Accounting Review*. 56:4, 813-829.

Merchant, K.A. (2010). Paradigms in accounting research: A view from North America. *Management Accounting Research*. 21, 116-120.

Mia, L. and Clarke, B. (1999). Market competition, management accounting systems and business unit performance. *Management Accounting Research*. 10, 137-158.

Miles, R.E. and Snow, C.C. (1978). *Organizational Strategy, Structure and Process*. McGraw Hill. New York.

Min S. and Mentzer, J.T. (2004). Developing and measuring supply chain management concepts. *Journal of Business Logistics*. 25:1, 63-99.

Modell, S. (2005). Triangulation between case study and survey methods in management accounting research: an assessment of validity implications. *Management Accounting Research*. 16, 231-254.

Modell, S. (2009). In defence of triangulation: a critical realist approach to mixed methods research in management accounting. *Management Accounting Research*. 20, 208-221.

Modell, S. (2010). Bridging the paradigm divide in management accounting research: The role of mixed methods approaches. *Management Accounting Research*. 21, 124-129.

Monczka, R. M., Petersen, K. J., Handfield, R. B. and Ragatz, G. L. (1998). Success factors in strategic supplier alliances: the buying company perspective. *Decision Sciences*. 29:3, 553-577.

Morgan, J., and Monczka, R. (1996). Supplier integration: A new level of supply chain management. *Purchasing*. 120:1, 110-113.

Mouritsen, J., Hansen, A. and Hansen, C.Ø. (2001). Inter-organizational controls and organisational competencies: episodes around target cost management/functional analysis and open book accounting. *Management Accounting Research*. 12, 221-244.

Mouritsen, J. and Thrane, S. (2006). Accounting, network complementarities and the development of inter-organisational relations. *Accounting, Organizations and Society*. 31, 241-275.

N

Naranjo-Gil, D. and Hartmann, F. (2007). Management accounting systems, top management team heterogeneity and strategic change. *Accounting, Organizations and Society*. 32, 735-756.

Naranjo-Gil, D. and van Rinsum, M. (2006). The effect of management style and management accounting system design on performance. *Journal of Applied Management Accounting Research*. 4: 1, 33-44.

Narasimhan, R. and Das, A. (2001). The impact of purchasing integration and practices on manufacturing performance. *Journal of Operations Management*. 19:5, 593-609.

Narasimhan, R. and Jayaram, J. (1998). Causal linkages in supply chain management: An exploratory study of North American manufacturing firms. *Decision Sciences*. 29:3, 579-605.

Nunnally, J. (1978). *Psychometric Theory*. 2nd Ed. Mc-Graw Hill, New York.

Nunnally, J.C. and Bernstein, I.H. (1994). *Psychometric Theory*. 3rd Ed. McGraw-Hill, New York.

O

O'Connor, N.G., Chow, C.W. and Wu, A. (2004). The adoption of ''Western'' management accounting/controls in China's state-owned enterprises during economic transition. *Accounting, Organizations and Society*, 29, 349–375.

Oppenheim, A.N. (1992). *Questionnaire Design, Interviewing and Attitude Measurement*. Continuum. New York.

Otley, D. (1980). The contingency theory of management accounting research: Achievement and prognosis. *Accounting, Organizations and Society*. 5:4, 413-428.

P

Pallant, J. (2007). *SPSS Survival Manual: A Step by Step Guide to Data Analysis using SPSS for Windows*. 3rd Ed. Open University Press. New York.
Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing*. 64:1, 12-40.

Phadoongsitthi, M. (2003). *The Role of Managerial Accounting in Emerging Economies: An Empirical Study of Thailand*. University of Maryland, College Park: Ph.D Dissertation.

Preacher, K.J. and Leonardelli, G.J. (2001). Calculation for the Sobel Test: An interactive calculation tool for mediation tests. *Computer Software*. http://www.unc.edu/~preacher/sobel/sobel.htm

Preacher, K.J. and MacCallum, R.C. (2002). Exploratory factor analysis in behaviour genetics research: Factor recovery with small sample sizes. *Behaviour Genetics*.32, 153-161.

R

Ramos, M.M. (2004). Interaction between management accounting and supply chain management. *Supply chain management*. 9:2, 134-138.

Reid, G.C. and Smith, J.A. (2000). The impact of contingencies on management accounting system development. *Management Accounting Research*. 11, 427-450.

Roslender, R. and Hart, S.J. (2003). In search of strategic management accounting: Theoretical and field study perspectives. *Management Accounting Research*. 14, 255-279.

