Supply chain management practices in the electronics industry in Malaysia

Consequences for supply chain performance

Veera Pandiyan Kaliani Sundram
Department of Business, Universiti Teknologi MARA, Segamat, Malaysia
Abdul Razak Ibrahim
Department of Business, University Malaya, Kuala Lumpur, Malaysia, and
V.G.R. Chandran Govindaraju
Malaysian Industry-Government Group for High Technology, Selangor, Malaysia

Abstract

Purpose – The purpose of this paper is to explore the effects of different dimensions of supply chain management practices (SCMP) on supply chain performance (SCP) in the electronics industry in Malaysia.

Design/methodology/approach – The study employed the quantitative method where convenience sampling and self-administrated survey questionnaires were sent to 125 electronics firms in Malaysia. The research framework was tested using variance-based structural equation model, the partial least squares (PLS) method.

Findings – The empirical results of PLS indicate that six of the seven dimensions of SCMP have a significant positive effect on SCP. Furthermore, agreed vision and goals shows a greater influence than other dimensions of SCMP.

Research limitations/implications – This study took a narrow focus solely on the electronics manufacturing industry with a relatively small sample size of respondents. Also the data were only collected from single respondents in an organization. However, being the first study to explore the dimensions of SCMP and how those dimensions relate to SCP, the study shapes the pathway for future research.

Practical implications – The results offer insights to SCM practitioners and policy makers on the importance of SCMP to increase the competitiveness of manufacturing industry in terms of SCP.

Originality/value – This study employs a newly developed framework based on existing theoretical arguments to empirically examine the relationship between two important factors, the SCMP and SCP. This study is perhaps one of the first to address the effect of SCMP that includes combination of comprehensive practices and system approach towards the overall performance of the supply chain.

Keywords Supply chain management practices, Performance, Manufacturing industries, Partial least squares, Malaysia, Electronics industry

Paper type Research paper

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1. Introduction
Globalization has driven many corporations to widen their resources and capability enhancement from internal environmental practices to greater heights. Attention is increasingly shifting towards external collaboration and networking outside the boundaries of the organization. This requirement has become essential in order to be competitive locally and across the borders (Oliver and Webber, 1982; Lambert et al., 1998). As to achieving this, organizations need to have strong upstream and downstream integration of their elaborate network of business relationships. Therefore, there is an imminent need for supply chain management (SCM) in all sectors across each value chain entities. SCM has drawn increasing attention from many practitioners and scholars in recent years (Bechtel and Jayaram, 1997; Burgess et al., 2006) due to the benefits of SCM for operational success (Croom et al., 2000). In the corporate world, in order to meet customer requirement, the integration of various business processes such as demand planning and forecasting, procurement, manufacturing and assembly, distribution and return of effective and efficient management of flow of resources from point of origin to point of destination has become important parts of SCM (Lummus and Vokurka, 1999; Mentzer et al., 2001; New, 1997). SCM also includes the total connectivity between the upstream (supply and manufacturing) and downstream (distribution) value chain entities in order to achieve competitiveness (Hong and Jeong, 2006; Boddy et al., 2000). Similarly, Hong and Jeong (2006) referring to the works of Carmignani (2009), Lambert and Cooper (2000) and Zhao and Simchi-Levi (2002), defined SCM as:

[...] is a set of approaches utilized to effectively integrate suppliers, manufacturers, logistics, and customers for improving the long-term performance of the individual companies and the supply chain as a whole.

As such, the primary role of SCM is to meet customer requirement in terms of providing customer with the right product (Dale et al., 1994) of right quality (Carmignani, 2009; Brewer and Speh, 2000) and quantity (Chan et al., 2001) from a right source (Carr and Smeltzer, 1999) at right price (Chin et al., 2004), and finally the utilizing the right technology (Boubekri, 2001; Basnet et al., 2003). The strategic nature of SCM practices (SCMP) will be able to explain the dual purpose of SCM namely to improve the performance of an individual organization and to improve the performance of the entire supply chain (Wong et al., 1999). In order to be highly competitive and to achieve sustainable profitability growth, SCM seeks close integration of internal functions within firm and external linking with suppliers, customers, and other channel members. This could be achieved through effective construction of various SCMP (Kim, 2006). Literatures have highlighted on the need to understand SCMP, which is becoming an essential prerequisite, to staying in the competitive global race and to grow profitably (Power et al., 2001; Moberg et al., 2002; Sezen, 2008).

