# INVESTIGATING THE RELATIONSHIP BETWEEN SUPPLY CHAIN MANAGEMENT AND MANAGEMENT ACCOUNTING PRACTICES

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## ABSTRACT

*This paper investigates relationships between supply chain management and management accounting practices and their individual or combined effects on both supply chain and overall organisational performance. Using a contingency theory approach a conceptual model was empirically tested with managers in Malaysian publicly listed organisations and the resultant structural equation analysis found a positive and direct relationship between both sets of practices. The findings also found a positive and direct relationship between these two sets of practices and supply chain performance, but only found an indirect relationship related to overall organisational performance that was mediated through supply chain performance. The findings provide practice with a strategically important overview of these relationships to support the creation of a successful supply chain environment that will lead to improved supply chain and overall performance.*

***Keywords:*** *Supply chain management, Management accounting practices, Supply chain performance, Organisational performance*

**บทคัดย่อ**

บทความนี้มีวัตถุประสงค์เพื่อสืบค้นความสัมพันธ์ระหว่างแนวปฏิบัติทางการจัดการโซ่อุปทานและแนวปฏิบัติทางการบัญชีบริหาร รวมถึงผลกระทบต่อโซ่อุปทานและผลประกอบการรวมขององค์กร โดยการนำทฤษฎีเชิงสถานการณ์มาใช้เพื่อสร้างแบบจำลองความคิด แล้วทำการทดสอบเชิงประจักษ์กับผู้จัดการบริษัทจดทะเบียนในตลาดหลักทรัพย์ประเทศมาเลเซีย ทั้งนี้ผลจากโมเดลสมการโครงสร้างแสดงให้เห็นถึงความสัมพันธ์ทางตรงและเชิงบวกระหว่างแนวปฏิบัติทั้งสอง รวมถึงความสัมพันธ์ทางตรงและเชิงบวกระหว่างแนวปฏิบัติทั้งสองต่อผลประกอบการโซ่อุปทาน แต่กลับพบเพียงความสัมพันธ์ทางอ้อมต่อผลประกอบการขององค์กรโดยผ่านตัวแปรคั่นกลาง คือ ผลประกอบการโซ่อุปทาน ผลการวิจัยแสดงให้เห็นภาพรวมของความสัมพันธ์เหล่านี้เพื่อสนับสนุนการสร้างสภาพแวดล้อมเพื่อช่วยในการปรับปรุงโซ่อุปทานและผลประกอบการโดยรวม

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## INTRODUCTION

Supply chain management (SCM) has developed an increasing profile since its introduction in the 1980s (Grant, 2012). SCM extends the boundaries of individual organisations and hence success in the establishment and maintenance of long-term collaborations with suppliers and customer along the supply chain has an impact on competitive advantage and profitability (Chan & Qi, 2003; Fynes et al., 2008). Consequently, there has been considerable research addressing SCM design and subsequent inter-organisational practices (Tan, 2002; Kotzab et al., 2015) and its impact on organisational and supply chain performance (Fabbe-Costes & Jahre, 2007).

Literature has also considered costs related to activity-based costing, open book accounting, supply chain activities, production and purchasing (e.g. Ellram, 2006; Romano & Formentini, 2012; Schulze et al., 2012; Pettersson & Segerstedt, 2013). However, other than the foregoing there has been little attempt to evaluate and integrate knowledge from the accounting discipline into the SCM discipline within the SCM literature with only modest research on inter-disciplinary relationships between SCM and accounting and financial statement analysis (e.g. Ramos, 2004; Longinidis & Georgiadis, 2011) as well as finance and economics (e.g. Dekker & Van Goor, 2000; Gomm, 2010).

A recent review of SCM research (Swanson et al., 2018) did not list accounting or finance in a set of twenty-one key topics, but also did not suggest them as topics in a future research agenda. This is surprising given SCM's focus on cost efficiency and supply chain effectiveness as important performance criteria for both supply chains and the organisation (Gunasekaran et al., 2014), early discussions using the DuPont Strategic Profit Model to locate logistics costs in balance sheets and income statements (Grant et al., 2006) predominance of transaction cost economics (TCE) and the resource based-view (RBV) as SCM theoretical frameworks (Halldórsson et al., 2015), financially-based performance measurement models and tools such as the Supply Chain Operations Reference (SCOR) model and the Balanced Scorecard (Shaw et al., 2010) and recent interest in supply chain finance as a mechanism to follow the flow of funds through the supply chain (Tate et al., 2018).

The accounting literature has called for research using management accounting systems in emerging circumstances and different functional strategies (Bhimani & Bromwich, 2010), including investigating how changes in SCM affect the use of management accounting systems and vice-versa. It also suggests that a supply chain and its members would benefit considerably from information provided by management accounting practices (MAP), i.e. looking across rather than up and down, the organisational hierarchy (Hopwood, 1996).

Such horizontal approaches have used interpretive research applying contingency theory, particularly using case studies of relationships within individual companies in the management control of inter-organisational relationships. But, there is relatively little research creating an overview of the nature of a SCM-management accounting relationship, or what might also be termed the integration of SCM practices (SCMP) and MAP, and their collective impact on performance. This paper's research objective is to investigate those relationships and impacts and contributes through using a contingency theory framework in a cross-disciplinary research setting to test and validate relevant variables and constructs.

The remainder of the paper is structured as follows. The next section provides a review of the evolution and development of SCM practices (SCMP) and MAP. It then presents a resultant theoretical model, testable hypotheses, and research methodology followed by a discussion of findings from an empirical study conducted in Malaysia. Finally, conclusions, contributions, study limitations and directions for future research round off the paper.

## LITERATURE REVIEW

### *SCM Practices (SCMP)*

SCM includes a set of structures, approaches and practices to effectively integrate suppliers, manufacturers, distributors and customers with the aim of improving the long-term performance of individual organisations and the supply chain as a whole (Grant, 2012). To improve supply chain execution and the performance of the entire supply chain, a set of intra- and inter-organization practices need to be implemented (Kotzab et al., 2015).