Rudestam, K.E. and Newton, R. R. (2007). *Surviving your dissertation: a comprehensive guide to content and process*. 3rd Ed. Sage Publication. Thousand Oaks.

Ryan, B., Scapens, R.W. and Theobald, M. (2003). *Research Method and Methodology in finance and accounting.* Thomson. London.

S

Sahay, B.S. (2003). Supply chain collaboration: the key to value creation. *Work Study*. 52:2, 76-83.

Sarantakos, S. (1998). *Social Research*. MacMillan Press. London, England.

Saunders, M., Lewis, P. and Thornhill, A. (2007). *Research Methods for Business Students*. 4th Ed. Pearson Education. Harlow.

Scapens, R.W. (1994). Never mind the gap: toward an institutional perspective on management accounting practice. *Management Accounting Research*. 5, 301-321.

Scapens, R.W. (1999). *Broadening the scope of management accounting: from a micro economic to a broader business perspective*. Working paper, University of Manchester, September, 1999.

Seal, W., Berry, A. and Cullen, J. (2004). Disembedding the supply chain: institutionalized reflexivity and inter-firm accounting. *Accounting, Organizations and Society*. 29, 73-92.

Seal, W., Cullen, J., Dunlop, A., Berry, T. and Ahmed, M. (1999). Enacting a European supply chain: a case study on the role of management accounting. *Management Accounting Research*. 10, 303-322.

Sekaran, U. (2000). *Research methodology for business: a skill-building approach*. 3rd Edition. Wiley. New York.

Seuring, S.A. (2008). Assessing the rigor of case study research in supply chain management. *Supply Chain Management: An International Journal*. 13:2, 128-137.

Seuring, S.A., (2006). Supply chain controlling: summarizing recent developments in German literature. *Supply Chain Management: An International Journal*. 11:1, 10-14.

Seuring, S. (2002). Supply chain target costing – an apparel industry case study. In Seuring, S. and Goldbach, M. (Eds). *Cost Management in Supply Chains*. Physica-Verlag, Heidelberg. 111-126.

Shank, J.K. and Govindarajan, V. (1992). Strategic cost management: the value chain perspective. *Management Accounting Research*. 3,177-197.

Shields, M.D. (1998). Management accounting practices in Europe: A perspective from the States. *Management Accounting Research*. 9, 501-513.

Sim, K.L. and Killough, L.N. (1998). The performance effects of complementarities between manufacturing practices and management accounting systems. *Journal of Management Accounting Research*. 10, 325-346.

Smith, D. and Langfield-Smith, K. (2004). Structural equation modeling in management accounting research: critical analysis and opportunities. *Journal of Accounting Literature*. 23, 49-86.

Smith, M. (2000). Innovation Diffusion. *Management Accounting*. June, 40-41.

Smith, M. and Dikolli, S. (1995). Customer profitability analysis: an activity-based costing approach. *Managerial Auditing Journal*. 3-7.

Sobel, M.E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology*. 13, 290-312.

Spekman, R.E., Kamauff Jr., J.W. and Myhr, N. (1998). An empirical investigation into supply chain management: a perspective on partnerships. *Supply Chain Management*. 3:2, 53-67.

Spicer, B.H. (1992). The resurgence of cost and management accounting: a review of some recent developments in practice, theories and case research methods. *Management Accounting Research*. 3, 1-37.

Stapleton, D., Pati, S., Beach, E. and Julmanichoti, P. (2004). Activity-based costing for logistics and marketing. *Business Process Management Journal*. 10:5, 584-597.

Straub, D.W, Boudreau, M-C. and Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Associations for Information Systems* (*CAIS).*

Stuart, I.S. (1997). Supply chain strategy: organizational influence through supplier alliances. *British Journal of Management*. 8, 223-236.

Sulaiman, M., Ahmad, N.N.N. and Alwi, N.M. (2004). Management accounting practices in selected Asian countries: a review of the literature. *Managerial Auditing Journal*. 19:4, 493-508.

Sulaiman, M., Ahmad, N.N.N. and Alwi, N.M. (2005). Is standard costing obsolete?: empirical evidence from Malaysia. *Managerial Auditing Journal*. 20:2, 109-124.

T

Tabachnick, B.G. and Fidell, L.S. (2001). *Using Multivariate Statistics*. 4th Ed. Pearson, USA.

Tan, K.C., Kannan, V.R. and Handfield, R.B. (1998). Supply chain management: supplier performance and firm performance. *International Journal of Purchasing and Materials Management*. 34:3, 2-9.

Tan, K.C. (2001). A framework of supply chain management literature. *European Journal of Purchasing & Supply Management.* 7, 39-48.