However, in spite of the key role of SCMP, far limited and scant scholarly investigation has been undertaken to present a theoretical viewpoint, supported by empirical evidence (Basnet et al., 2003), on how SCMP yield performance gains at firm level and improve the total supply chain performance (SCP). In addition, although some organizations have realized the importance of implementing SCMP, they often do not know exactly what to implement, due to a lack of understanding of what constitutes a comprehensive set of SCMP (Li et al., 2006b) especially in emerging markets. For instance, in the case of the semiconductor industry in Malaysia, Rajagopal et al. (2009a) discussed on why
firms were reluctant to focus on supply chain partnering despite its importance for performance. Furthermore, given the failure of so many SCMP efforts to yield the desired improvements in performance, the question remains whether SCMP can positively impact performance (Handfield and Nichols, 1998; Tan et al., 1999) especially in countries that are still developing. This study describes a research effort that addresses these questions. The study has a single main underlying purpose that is to disclose the interrelationships among the two main constructs; SCMP and SCP. Accordingly, the main research question is of whether the SCMP affect SCP.

The theoretical gaps this study addresses are of importance because the SCMP construct developed in this study incorporates combination of new dimensions of SCMP. For instance, due to the lack of understanding on other dimensions of SCMP, Li et al. (2006b) suggest future research to use additional dimensions like agreed supply chain leadership. This study identified new dimensions of SCMP which combines components of SCMP proposed by Li et al. (2006b) (comprehensive model) and Min and Mentzer (2004) (system approach model). In addition, to our knowledge, there are only a limited number of studies (Kim et al., 2006; Rai et al., 2006; Wu et al., 2006; Zolait et al., 2010) available for examining the issue using the resource-based view (RBV) that emphasize the role of firms’ capability and competence. Studies using RBV in the context of SCM is also limited to examining only the link between information technology (IT) and SCM performance (Jean et al., 2008). Therefore, this study proposes linking the SCMP and SCP using RBV as the underpinning theory.

In addition to the above motivation, apparently, studies on the issues for emerging countries are limited and there is no published studies on comprehensive SCMP in Malaysia, particularly in manufacturing industry. To date, the limited research conducted in the area of SCMP were largely concerning countries such as New Zealand (Basnet et al., 2003), Pakistan (Bhatta et al., 2007), Hong Kong (Chin et al., 2004), the USA (Gowen and Tallon, 2003; Hong and Jeong, 2006), the UK (Holt and Ghobadian, 2009), and Turkey (Koh et al., 2007). Despite lacking developing countries’ case study, there are several other reasons that prompted this study to focus on Malaysia, specifically the electronics industry. The electronics manufacturing industry contributed over a quarter of manufacturing value added and over 50 percent of manufactured export in Malaysia over the period of 1980-2005 (Chandran, 2010). Owing to a small domestic market, electronics manufacturing is always driven by the export market through global orientation. Since the 1970s, electronics industries in Malaysia have also managed to attract huge amount of foreign direct investment. Now with the relocation of multinational corporations (MNCs), learning among local firms with respect to SCMP has especially improved among firms that have desires to benefit by integrating into the global supply chain. However, despite a long and steady reputation of electronics manufacturing, effort to embed high-tech environment and large-scale innovation is still moderate and slow. Thus, the notion that SCMP will significantly contribute to SCP should not be taken for granted without empirically testing the relationship. As such, Malaysia offers an interesting case for a middle income economies to examine the SCMP and its relationship to the performance.