SCMP can be either macro- or micro- in focus, and while the SCM domain is extensive, the primary practices noted in the literature include *strategic supplier partnerships*, *customer relationships*, *information sharing*, and *internal supply chain activities* (Li et al., 2006). Potter et al. (2015) differentiated between macro- or strategic issues and micro- or operational issues and highlighted the latter's relationship to costs. They considered costs related to internal or operational supply chain activities are either physical delivery process or marketability costs where *"physical costs dominate lean supply* [whilst] *marketability costs dominate agile supply"* (2015: 603).

*Strategic supplier partnerships* (SSP) emphasize direct, long-term association and encourage mutual planning and problem solving efforts (Chen et al., 2004). The objective of SSP is to promote shared benefits among the parties and ongoing participation in one or more key strategic areas such as technology, products and markets. This enables organisations to work more effectively with a few important suppliers who are willing to share responsibility for the success of their products (Lee et al., 2007).

*Customer relationships* cover practices on complaint handling, customer satisfaction and the establishment of long-term relationships related to them (Grant, 2005). The growth of mass customization and personalized service leads to an era in which relationship management with customers is becoming crucial for corporate survival (Li et al., 2006). Thus close customer relationships allow an organization to differentiate its products from competitors, sustain customer loyalty and extend the value it provides to its customers.

*Information sharing* relates to the extent of the information communicated between partners whereas information quality refers to its accuracy, adequacy and timeliness (Li et al., 2005, 2006). The flow of information and the ability to analyse that information is a significant challenge and a key performance driver in contemporary supply chains (Tan, 2002; Fawcett et al., 2007). By obtaining and sharing the data available with other parties within the supply chain, information can be used as a source of competitive advantage. Thus the capability of the channel as a whole to react faster and more effectively to developments in the market will be improved.

*Internal supply chain activities* are comprised primarily of lean and/or agile practices (Potter et al., 2015). Lean practices are concerned with a drive to achieve the elimination of waste, low inventory, small lot sizes and just-in-time (JIT) delivery (Purvis et al., 2014; Soltan & Mostafa, 2015). However, postponement stemming from agile practices involves the delayed differentiation of products in the supply chain and allows an organisation to be flexible both upstream or downstream in developing different versions of a product in order to meet changing customer needs and to differentiate a product or to modify a demand function (Van Hoek, 2001; Boone et al., 2007).

### *Management Accounting in an SCM Environment*

Management accounting refers to the systems and practices in an organisation 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 & Luther, 2006). In an era of globalization, in which low costs, operating efficiency and customer satisfaction are all part of the focus, traditional management accounting is seriously challenged (Burns & Vaivio, 2001). Moreover, global organisations are also becoming concerned over total supply chain costs as opposed to simply lower-cost labour when outsourcing, such that some organisations are 're-shoring' operations either in their home market or nearby markets (Ellram et al., 2013; Menachof & Grant, 2016).

And yet, the SCM discipline has not paid much attention to the role of management accounting techniques; Lambert and Burduroglu's (2000) paper discussing Dupont's Strategic Profit Model, which is based on an organisation's balance sheet, is one that has but is also one of the latest. Further, recent notions of supply chain 'finance' have focused primarily on managing and reducing accounts payables and receivables and inventory, i.e. working capital management, or supplier development to reduce procurement costs (see for example Tate et al., 2018).

Traditional management accounting techniques are now being used alongside 'advanced' or 'strategic' accounting and management practices including activity-based costing (ABC), target costing, product life cycle costing, just-in-time (JIT) inventory, total quality management (TQM), value chain analysis, and the balanced score-card (BSC) approach to performance measures (Shaw et al., 2010), particularly in developing nations where adoption of such practices and SCM may lag developed nations (Guilding et al., 2000; Islam & Kantor, 2005).

The management accounting literature related to SCM has focused on costing and control in an inter-organizational setting. Some specific cost and management accounting practices have been suggested including value chain analysis and activity-based costing (Lin et al., 2001), target costing and inter-organizational cost management (Ellram, 2006), open book accounting (Kajüter & Kulmala, 2005) and performance-based contracting (Howard et al., 2016).

It is also argued that SCM has several implications for management accounting, costs and finance, particularly in terms of cost-tradeoffs to ensure supply chain optimality as opposed to perhaps organisation optimality (Gomm, 2010; Grant, 2012). Exclusive reliance on traditional management accounting is said to lack the full potential to recognize and make visible the scope for exploiting linkages with an organisation's suppliers and customers. Indeed, the contribution of management accounting to SCM therefore may depend on its ability to develop costing and performance measurement technologies that can be understood and acted upon by non-accountants who currently predominate in the supply chain field (Langfield-Smith & Smith, 2003, Ma & Tayles, 2009).

### *Supply Chain and Organisational Performance Measurement*

Research into supply chain performance measures came to prominence relatively recently (Chan et al., 2003; Lee et al., 2007; Shaw et al., 2010). It is noted that non-financial performance measures are becoming of increasing interest in the supply chain environment in both developed and developing nations (Chan et al., 2003). For example, such measures for suppliers include dependability, flexibility, and quality (Fynes et al., 2008), easy ordering, action on complaints, trust, commitment and integrity (Grant, 2004), communication, design effectiveness and geographical proximity (Chow et al., 2008) and responsiveness (Chan et al., 2003; Chen et al., 2004).