Tan, K.C. (2002). Supply chain management: practices, concerns and performance issues. *Journal of Supply Chain Management*. 38:1, 42-53.

Tan, K.C., Kannan, V.R. and Handfield, R.B, and Ghosh, S. (1999). Supply chain management: an empirical study of its impact on performance. *International Journal of Operations and Production Management*. 19:10, 1034-1052.

Tan, K.C., Lyman, S.B. and Wisner, J.D. (2002). Supply chain management: a strategic perspective. *Internation Journal of Operations and Production Management*. 22:6, 614-631.

Taylor, D.H. (1999). Supply chain improvement: the lean approach. *Logistics Focus*. 7: 14-20.

Tenenhaus, M., Pagès, J., Ambroisine, L. and Guinot, C. (2005a). PLS methodology to study relationships between hedonis judgements and product characteristics. *Food Quality and Preference*. 16, 315-325.

Tenenhaus, M., Vinzi, V.E., Chatelin, Y-M. and Lauro, C. (2005b). PLS path modelling. *Computational Statistics & Data Analysis*. 48, 159-205.

Theeranuphattana, A. and Tang, J.C.S. (2008). A conceptual model of performance measurement for supply chains. *Journal of Manufacturing Technology Management*. 19:1, 125-148.

Tiessen, P. and Waterhouse, J.H. (1983). Towards a descriptive theory of management accounting. *Accounting, Organizations and Society*. 8:2/3, 251-267.

Tillema, S. (2005). Towards an integrated contingency framework for MAS sophistication: case studies on the scope of accounting instruments in Dutch power and gas companies. *Management Accounting Research*. 16, 101-129.

Tomkins, C. (2001). Interdependencies, trust and information in relationships, alliancesand networks. *Accounting, Organizations and Society*. 26, 161-191.

V

Vaivio, J. and Sirén, A. (2010). Insights into method triangulation and paradigms in interpretive management accounting research. *Management Accounting Research*. 21, 130-141.

Van der Meer-Kooistra, J. and Vosselman, E.G.J. (2000). Management control of inter-firm transactional relationships: The case of industrial renovation and maintenance. *Accounting, Organizations and Society*. 25:1, 51-77.

Van der Stede, W. A. (2000). The relationship between two consequences of budgetary controls: budgetary slack creation and managerial short term orientation. *Accounting, Organizations and Society*. 25, 609-622.

Van der Stede, W. A., Young, S. M. and Chen, C. X. (2005). Assessing the quality of evidence in empirical management accounting research: The case of survey studies. *Accounting, Organizations and Society*. 30, 655-684.

Van de Ven, A. and Drazin, R. (1985). The concept of fit in contingency theory. *Research in Organizational Behavior*. 333-365.

Van Hoek, R.I. (1998). "Measuring the unmeasurable" – measuring and improving performance in the supply chain. *Supply Chain Management*. 3:4, 187-192.

Van Hoek, R.I. (2001). The rediscovery of postponement a literature review and directions for research. *Journal of Operations Management*. 19, 161-184.

Van Hoek, R.I., Voss, R.I. and Cammandeur, H.R. (1999). Restructuring european supply chain by implementing postponement strategies. *Long Range Planning*. 32:5, 505-518.

Venkatraman, N. and Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *Academy of Management Review*. 11:4, 801-814.

W

Waldron, M. (2005). Overcoming barriers to change in management accounting systems. *Journal of American Academy of Business*. 6:2, 244-249.

Waller, M.A., Dabholkar, P.A. and Gentry, J.J. (2000). Postponement, product customization and market-oriented supply chain management. *Journal of Business Logistics*. 21:2, 133-159.

Waters , D. (2003). *Logistics: An introduction to supply chain management*. Palgrave Macmillan.

Waweru, N.M., Hoque, Z. and Uliana, E. (2004). Management accounting change in South Africa: Case studies from retail services. *Accounting, Auditing & Accountability Journal*. 17:5, 675-704.

Wisner**,** J.D. (2003). A structural equation model of supply chain management strategies and firm performance. *Journal of Business Logistics*. 24:1-24.

Womack, J., and Jones, D. (1996). *Lean Thinking*. Simon and Schuster. New York.

Wu, J., Boateng, A. and Drury, C. (2007). An analysis of the adoption, perceived benefits, and expected future emphasis of western management accounting practices in Chinese SOEs and JVs. *The International Journal of Accounting*. 42, 171-185.

Y
Yasin, M.M., Bayes, P.E. and Czuhry, A.J. (2005). The changing role of accounting in supporting the quality and customer goals of organizations: an open system perspectives. *International Journal of Management.* 22:3, 323-331.