The remainder of the study is organized as follows. Section 2 outlines the main conceptual issues on SCMP and SCP. Section 3 describes the research model and explicates the theoretical basis for the hypotheses development. Sections 4 and 5 describes the research methodology and reports the results, respectively. Section 6 presents the discussion and the conclusions.
2. Main conceptual issues

2.1 SCM practices
SCMP are viewed from a variety of different perspectives and multi-dimensional concept. SCMP have been defined as the set of activities undertaken in an organization to promote effective management of its supply chain. Pioneering research conducted by Donlon (1996) describes the SCMP to include supplier partnership, outsourcing, cycle time compression, continuous process flow, and IT sharing. Tan et al. (1998a) empirically assessed the inclusion of purchasing, quality, and customer relations dimensions to represent SCMP. Tan (2001) also recommended that SCMP to include the flow of materials and information and postponement (POS) strategy and mass customization. Similarly, Tan et al. (2002) identify six other dimensions of SCMP through factor analysis namely supply chain integration, information sharing (IS), supply chain characteristics, customer service management, geographical proximity, and just-in-time capability. Chen and Paulraj (2004) use supplier-base reduction, long-term relationship, communication, cross-functional teams, and supplier involvement to measure SCMP. In addition, Min and Mentzer (2004) identify the concept SCMP through system approach which includes dimensions such as agreed vision and goals, IS, risk and reward (RR) sharing, co-operation, process integration, long-term relationship, and agreed supply chain leadership. Subsequently, realizing the importance of the SCMP, Li et al. (2005) conceptualizes, develops, and validates six dimensions (strategic supplier partnership (SSP), customer relationship (CR), IS, information quality (IQ), internal lean practices, and POS) of SCMP and conducted a test on its relationship with the firms competitive advantage and performance (Li et al., 2006b). In reviewing and consolidating the literature, two important concepts are identified to develop the total SCMP which will be able to structure complete multi-dimensional practices, comprising seven constructs. The seven constructs constitute the combination of comprehensive model (Li et al., 2006b, 2005) and system approach model (Min and Mentzer, 2004). In other words, the proposed total SCMP in this study will cover all the important dimensions such as upstream (SSP) and downstream (CR) sides of a supply chain, information flow across a supply chain (IS and IQ), internal supply chain processes (POS), and system approach (Min and Mentzer, 2004) that includes agreed vision and goals and risk and award sharing.

2.2 Supply chain performance
Performance measurement has been defined as a systematic process of effectively and efficiently quantifying a concept or an action (Neely et al., 1997). In SCM, performance measurement enables collaborative integration among the supply chain partners. In addition, there are short-term objectives of SCM (enhance productivity and reduce inventory and lead time) and long-term objectives (increase market share and integration) (Li et al., 2006b; Lyons et al., 2004). The traditional methods focus solely on well-known financial measures, which are best, suited to measure the value of simple SCM applications. Unfortunately, evaluation methods that rely on financial measures are not well suited for newer generation of SCM applications. As such, a balanced approach to evaluate SCP is needed to measure the short- and long-term objectives that includes financial and non-financial aspect. Based on this discussion, in this study, following Koh et al. (2007) wider approach is adopted to measures SCM-related...
organizational performance. The construct measurements incorporate items that relate to sales growth, costing accuracy, and coordination between department, supplier, and customer.

2.3 SCMP and performance
Kim et al. (2006) stated that supply chain efficiency can only be realized through the various interaction of SCMP. This view is supported by others studies (Dawe, 1994; Ballou, 1992) and consensus emerged in that SCMP should shift from function to integrative in order to value its performance effectiveness. Specifically, Kim et al. (2006) provided empirical evidence to show how SCMP could potential enhance organization’s competitive capabilities such as cost leadership, customer service, and product differentiation. Recent studies (Koh et al., 2007; Li et al., 2005, 2006b) also indicated that the SCMP have a common goal of ultimately improving organizational performance. For instance, Koh et al. (2007) identified that SCMP have significant direct positive impact on organizational performance event in small and medium enterprises. As a whole, previous literature forms a strong consensus on the positive link between SCMP and SCP.

3. Research model and hypotheses
Figure 1 shows the framework of the study. The framework proposes that implementation of SCMP, in electronics manufacturing industry, to influence the SCP. The influence of seven critical dimensions of SCMP on SCP namely supplier strategic, CR, IS, IQ, POS, agreed vision and goals, and RR sharing were examined. Consequently, based on the extent literature, the following sections discus the RBVs, the proposed relationships between SCMP and SCP, and the hypotheses of this study. Likewise, Section 4 discusses the construct measurements for the proposed framework.