Financial performance has served as a basis for comparing and evaluating organizations over time. Prior studies have measured organisation performance using financial indicators such as return on investment or ROI, ROI growth, profit margin on sales, sales growth) and market indicators such as market share, growth of market share (Chen et al., 2004; Grant et al., 2006). An increasing number of researchers report the use of non-financial measures for performance evaluation and argue that the past emphasis on solely traditional financial performance metrics were a distraction from appropriate concern for non-financial factors such as customer satisfaction, product quality and competitive position. They further argue that the use of non-financial measures may help managers to recognize changes in the business environment and determine and assess progress and trade-offs towards wider business objectives and achievement of broader performance goals (Hoque & James, 2000; Li et al., 2006; Shaw et al., 2010).

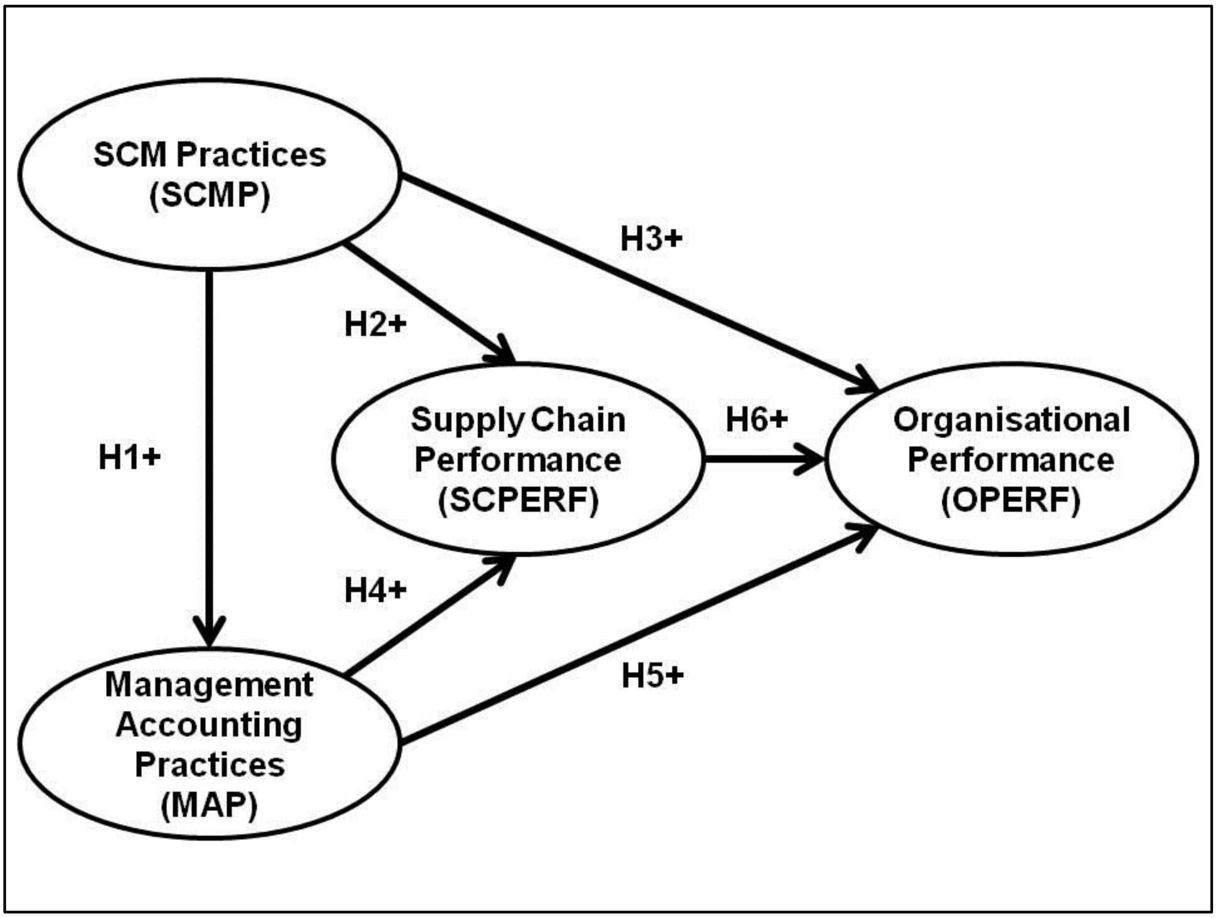
## A CONTINGENCY PERSPECTIVE, CONCEPTUAL MODEL AND HYPOTHESIS DEVELOPMENT

As firms adapt to environmental, technological and management developments they must design management accounting systems to suit them, in other words, a contingency theory perspective (Gerdin & Greve, 2004). The fundamental tenet of contingency theory holds that a company's performance is a product of an appropriate fit between the structure (i.e. MAP) and the context (i.e. SCMP). Further, MAP evolve partly in response to the environmental contingencies confronted by individual firms, in this case the supply chain environment which also is subject to contingency effects (Flynn et al., 2010). That is, whilst organisation structure is a function of context, this context is simultaneously determined by the external environment and other organisation factors, including MAP.

Three types of questions have been addressed in management accounting research using contingency theory: 1) the fit as noted above, 2) the impact of this fit on performance, and 3) the investigation of multiple contingencies and their impact on organisational design (Islam & Hu, 2012). There has also been some theoretical and interpretive research applying contingency theory, but much of this has been using case studies of relationships within individual companies or focusing on individual techniques. For example, Caglio and Ditillo (2012) present a quantitative analysis exploring factors which explain why firms share management accounting information but only at one company. They focused on antecedents of management accounting and control processes at a micro level, whereas this paper takes a macro focus and uses both SCMP and MAP as antecedents. Haldma and Lääts (2002) observed that changes in MAP are associated with shifts in the business and accounting environment but, despite the importance of SCM and logistics research, there is limited research matching management accounting practices to this.