Yazdifar, H. and Tsamenyi, M. (2005). Management accounting change and the changing roles of management accountants: a comparative analysis between dependent and independent organizations. *Journal of Accounting & Organizational Change*. 1:2, 180-198.

Yi, M.Y. and Davis, F.D. (2003). Developing and validating observational learning model of computer software training and skill acquisition. *Information Systems Research*. 14:2, 146-169.

Yin, R.K. (2009). *Case Study Research: Design and Methods*. 4th Ed. Sage Publications. Thousand Oaks.

Young, S.M. and Selto, F.H. (1991). New manufacturing practices and cost management: a review of the literature and directions for research. *Journal of Accounting Literature*. 10, 265-298.

Z
Zhu, Q. and Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management*. 22: 265-289.

Web access
CSCMP at http:cscmp.org/aboutcscmp/definitions.asp (accessed on 26/11/2008)

Malaysian-economy: http://www.malaysian-economy.com/ (accessed on 21/12/2008)

Malaysian Industrial Development Authority (MIDA): http://www.mida.gov.my (accessed on 21/12/2008)

Appendix A

THE UNIVERSITY OF HULL

22 June 2009

Dear Sir/Madam,

A SURVEY OF THE IMPACT OF SUPPLY CHAIN MANAGEMENT PRACTICES ON MANAGEMENT ACCOUNTING AND ORGANIZATIONAL PERFORMANCE

Supply chain management practices (SCM) are expected to create added value in numerous ways. As organizations become involved in inter-organizational supply chains, the implications for management accounting systems and performance are increasingly important.

This study aims to investigate the relationship between SCM practices, firm's adoption of different levels of management accounting practices and organizational performance. As management accountant / senior / executive-level manager, your responses are invaluable in enabling me to obtain as full an understanding as possible of this topical issue. In answering the questionnaire, please try to act as your organization's representative. The design of the study focuses on the organization, not the individual.

All the information you provide will be strictly confidential. Your responses will only be presented in aggregate form and no single firm's results will be highlighted.

The questionnaire should take about 20 minutes to complete. Enclosed is a stamped, self-addressed envelope for your convenience. If you have any queries or would like further information please do not hesitate to contact me. Your participation in this research study will be very much appreciated.

Thank you once again for your contribution.

Yours faithfully

Noriza Mohd Jamal
Ph.D candidate
N.Mohd-Jamal@2007.hull.ac.uk
Supervisors:
Professor Mike Tayles
Director, Centre of International Accounting and Finance
Professor David Grant
Director, University of Hull Logistics Institute
University of Hull

Hull, HU6 7RX, UK.

Please send your answered questionnaire promptly to:

Noriza Mohd Jamal
Management Department
Faculty of Management and Human Resource Development
Universiti Teknologi Malaysia
81310 Skudai, Johor,
Malaysia.

Tel: +60196401818 (mobile)
Fax: +607 5566911

Note:
The questionnaire applies to your organization or its business unit with which you are most familiar. Please complete all items in the questionnaire. If you have less knowledge of any of the sections, please consult a colleague within the organization.

If you would like to participate in the prize draw of £100 and receive a copy of the executive summary of the results, please attach your business card with this questionnaire or provide your information in the space provided below. This information will only be used for the draw prize and sending you a copy of the executive summary of the results. It will not be recorded or revealed to third parties. Person completing the questionnaire: Name:……………………………… Job Title…………………………………. Organization / Company Name:……………………………………………………... Telephone Number:………………………………………………………………………..

SECTION A: SUPPLY CHAIN MANAGEMENT PRACTICES IN YOUR FIRM

Please circle the extent of the following elements of supply chain management practices* that accurately reflects your organization's present conditions using a 7-point scale ranging from "1" (not at all) to "7" (to a large extent). Please use 4 infrequently.
(*see glossary at the back)