Thus, we investigate the interaction between SCM and MAP as potential contingency factors in the context of supply chain performance (SCPERF) and organisation performance (OPERF). That is, as an organisation places greater focus on SCMPs does the management accounting system respond by developing and placing different emphasis on MAP? Further, does such interaction influence the performance of the supply chain and finally, when focus is placed on the whole supply chain and its performance to what extent does this affect individual organisational performance? Hence, we use an *interaction approach* of the contingency model of management accounting to empirically assess this aspect. Following Gerdin and Greve's (2004) hierarchical taxonomy of forms of fit we propose a Cartesian-contingency-mediation form of fit for empirical testing via the conceptual path model shown in Figure 1.

**Figure 1: Conceptual Path Model**




Our empirical study of SCMP as they pertain to MAP considers upstream (strategic supplier partnership) and downstream (customer relationship) elements 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) that featured in our literature review above. We therefore argue that a relationship exists between SCM and management accounting and between the practices of these two constructs and supply chain and organisational performance (Ramos, 2004). The hypotheses shown in the conceptual model are discussed in the following sections.

***SCMP and MAP***

Management requires accurate and timely information on supply chain activities and costs, including how best to allocate resources and hence these costs among customers, products, services, suppliers and other important cost objects to improve the effectiveness and efficiency of the supply chain, (Dekker &Van Goor, 2000). 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. More specific control mechanisms on cost and accounting information exchanges for partners' control systems are open book accounting (Kajüter & Kulmala, 2002), value chain analysis (Dekker, 2003) and inter-organisational cost management (Cooper & Slagmulder, 2004). However, much of the literature that can be related to supply chain and accounting presents a particular technique in isolation but does not deal with it in the wider framework that is contained in this research. Thus looking holistically, the SCM framework developed in this study proposes that SCM practice has an impact on management accounting practices and we propose:

**H1: SCMP positively affects MAP.**

***SCMP and SCPERF***

Prior studies have indicated that various components of SCMP have an impact on SCPERF. 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 (Chan & Qi, 2003; Li et al., 2006; Fabbe-Costes & Jahre, 2007). Likewise, Chen et al. (2004) found that strategic purchasing based on regular communication and long term orientation increases customer responsiveness and was supported by Fynes et al. (2008) 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) asserted that well-defined supply chain linkages have been a key factor in the improvement of supply chain performance and reliability across a wide range of industries.

Information sharing leads to high levels of supply chain integration (Chan et al., 2003) 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. Cagliano et al. (2006) examined 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 there is a need for consistency between external and internal integration. Further, adopting a postponement strategy not only increases flexibility in the supply chain, but also improves customer responsiveness (Boone et al., 2007; Purvis et al., 2014). Kotzab et al. (2015) found that integrating supply chain activities from firstly internal processes and then secondly external and relationship processes with suppliers and customers will lead to improved SCM execution and performance. Based on this research we propose:

**H2: SCMP positively affects SCPERF.**

***SCMP and OPERF***

Successful implementation of SCM brings greater efficiency and effectiveness and improved competitive advantage for the organisation. Components of SCM have been found to have considerable impact on organisation performance (Fynes et al., 2008; Chow et al., 2008). For example, strategic supplier partnerships can yield organisation-specific benefits in terms of productivity, competitive advantage, and consequently financial and organisation performance. We therefore propose:

**H3: SCMP positively affects OPERF.**

### *MAP and SCPERF*

Abdel-Maksoud et al. (2005) investigated whether the deployment of contemporary management accounting is associated with the existence and importance of non-financial performance measures. In their research they embraced measures related to supply chain performance such as flexibility, on-time delivery, efficiency and resource utilisation. The contemporary management accounting practices addressed were, benchmarking of performance, ABC, Activity-based Management (ABM) and Budgeting (ABB), BSC, Economic Value Added (EVA), throughput accounting, strategic management accounting and customer profitability analysis. It was found that these MAP had an important impact on supply chain performance measures discussed in the previous section.

This finding is supported by Kannan and Tan (2005) who identified various approaches that have been proposed to improve operations performance. In particular, their research addressed the extent to which JIT, SCM, and TQM are correlated, and how they impact performance. The target costing process has been shown to extend into the supplier environment in order to identify specific needs for cost reduction which then become targets for the attention of both supply chain parties working collaboratively (Ellram, 2006). Accordingly, we propose:

**H4: MAP positively affects SCPERF.**

### *MAP and OPERF*

The relationship between management accounting practice and organisational performance has been subjected to various empirical investigations often involving a contingency framework. These have involved the relationship between organisational performance and MAPs generally (Hoque, 2004), strategic management accounting practices (Cadez & Guilding, 2008), lean management accounting practices (Fullerton et al., 2014) or specific management accounting practices such as ABC (Kennedy & Affleck-Graves, 2001) and the Balanced Scorecard (Hoque & James, 2000; Shaw et al., 2010). Thus, we argue that better and more appropriate management accounting information facilitates more effective management decisions leading to enhanced performance. Baykasoglu and Kaplanoglu (2008) report that ABC can improve organizational performance by helping organizations to become more efficient; providing them with a clearer picture of where resources are being spent, customer value is being created, and money is being made or lost; identifying value-added activities and eliminating or reducing non-value-added activities. Thus, we propose:

**H5: MAP positively affects OPERF.**

### *SCPERF and OPERF*

Lastly, several SCM studies have cited SCPERF's potentially positive impact on overall organisational performance (Flynn et al., 2010). Again though, as noted above some authors have pointed out that the results are mixed e.g. Fabbe-Costes and Jahre (2007) and Kotzab et al. (2015). Notwithstanding this, a flexible supply chain should be capable of introducing new products and features in the market place quickly while a well-integrated supply chain will enable organisations to compete based on time, cost, price and delivery dependability (Chan et al., 2003; Fynes et al., 2008). Additionally, a supply chain characterised by quick responsiveness to customers (or agility) and superior supplier performance will be competitive in terms of time, quality and cost whilst lean production practices will have a strong influence on supply chain integration (Cagliano et al., 2006). Based on this research we propose:

**H6: SCPERF positively affects OPERF.**

As much research has tested issues of either SCMP or MAP on performance our empirical study is testing extant measures in a combinatory manner as set out in Figure 1. The next section describes our research method.

## RESEARCH METHOD

### *The Research Context of Malaysia*

Developing countries like 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 growth. Indeed, the recent significant economic growth in South East Asia has been attributed, in part, to its development of successful supply chain relationships (MIDA, 2018). Malaysia was a founding member of the Association of South East Asian Nations (ASEAN) and is a leader for the development of the ASEAN Economic Community (AEC). 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. However, contributions in the ongoing debate on the effectiveness of management accounting practices have attracted very little attention in developing countries like Malaysia and it has been noted that research in management accounting systems have been dominated by studies of large companies in developed countries (Haldma & Lääts, 2002). Accordingly, Malaysia forms the context for our empirical study.

Data for the study were collected from a random sample of 355 publicly listed companies drawn from the Industrial and Consumer Products sectors listed under *Bursa Malaysia*. These sectors and sampled companies are the unit of analysis and permits the sample to include larger and more advanced companies in the region and who are more likely to formally employ multiple SCMPs and MAPs as well as multiple performance measures. It is also more likely that large companies will have the means and the technical expertise to design and implement costing and control systems comprising both SCM and MA practices which are appropriate to the survival and prosperity of the business.

These two sectors were selected for study for a number of reasons; firstly, both sectors are major contributors to Malaysian economic performance (Malaysian-economy, 2018). The manufacturing sector for industrial and consumer products is the major one generating employment opportunities and the fastest growing sector in Malaysia. The sector contributes approximately 50% to gross domestic product (GDP), over 80% to total exports and over 30% of total employment (DOSM, 2018). Secondly, companies from both sectors are involved in collaborative arrangements in chains with suppliers and customers; i.e. the involvement of suppliers, producers, distributors, wholesalers and retailers in ‘supply chains’. Finally, the dominant nature of the sectors makes them appropriate research sites for this investigation, whilst the focus on the two sectors also removes from the findings distractions caused by peripheral industries.

### *Research Technique*

The data for the study were collected from a cross-sectional mail questionnaire survey. Telephone calls were made to each company to check it was relevant to them, to confirm their willingness to participate, and to identify the target senior executives or individuals best equipped to answer questions on supply chain, management accounting and performance issues. Each of these senior executives was posted a copy of the survey instrument and cover letter. In the cover letter the respondent was encouraged to consult more widely if they had uncertainty over any particular response. To minimise definitional problems, a glossary containing a brief description of terms used was included, thereby reducing possible misunderstandings.

The final number of complete and usable responses was 82, representing an effective response rate of 23%, which form the sample and is considered acceptable when compared with similar survey studies in this field. The first stage produced 52 responses while the follow up stages generated another 30 responses. Accumulated data was then assessed for non-response bias by looking at early and late responses and key known variables of respondents and non-respondents (Armstrong & Overton, 1977). From this analysis non-response bias did not appear to present a problem.

***Profile of Participating Companies***

A summary of the participating company profiles is shown in Table 1. 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 points of the supply chain. It can be seen that the respondents categorised themselves across this spectrum, some in more than one position. The highest 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 consumer.

**Table 1**: **Profile Summary 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** |
| <50 | 15 | 18.3 |
| 50 to <100 | 16 | 19.5 |
| 100 to < 500 | 35 | 42.7 |
| over 500 | 16 | 19.5 |
| 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 of 82 respondents
*Note: for this item respondents could provide more than one answer

As expected from our sampling process nearly 43% of firms employed more than 500 people and more than 60% had average annual sales exceeding RM100 million.

Approximately 30% of respondents had the job title accountant, controller or manager who had financial responsibilities; hence they were in an appropriate position to comment on MAP and organisational performance. Others indicated that they had wider corporate executive functions, where they also mentioned manufacturing, purchasing transportation, distribution and sales. Their responsibilities were wider than just finance and they were quite well situated to comment on the operation of the supply chain. Finally, half of the respondents have been in their current organizations for more than five years, a further 23% for 2 to 5 years.

***Constructs for Measurement***

SCMP, MAP, SCPERF OPERF were conceptualized as second-order constructs initially composed of between four and seven first-order constructs. A second-order construct is supported to the extent that it shows a greater nomological validity than a first-order construct (Hair et al., 2010). It was considered appropriate to have a higher-order measurement model for these constructs because such a higher-order model is more parsimonious. All first-order constructs were measured using five or six manifest variables in the questionnaire survey.

The survey employed six SCMP constructs derived from the literature: strategic supplier partnership (SSP), customer relationship (CR), information sharing (IS), information quality (IQ), internal lean practices (ILP) and postponement (POS). The extent and emphasis of SCM practices was measured using a 7-point Likert scale ranging from '1' (not at all) to '7' (to a large extent) with all manifest variables.

The International Federation of Accountants (IFAC) Statement of Management Accounting Concepts was used to incorporate management accounting into the model. The IFAC framework covers a spectrum of MAP from traditional cost determination and financial control through, information for planning and control and the reduction of waste of resources to information which supports the creation of value. The extent and emphasis of management accounting was measured by asking companies to rate both the importance of the respective MAPs and the frequency of use in order to calculate an emphasis score. The importance measurement was based on a 3-point scale (1 = not important to 3 = important) while the frequency of use was based on a 5-point scale (1 = never, to 5 = very often). This followed the approach to capture MAP variables, in their MAP research, adopted by Abdel-Kader and Luther (2008).

SCPERF questions again came from the literature review and related to constructs of supply chain flexibility (FLEX), supply chain integration (INT), supplier performance (SUP) and responsiveness to customers (RESC). To gauge overall organisational performance (OPERF), both financial and non-financial performance measures were employed using those also employed in previous literature. Perceived overall organisation performance included market share (MS), return on investment (ROI), profit margin on sales (PMS), total cost reduction (TCR), customer satisfaction (CS), product quality (PQ) and competitive position (CP). 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).