	Strategic supplier partnership (SSP)	Not at all						To a large extent
SSP1	We consider quality as our number one criterion in selecting suppliers.	1	2	3	4	5	6	7
SSP2	We strive to establish long-term relationships with our suppliers.	1	2	3	4	5	6	7
SSP3	We regularly solve problems jointly with our suppliers.	1	2	3	4	5	6	7
SSP4	We have helped our suppliers to improve their product quality.	1	2	3	4	5	6	7
SSP5	We have continuous improvement programs that include our key suppliers.	1	2	3	4	5	6	7
SSP6	We include our key suppliers in our planning and goal-setting activities.	1	2	3	4	5	6	7
SSP7	We actively involve our key suppliers in new product development processes.	1	2	3	4	5	6	7
	Customer relationship (CR)	Not at all						To a large extent
CR1	We frequently evaluate the formal and informal complaints of our customers.	1	2	3	4	5	6	7
CR2	We frequently interact with customers to set reliability, responsiveness and other standards for us.	1	2	3	4	5	6	7
CR3	We have frequent follow-up with our customers for quality / service feedback.	1	2	3	4	5	6	7
CR4	We frequently measure and evaluate customer satisfaction.	1	2	3	4	5	6	7
CR5	We frequently determine future customer expectations.	1	2	3	4	5	6	7
CR6	We facilitate customers' ability to seek assistance from us.	1	2	3	4	5	6	7
CR7	We periodically evaluate the importance of our relationship with our customers.	1	2	3	4	5	6	7
	Level of information sharing (IS)	Not at all						To a large extent
IS1	We share our business units' proprietary information with trading partners*.	1	2	3	4	5	6	7
IS2	We inform trading partners in advance of our changing needs.	1	2	3	4	5	6	7

IS3	Our trading partners share proprietary information with us.	1 2 3 4 5 6 7
IS4	Our trading partners keep us fully informed about issues that affect our business.	1 2 3 4 5 6 7
IS5	Our trading partners share business knowledge of core business processes with us.	1 2 3 4 5 6 7
IS6	We and our trading partners exchange information that supports business planning.	1 2 3 4 5 6 7
IS7	We and our trading partners keep each other informed about events or changes that may affect the other partners.	1 2 3 4 5 6 7
	Level of information quality (IQ) Information exchange between our trading partners and us is …	Not at all … To a large extent
IQ1	…timely.	1 2 3 4 5 6 7
IQ2	…accurate.	1 2 3 4 5 6 7
IQ3	…complete.	1 2 3 4 5 6 7
IQ4	…adequate.	1 2 3 4 5 6 7
IQ5	…reliable.	1 2 3 4 5 6 7
	Internal Lean Practices (ILP)	Not at all … To a large extent
ILP1	Our firm targets the reduction of set-up time.	1 2 3 4 5 6 7
ILP2	Our firm has continuous quality improvement.	1 2 3 4 5 6 7
ILP3	Our firm uses a "Pull" production system.	1 2 3 4 5 6 7
ILP4	Our firm pushes suppliers for shorter lead-times	1 2 3 4 5 6 7
ILP5	Our firm streamlines ordering, receiving and other paperwork from suppliers.	1 2 3 4 5 6 7
	Postponement (POS)	Not at all … To a large extent
POS1	Our products are designed for modular assembly.	1 2 3 4 5 6 7
POS2	Our production process modules can be re-arranged so that customization can be carried out later.	1 2 3 4 5 6 7
POS3	We delay final product assembly activities until customer orders have actually been received.	1 2 3 4 5 6 7
POS 4	We delay final product assembly activities until the last possible position (or nearest to customers) in the supply chain.	1 2 3 4 5 6 7

SECTION B: MANAGEMENT ACCOUNTING PRACTICES IN YOUR FIRM

Please circle both the importance and the frequency of use of management accounting practices (MAPs). The measurement is based on a 3-point scale **(1=little, 2=moderate, 3= a lot) for the importance of MAPs;** and based on a 5-point scale **(1=never, 2-=rarely, 3=sometimes, 4=often, 5=very often) for the frequency of use.**

(*see glossary at the back)

MANAGEMENT ACCOUNTING PRACTICES / TECHNIQUES	**HOW IMPORTANT?**			**HOW FREQUENTLY?**				
	Little	**moderate**	**A lot**	**Never**				**Very often**
COSTING SYSTEM								
Separation between variable and fixed/non incremental costs	1	2	3	1	2	3	4	5
A plant-wide overhead rate	1	2	3	1	2	3	4	5
Departmental overhead rates	1	2	3	1	2	3	4	5
Activity-based costing (ABC)*	1	2	3	1	2	3	4	5
Target costing*	1	2	3	1	2	3	4	5
Quality costing*	1	2	3	1	2	3	4	5
Regression* and/or learning curve* techniques	1	2	3	1	2	3	4	5
Inter-organizational cost management / cost reduction program*	1	2	3	1	2	3	4	5
Open book costing*	1	2	3	1	2	3	4	5
BUDGETING								
Budgeting for planning	1	2	3	1	2	3	4	5
Budgeting for controlling costs	1	2	3	1	2	3	4	5
Activity-based budgeting*	1	2	3	1	2	3	4	5
Budgeting with 'what if analysis'	1	2	3	1	2	3	4	5
Flexible budgeting*	1	2	3	1	2	3	4	5
Zero-based budgeting*	1	2	3	1	2	3	4	5
Budgeting for long term / strategic plans	1	2	3	1	2	3	4	5
PERFORMANCE EVALUATION								
Performance evaluation based on financial measures	1	2	3	1	2	3	4	5
Performance evaluation based on non-financial measures related to customers	1	2	3	1	2	3	4	5
Performance evaluation based on non-financial measures related to operations	1	2	3	1	2	3	4	5