### *Analysis Techniques*

Using SPSS, exploratory factor analysis (EFA) was conducted as 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. EFA is useful at identifying an underlying factor structure providing initial unidimensionality (convergent validity) and discriminant validity for a strong measurement model.

The results obtained from PCA and reliability analysis using SPSS were submitted to partial least squares (PLS) path modelling analysis. The justifications for using PLS were the minimal requirements regarding residual distributions and sample size ($N<100$) and assessment of predictive validity rather than goodness-of-fit focusing on path analysis (Hair et al., 2012).

A PLS model is analysed and interpreted in two stages: firstly an assessment of the reliability and validity of the measurement model and secondly an assessment of the structural model. The important statistics of the measurement model are item reliability, internal consistency, Average Variance Extracted (AVE), square-root of AVE and cross loadings. The first three are tests for convergent validity and the last two are tests for discriminant validity (Hair et al., 2010).

Individual variable or item reliabilities are evaluated by examining the factor loadings, or simple correlations of the individual items on their respective first-order 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 the error variance (Hair et al, 2010).

Convergent and discriminant validity were also assessed by checking that the AVE of each construct is larger than its correlation with the other constructs. Hair et al. (2010) suggest AVE should be higher than 0.5; indicating the convergent validity measures contain less than 50% error variance. The AVE measures for any two constructs that are related in the model should exceed their squared correlations, indicating discriminant validity.

Second-order constructs were modelled using PLS algorithms and their reliability evaluated using the relative loadings of the first-order construct variables. If the perspective is valid a comparison of loadings would be an indicator of each variable reflecting the overall second order construct. For this purpose, the requirement is that item loading and AVE should be greater than 0.5, and composite reliability should be larger than 0.7. Convergent reliability in the second-order construct is also shown when t-values of the outer model loadings exceed 1.96 or are significant to at least $p<0.05$ (Hair et al., 2010).

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. The Beta ($\beta$) coefficient and t-values were evaluated to test the significance of the relationships. The indirect or mediation effects were tested using Sobel's Test contained in SPSS.

## FINDINGS

In the survey instrument the SCMP construct consisted of six first-order constructs, however following validation postponement was removed from further analysis due to a low correlation or loading relative to other constructs that impacted the validation of the second-order SCMP construct. While postponement was relevant to some respondents it was not relevant to them all and hence was confounding the analysis. Additionally, the EFA resulted in a situation where the Customer Relationship (CR) dimension revealed two distinct factors. The characteristics of one displayed particular strategic aspect and was renamed Strategic Customer Relationship (SCR) while the original CR was applied to the other. The dimensions of information sharing (IS) and information quality (IQ) loaded on a single construct and it was decided to merge them into one component renamed as Information Management (IM). The summary of statistical testing, necessary to validate the measurement items in the model is provided in Tables 2 and 3. All test values are considered acceptable according to standards from Hair et al. (2010).

**Table 2: Item Loading, Composite Reliability and Average Variance Extracted**

| Construct / Measures | Item loading | Standard error | T-Statistics |
|---|---|---|---|
| **SCMP: $P_c$ = 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 |
| **MAP: $P_c$ = 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 – SUP | 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 |

$P_c$ = Composite Reliability; AVE = Average Variance Extracted

**Table 3: Discriminant Validity: Correlations of Latent Variables**

| | MAP | SCMP | 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

The structural model depicted in Figure 1 was used to test the hypothesised relationships between theoretical constructs. A summary of the path coefficients and their associated t-values, and the $R^2$ of the endogenous constructs is presented in Tables 4 and 5. Out of the six hypotheses in the conceptual model, four were found to be significant and supported.

**Table 4: Direct Effects Model**

| | **Support/ Rejection of Conceptual Model Hypotheses** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | **Constructs** | **Beta value** | **T-value** | **Std. Error** | **Sig.** | **Sig. level** | **Outcome** |
| H1 | SCMP ⟶ MAPs | 0.467 | 4.779 | 0.098 | Yes | 0.01 | Supported |
| H2 | SCMP ⟶ SCPERF | 0.349 | 3.303 | 0.106 | Yes | 0.01 | Supported |
| H3 | SCMP ⟶ OPERF | 0.084 | 1.018 | 0.083 | No | - | Unsupported |
| H4 | MAP ⟶ SCPERF | 0.224 | 1.933 | 0.116 | Yes | 0.05 | Supported |
| H5 | MAPs ⟶ OPERF | -0.005 | 0.054 | 0.093 | No | - | Unsupported |
| H6 | SCPERF ⟶ OPERF | 0.642 | 7.700 | 0.083 | Yes | 0.01 | Supported |

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

H1 predicted a positive effect of SCMP on MAP. The structural path coefficient between the SCMP and the MAP constructs is positive and statistically significant at a p-value <0.01. The SCMP construct also yielded a statistically significant beta path co-efficient with the SCPERF construct (H2). The results indicate a positive direct relationship between the two constructs at a p-value < 0.01. The possibility of an indirect relationship between the SCMP construct and the SCPERF construct through the MAP construct was explored and the results found that SCMP have statistically significant indirect effects on SCPERF through MAP at a p-value < 0.05. Table 5 shows both the direct (Panel A) and indirect (Panel B) effects.

**Table 5: Direct and Indirect Effects Model**

| **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 was used in testing the statistical significance of an indirect relationship between an independent construct and a dependent construct through a mediator. The test generates t-statistics and p-values for the indirect path and is contained in SPSS.

***p<0.01 (one-tailed)

**p<0.05 (one-tailed)

SCMP was also hypothesised (H3) to positively affect OPERF. Although the beta path co-efficient between the SCMP construct and the OPERF construct is positive, in this instance, it is not statistically significant. Whether SCMP has an indirect effect on OPERF through SCPERF was also examined and the results indicate a statistically significant indirect effect at a p-value < 0.01 (see Panel B in Table 5).