MANAGEMENT ACCOUNTING PRACTICES	HOW IMPORTANT? Little	moderate	A lot	HOW FREQUENTLY? Never				Very often
Performance evaluation based on non-financial measures related to employees	1	2	3	1	2	3	4	5
Performance evaluation based on residual income or economic value added (EVA)*	1	2	3	1	2	3	4	5
Benchmarking*	1	2	3	1	2	3	4	5
Joint inter-organizational performance measurement system	1	2	3	1	2	3	4	5
INFORMATION FOR DECISION MAKING								
CVP analysis for major products*	1	2	3	1	2	3	4	5
Product profitability analysis*	1	2	3	1	2	3	4	5
Customer profitability analysis*	1	2	3	1	2	3	4	5
Stock control models	1	2	3	1	2	3	4	5
Evaluation of major capital investments based on Discounted Cash Flow (DCF)*	1	2	3	1	2	3	4	5
Evaluation of major capital investments based on payback period and/or Accounting Rate of Return (ARR)*	1	2	3	1	2	3	4	5
Evaluation of major capital investments using non-financial aspects	1	2	3	1	2	3	4	5
Evaluating the risk of major capital investments projects using probability analysis or computer simulation	1	2	3	1	2	3	4	5
Performing sensitivity 'what if' analysis when evaluating major capital investments projects	1	2	3	1	2	3	4	5
STRATEGIC ANALYSIS								
Long range forecasting	1	2	3	1	2	3	4	5
Shareholder value analysis	1	2	3	1	2	3	4	5
Industry analysis	1	2	3	1	2	3	4	5
Analysis of competitive position	1	2	3	1	2	3	4	5
Value chain analysis*	1	2	3	1	2	3	4	5
Product life cycle analysis*	1	2	3	1	2	3	4	5
Integration with suppliers' and/or customers' value chains	1	2	3	1	2	3	4	5
Analysis of competitors' strengths and weaknesses	1	2	3	1	2	3	4	5

SECTION C: PERCEIVED SCM PERFORMANCE AND OVERALL ORGANIZATIONAL PERFORMANCE

With regard to the actual level of the performance, please circle the appropriate number to indicate the extent of supply chain management performance and overall firm performance **relative to your competitors / similar companies in the industry**. The item scales are five-point Likert scales; **1= significantly below, 2= below, 3= same as your competitor, 4= above, 5= significantly above, NA= not applicable)**

SUPPLY CHAIN MANAGEMENT PERFORMANCE (relative to your competitors)		**Significantly below**				**Significantly above**	
SUPPLY CHAIN FLEXIBILITY	Ability to handle non–standard orders.	1	2	3	4	5	NA
	Ability to meet special customer specification.	1	2	3	4	5	NA
	Ability to produce products characterized by numerous features options, sizes, colours, etc.	1	2	3	4	5	NA
	Ability to rapidly adjust capacity so as to accelerate to decelerate production.	1	2	3	4	5	NA
	Ability to rapidly introduce product improvements / variation.	1	2	3	4	5	NA
	Ability to handle rapid introduction of new products.	1	2	3	4	5	NA
	Ability to respond to the needs and wants of the firm's target market(s).	1	2	3	4	5	NA
SUPPLY CHAIN INTEGRA-TION	Communication and coordination between all functions in the firm.	1	2	3	4	5	NA
	Cross-functional teams used for process design and improvement in the firm.	1	2	3	4	5	NA
	Communication and coordination between us and suppliers	1	2	3	4	5	NA
	Communication and coordination between us and customers	1	2	3	4	5	NA
	Integration of information systems in the firm.	1	2	3	4	5	NA
	Integration of activities of our firm and our trading partners.	1	2	3	4	5	NA
SUPPLIER PERFOR-MANCE	Timely delivery of materials / components / products to our firm.	1	2	3	4	5	NA
	Dependability of delivery to our firm.	1	2	3	4	5	NA
	Providing materials /components / products that are highly reliable.	1	2	3	4	5	NA
	Providing high quality materials /components /products to our firm.	1	2	3	4	5	NA
	Providing high quality materials /components/products to our firm at low cost.	1	2	3	4	5	NA
RESPON-SIVENESS TO CUSTOMERS	Fulfilling customer orders on time.	1	2	3	4	5	NA
	Shorter order-to-delivery cycle time	1	2	3	4	5	NA
	Customer response time	1	2	3	4	5	NA