H4 predicted MAP positively affecting SCPERF and the beta path coefficient linking the MAP construct to the SCPERF construct is positive and statistically significant at a p-value < 0.05. However, the construct yielded a non-significant and negative relationship with OPERF construct (H5). Though this suggests that there is no direct association between MAP and OPERF, the possibility of an indirect relationship was explored and it was found that the MAP construct has a statistically significant indirect effect on the OPERF construct via the SCPERF construct at a p-value < 0.05 (see Panel B in Table 5). In H6, SCPERF was predicted to be positively related to OPERF. The structural model provides statistically significant results that confirm this hypothesis. The beta co-efficient linking the SCPERF construct to the OPERF construct is positive and statistically significant at a p-value <0.01.

As the primary objective of any PLS modelling exercise is the minimisation of error (Hair et al., 2012), 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 the conceptual model (Figure 1) the following $R^2$ values were generated: MAP (21.8%), SCPERF (24.5%) and OPERF (46.5%). These figures give an indication of the explanatory power of the model by outlining the amount of variance of each endogenous (dependent) construct that is explained by the model. This is similar to the role played by $R^2$ values within multivariate analysis. It can be deduced that a substantial amount of variance is explained in the model. These indices provide evidence for the existence of the relationships and the individual $R^2$ values are greater than the recommended 10% (Hair et al., 2010) for all predicted variables.

One of the stronger relationships (higher standardised coefficients) is between SCMP and MAP (0.467) suggesting the strongly significant influence of supply chain practices on MAP. Two other significant coefficients are 0.349 (SCMP to SCPERF) and 0.224 (MAP to SCPERF). These values point to the influence on supply chain performance exercised by both supply chain management practices and management accounting practices.

## DISCUSSION

We suggest several implications from the study findings. First, there is strong empirical support for the relationship between SCMP and MAP (H1). This confirms the contingent impact of SCMP in influencing the adoption and importance of MAP and is in-line with previous research reporting management requires accurate and timely information on supply chain activities and costs. As supply chain networking places a number of demands on cost management, this information is crucial for firms to determine how best to allocate their costs among various cost objects for decision-making, cost reduction and cost management purposes, which will include the implications of the efficiency and quality of tasks performed (Dekker, 2003).

In an SCM environment more detailed management accounting information is required as organisations strive to reduce the costs along the whole supply chain, which is dependent on the ability of the organisation to trace costs accurately to its supply chain and logistics activities (Dekker & Van Goor, 2000). Cost information is seen to play a role in strategic sourcing decisions and thus will influence the ongoing management of partnerships. A detailed cost analysis is important for buyers to understand the cost structures of their suppliers and supports a requirement to engage in inter-organisational cost management processes, including supplier selection, joint product design and joint manufacturing process development (Cooper & Slagmulder, 2004). In-line with contingency theory, this finding supports the view that these external relationships have direct effects on a company's MAP (Haldma & Lääts, 2002; Chenhall & Moers, 2007).

The result for H2 is consistent with some, though not all, previous research. Thus the implementation of various SCM practices such as SSP, CR, IM and ILP will lead to improved supply chain flexibility (Fynes et al., 2008), supply chain integration (Cagliano et al., 2006), supplier performance and customer responsiveness (Chan et al., 2003; Chen et al., 2004). Information sharing and the adoption of internal supply chain activities such as lean production has a strong influence on effectiveness, leading to improved supply chain integration and ultimately performance (Li et al., 2005, 2006; Cagliano et al., 2006; Fawcett et al., 2007; Kotzab et al., 2015).

The relationship between MAP and SCPERF (H4) was found to be significant and confirms the contribution of MAP to SCPERF. This finding is consistent with Abdel-Maksoud et al. (2005), who found that various management accounting practices have an impact on supply chain related performance such as flexibility, on-time delivery and efficiency. Additionally, some practices, like target costing and ABC, can be extended to suppliers to identify areas for mutual cost reduction where performance improvement then becomes the aim for both parties (Ellram, 2006). Such a cost reduction programme should eventually lead to greater supplier integration and improved supplier and hence supply chain performance. This highlights the role of MAP in evaluating and applying financial values to the performance measures which are generated within a SCM environment, both within and outside the traditional boundaries of the organisation, thus reminding managers that any initiatives undertaken must eventually result in improved financial performance.

The findings also reveal that SCPERF is an important mediator of organisational performance. It plays a significant role as an intermediate factor in the linkage between both SCM practices and organisational performance and between management accounting practices and organisational performance (Chan et al., 2003). The findings reaffirm that integrating the internal functions within firms first and effectively linking them with the external operations of suppliers, customers and other trading partners, through management accounting, directly increases supply chain performance and indirectly organisational performance (Kotzab et al., 2015). The findings also reveal that SCM practices increase SCPERF indirectly via MAPs, so reinforcing the message of the beneficial impact of integration of SCM and MA.

The relationships between SCMP and OPERF (H3) and MAP and OPERF (H5) were both unsupported. The first outcome implies that in this context, SCMP do not appear to impact directly on the organizational performance in Malaysian Industrial/Consumer Products Sector companies. Although this finding does not categorically demonstrate that a company's SCMP are of little or no benefit in contributing to overall organisational performance, it appears OPERF is by many other factors and supports Fabbe-Costes and Jahre (2007) that empirical evidence from some of the SCM literature cannot permit a clear conclusion that SCM unequivocally and directly improves organisational performance.

While MAP does not directly impact overall OPERF in this context, and despite prior research reporting mixed findings about that relationship, MAP can still 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 & Moers, 2007). OPERF is a notoriously difficult construct to capture, even allowing for the financial and non-financial aspects which were the focus of this research. However, it should be noted that the findings in this study showed that MAP have a statistically significant indirect effect on OPERF via SCPERF. In other words, by contributing to SCPERF, MAP also influence overall organisational performance.