OVERALL ORGANIZATIONAL PERFORMANCE (relative to your competitors)		**Significantly below**				**Significantly above**	
OVERALL FINANCIAL PERFORMANCE	Return on investment	1	2	3	4	5	NA
	Profit margin on sales	1	2	3	4	5	NA
	Total cost reduction	1	2	3	4	5	NA
	Market share	1	2	3	4	5	NA
OVERALL NON FINANCIAL PERFORMANCE	Product quality	1	2	3	4	5	NA
	Competitive position	1	2	3	4	5	NA
	Customer satisfaction	1	2	3	4	5	NA

SECTION D: GENERAL INFORMATION ABOUT YOUR FIRM

For the following questions, please tick in the appropriate response.

1. Has your firm embarked upon a programme aimed specially at implementing "Supply Chain Management"?
   ( ) Yes ( ) No
   If Yes, for how long? ( ) years

2. Number of employees in your firm:
   ( ) 1 – 50 ( ) 51 – 100 ( ) 101 – 250 ( ) 251 – 500 ( ) 501 – 1,000 ( ) 0ver 1,000

3. Average annual sales of your firm in millions of RM:
   ( ) Under 10 ( ) 10 to < 50 ( ) 50 to < 100 ( ) 100 to < 500 ( ) Over 500

4. Your present job title:
   ( ) CEO/President ( ) Director ( ) Manager
   ( ) Other (Please indicate ______________________

5. Your present job function (mark all that apply):
   ( ) Corporate Executive ( ) Purchasing
   ( ) Manufacturing Production ( ) Distribution
   ( ) Transportation ( ) Sales
   ( ) Other (Please indicate ___________________________)

6. The years you have worked at this organization:
   ( ) under 2 years ( ) 2 – 5 years ( ) 6 – 10 years ( ) over 10 years

7. Please rank the importance of the following factors (from 1 –least important to 5 – most important) in selecting your suppliers (use each number only once)
   ( ) Cost ( ) Quality ( ) Lead Time ( ) On Time Delivery
   ( ) Delivery Reliability

8. What percentage of your business transactions with your suppliers is done electronically?
   ( ) Less than 10% ( ) 10 – 30%
   ( ) 30 – 50% ( ) 50 – 80%
   ( ) More than 80%

9. What percentage of your business transactions with your customers is done electronically?
   ( ) Less than 10% ( ) 10 – 30%
   ( ) 30 – 50% ( ) 50 – 80%
   ( ) More than 80%
10. Please mark the position of your company in the supply chain (mark all that apply)
   ( ) Raw material supplier ( ) Component supplier
   ( ) Assembler ( ) Sub-assembler
   ( ) Manufacturer ( ) Distributor

( ) Wholesaler ( ) Retailer
( ) Service Provider ( ) Other (Please indicate ______________)

11. Will you be prepared to participate in a further interview through telephone or in person?
( ) Yes ( ) No

THANK YOU FOR YOUR KIND PARTICIPATION IN THIS SURVEY.

Please send your answered questionnaire promptly to:

Noriza Mohd Jamal
Management Department
Faculty of Management and Human Resource Development
Universiti Teknologi Malaysia
81310 Skudai, Johor,
Malaysia.
Fax: +607 5566911

GLOSSARY

Accounting rate of return (ARR)	Income for a period divided by an average investment during the period. The accounting rate of return (ARR) is based on income, rather than discounted cash flows.
Activity-based budgeting	An approach to budgeting where a company uses an understanding of its activities and driver relationships to quantitatively estimate work load and resource requirements as part of an ongoing business plan.
Activity-based costing (ABC)	A costing system that identifies the relationship between the incurrence of cost and activities and applies cost to product on the basis of resources consumed (drivers).
Benchmarking	The process of using predetermined goals or standards to measure the performance of a product, service or department. The standard chosen represents the best level of performance achievable.
Customer profitability analysis	The processing of data about customers and their relationship with the enterprise in order to provide information regarding which customers lead to the most profit over time.
Cost-volume-profit (CVP) analysis	An analysis of the relationship of cost and revenue. It characteristically emphasizes both the volume at which there is neither profit nor loss and the influence of fixed and variable factors on the profit expectations at various levels of operation.
Discounted cash flow (DCF)	A method of evaluating future net cash flows by discounting them to their present value.
Flexible budgeting	A budget in which the budgeted amounts may be adjusted to any activity level. It may be a variable in which amounts are stated as a fixed amount plus a variable amount of activities or it may be a step budget in which a series of detailed financial budgets is developed.
Economic value added (EVA)	EVA – is an estimate of true economic profit after making corrective adjustments to Generally Accepted Accounting Principles (GAAP), including deducting the opportunity cost of capital.
Life cycle costing	The accumulation of costs for activities that occur over the entire life cycle of a product, from inception to abandonment by the consumer. It is a measure of the total costs over the product's life including design and development, acquisition, operation, maintenance, and service.
Open book costing	An open book agreement which effectively allows trading