In summary, whilst SCMP and MAP were not observed to directly influence OPERF at a statistically significant level these two practices are interrelated and have a collective impact on SCPERF and through this OPERF.

H6 is supported, indicating a positive association between SCPERF and OPERF. This implies that supply chain flexibility, supply chain integration, superior supplier performance and swift responsiveness to customers should enable companies to achieve a higher overall financial and non-financial performance. The findings from hypothesis 6 lend support to earlier research conducted by various researchers in this area (e.g. Cagliano et al., 2006; Flynn et al., 2010) whereby an emphasis on supply chain flexibility and supply chain integration may help companies reduce costs and enhance their overall performance.

From a practical point-of-view, these findings confirm the importance of strategic supplier partnership, customer relationship, information management and internal lean practices within an SCM framework in influencing MAP and following on from this their joint influence on supply chain and organisational performance. SCM and MAP play complementary roles in advancing performance in this setting. Organisations which focus on SCM will benefit from an emphasis on a range of MAP in their decision-making, planning and control activities in order to better identify costs, inefficiency, waste, and value adding and non-value adding processes across and beyond their traditional organisational boundaries. However, this is not automatic, an increase in emphasis on SCMP and MAP alone do not necessarily directly influence overall organisational performance. They require consideration and measurement of supply chain performance in order to contribute to organisational performance. The overall results highlight the critical role of SCM practices in encouraging and initiating management accounting practices and improving SCM performance which serves to emphasise the importance of the management accounting system's role in supporting and influencing SCM performance. Management accounting personnel must take account of and appropriately differentiate supporting data for the assessment of supply chain performance and organisational performance. It is intuitively attractive to believe that excellence in supply chain performance will automatically lead to improved organisational performance, but this may not necessarily apply to all companies along the supply chain. However, appropriate cross-functional collaboration between SCM and MAP has the potential to facilitate and reveal this profitability.

## CONCLUSIONS

This research employed an interaction approach of the contingency theory model to test the interdisciplinary relationship between SCMP and MAP and their impact on supply chain and organisational performance. Prior research in the SCM field has adopted contingency theory but mostly in case studies and using a qualitative approach however this paper adopted a quantitative and holistic approach.

This paper contributes in several respects. First, the research is cross-disciplinary and as such it can expand our understanding of the management accounting phenomena within the supply chain environment. Second, it uses contingency theory to present an in-depth and quantitative overview and test variables in the two distinct disciplines, that is, testing the independent theoretical frameworks to explore and determine the nature of their relationships, if any. Third, supply chain development has been recognised as an important reason for and an 'engine' of recent and significant economic growth in South East Asia, the fact that this research was conducted in that region is insightful. Finally, the study will increase awareness of factors that explain MAP and inform the further development of an integrated contingency framework explaining management accounting that is of theoretical and managerial use as discussed in the previous section.

As with all research this study has some limitations which should be noted when interpreting the findings. The relatively low number of responses to the questionnaire survey may have limited some of the insights obtained. Two of the relationships examined in the main model were found non-significant, whereas a greater sample size might have produced even more robust findings. However, given the length, complexity and subject matter of the survey, the response rate can be considered reasonable and has been shown to be adequate for PLS purposes.

A single respondent in each company was asked to respond regarding SCM and management accounting issues (although company-wide consultation was encouraged) and each of the companies was individually consulted to help to identify the most appropriate respondent. Future studies could enhance the appropriateness of respondents through a collaborative involvement of various SCM and accounting personnel from a single company, e.g. procurement manager, operations manager, customer relations manager, logistics manager, to reduce any potential common method bias and reveal any perceptual differences between the two groups and the impact of any discrepancies on overall performance. This would of course be a different, though interesting, piece of academic research and even more challenging to maintain the response rate.

The performance measurement constructs were based on the subjective assessment of respondents, though this is not unusual as it has been shown that such judgements do align with objective performance measures. Insights from eight interviews undertaken with a cross section of companies and other publically available information were used to confirm the self-reported performance. This enabled us to benchmark the reported supply chain and overall performance against data obtained from other company documents and the interviews. However, we were unable to obtain objective supply chain performance measures because of the perceived sensitive nature of this internal company data. Thus, future research could explore the possibility of obtaining still further objective data on supply chain and financial performance to supplement the self-reporting which was applied here.

The postponement dimension proved problematic from a measurement perspective and did not fulfil validation at a second-order level. This was probably because postponement did not feature significantly for a majority of respondents. That is not to say that Malaysian companies are not engaging in postponement. Therefore, a revision of this part of the measurement instrument is encouraged, so that better construct definition and measurement items could be developed.

The nature of SCM and SCPERF implies that the adoption of some MAP takes on a more strategic orientation, that is with greater outward looking and longer-term focus, compared to the inward and short-term perspective applied to more traditional management accounting. Future research could examine if and how accountants and managers evaluate these external and long-terms factors and reveal some of the challenges engaged in applying monetary values to them.

Finally, criticism is sometimes levelled at the use of cross-sectional surveys, which is the research method commonly used in quantitative contingency theory studies, where questionnaires are predominantly used. However when developed from a strong literature base and using a carefully worded questionnaire this approach can still generate useful insights which complement other research methodologies. The results make a contribution therefore in setting management accounting within a supply chain environment. Future studies could complement this work however by repeating an examination of this framework across other countries or environments or investigating how dimensions of SCMP affect MAP via case studies or longitudinal studies which could be explored employing other theoretical bases. Whilst we have employed a different methodology to Langfield-Smith and Smith we agree with one of their conclusions that the *"interdependencies between internal and inter-firm control systems could form an interesting focus for future research"* (2003: 305).

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