	partners to see a breakdown of all the finances and costs involved in any given area.
Payback period	The period of time necessary to recover the cash cost of an investment from the cash inflows attributable to the investment
Profitability analysis	The analysis of profit derived from cost objects with the view to improve or optimize profitability. Multiple views may be analyzed, such as market segment, customer, distribution channel, product families, products, technologies, platforms, regions, manufacturing capacity, etc.
Quality costing	A costing system associated with preventing, finding, and correcting defective work; includes prevention costs, appraisal costs, internal failure costs, and external failure costs.
Regression	A mathematical modeling methodology which analyzes the relationship between quantitative variables. The aim is to build models successful at predicting the dependent variable based upon changes in the independent variable.
Learning curve techniques	A mathematical expression of the phenomenon that incremental unit costs to produce decrease as managers and labour gain experience from practice and as better methods are developed.
Supply chain management	Supply chain management includes a set of approaches and practices undertaken by an organization to promote effective management of its supply chain.
Target costing	A method used in the analysis of product design that involves estimating a target cost and then designing the product / service to meet the cost.
Trading partner	Any external organization that plays an integral and critical role in the business; includes customers, suppliers, contract manufacturers, subassembly plants, distribution centres, wholesalers, retailers, carriers, and so on.
Value chain analysis	A method to identify all the elements in the linkage of activities a firm relies on to secure the necessary materials and services , starting from their point of origin, to manufacture, and to distribute their products and services to an end user.
Zero-based budgeting	A budget that is developed by analyzing the amount of each element of cost that should be incurred under a variety of assumptions for the budget period and then selecting what appears to be the optimum 'decision packages' from these alternatives. The first package is the amount developed 'from scratch'; that is, the amount required for the lowest possible level of activity.

Appendix B

QUESTIONS TO GUIDE THE INTERVIEWS

Date: Time: Venue / Organization:

Questions	**Remarks and observations**
1. Introduction ❖ Description of the study, method, the length of the interview, the interview will be recorded and later transcribed. ❖ Purpose of the interview (supplementary / complementary) ❖ Discussion of anonymity and confidentiality. ❖ Brief introduction from researcher and interviewees	
2. Supply Chain Management ❖ What does supply chain mean to **your organization**? What, who, and which departments are involved? When did you start SCM in your organization? ❖ How important is supply chain management (SCM) to your organization? ❖ How do you manage your SCM? Does the management of your firm fully support SCM? ❖ What are the benefits of SCM to your firm?	
3. SCM Practices ❖ Who are your major customers and major suppliers? ❖ How do you manage upstream and downstream relationships with suppliers and customers? What do your customer value? What do your supplier value?	

❖ Do you share business information with your customers / suppliers? If so, what type of information is shared? ❖ How do you determine the level / quality of information shared? ❖ What are the benefits of sharing information? ❖ What is your opinion on Open book costing? ❖ What sorts of internal lean practices do you have in the firm? (e.g. Continuous Quality improvement, Pull Production system) ❖ What are the benefits you experience in internal lean practices? ❖ Do you practice postponement? If you do, what are the benefits of postponement to your customers?	
4. Management Accounting Practices ❖ How important are management accounting practices (MAPs) to your firm? Can you give examples? ❖ To what extent is the sophistication level of your firm's MAPs? Can you give examples? (Do you think your MAPs are sophisticated?) ❖ Does SCM influence your firm's MAPs? How does it influence MAPs? Can you give examples?	
5. Performance ❖ How do you measure performance? What types of measurement are used? What are the financial measures? What are the non-financial measures? How do you monitor performance in relation to your competitors / over time?	
6. SCM / MAPs and Performance ❖ Is there a significant change in the firm's financial performance and non-financial performance since	

you have SCI? ❖ Does the firm’s SCM and MAPs influence performance? How do they influence performance? Can you give examples?	
7. Examples Success / Failures in implementing SCM / MAP ❖ Can you give me an example of a recent success or failure of the implementation of SCM? ❖ Can you give me an example of a recent success or failure of the implementation of MAPs?	