Figure 1. Framework of study
3.1 RBV and SCMP capability

The underpinning theory for the research framework is the RBVs of firm. RBV emphasizes the role of the firms’ internal and external resources for performance (Barney, 1991). Firm resources include assets, capabilities, organizational processes, firm attributes, information, and knowledge (Barney, 1991). The unique bundle of resources owned by firms that are heterogeneous is expected to explain the variation in firm performances (Penrose, 1959; Wernerfelt, 1995). These resources include organizational capability (Praest, 1998) as well as the firms’ basic competence and dynamic capability such as coordination of different types of knowledge and integration of multiple flow of technology (Prahalad and Hamel, 1990). One important form of capability is the SCM capability, i.e. SCMP capability (Sari, 2008; Trkman et al., 2007; Maheshwari et al., 2006; Sanchez-Rodriguez et al., 2005). Wu et al. (2006) stressed that supply chain capabilities as a unique set of organizational capabilities and proposed four such capabilities namely, information exchange, coordination with partners, integration ability, and supply chain responsiveness. In this context, supply chain capabilities is viewed as the ability of the firms in identifying, utilizing and assimilating information, and resources to facilitate the SCP (Wu et al., 2006).

In this study, similar to the RBV definition of capability, SCMP are viewed as the firms’ ability or potential ability to form SSP, establish CR and ability to share information, vision, goals, and risks. In other words, this study conceptualizes SCMP as the supply chain capability to include the seven main constructs mentioned in the proposed framework. These capabilities can also be viewed as business coordination and integration processes that are important to utilize the resources. As such, organizations embarking on supply chain need to focus on the ability of organizational skills and processes in practicing those elements of SCMP. Thus, organizations that have better SCMP are likely to develop a competitive advantage. Recent studies using RBV in the context of SCM include Kim et al. (2006), Rai et al. (2006), Wu et al. (2006) and Zolait et al. (2010). These studies, although limited in the context of emerging markets, provide interesting accounts on the use of RBV in the context of IT, supply chain capability, and SCP. These studies also confirm that IT capability facilitates the SCP. Our study emphasizes RBV from the capability centric lens that focuses mainly on SCMP as the main capabilities of firms.

3.1.1 Strategic supplier partnership. SSP is defined as the long-term relationship designed to leverage the strategic and operational capabilities of individual participating organization to achieve significant benefits to each party (Li et al., 2006b, 2005). A true supplier partnership, encourages mutual planning and problem solving efforts (Gunasekaran et al., 2001), and is critical in operating a leading-edge supply chain. Azar et al. (2009) have investigated the impact of supplier management on the performance and have found that effective supplier management is directly related to higher level of performance conformance. Similarly, Boddy et al. (2000) and Bordonaba and Cambra (2009) also viewed supply chain partnering (which is the broader concept of supplier strategic partnering) as crucial asserting that such strategic collaboration will definitely enhance performance among supply chain collaborative partners. From the RBV perspective, SSP is viewed as the firm’s ability to coordinate and integrate resources with their respective partners. Griffith and Harvey (2001) considered the ability to coordinate inter-organizational relationships effectively as one of the important resources of the firms. Wu et al. (2006) views SSP as one of the key supply
chain capability and refers SSP to the ability in coordinating the partner’s transaction-related activities. These capabilities improve operational efficiency and performance between the partners. Similarly, proponents of RBV viewed the ability to integrate strategies in an effort to jointly execute a collective activity as an important capability (Grant, 1996). In a similar notion, SSP represents this ability. Hence, strategic partnering with suppliers will be able to enhance the supply chain efforts to better performances. The following hypothesis was developed on this premise:

H1. The SSP has positive relationship with SCPs.

3.1.2 Customer relationship. CR is defined as the practice to manage customer complaints, build long-term relationships with customers, and improve customer satisfaction (Tan et al., 1998b). Close CR allows an organization to differentiate its product from competitors and dramatically extend the value it provides to its customers and sustain customer loyalty through customer satisfaction (Cox, 2004; Dadzie and Winston, 2007). RBV views dynamic capability of the firms in terms of reconfiguration of resources to meet evolving customer demands (Zahra and George, 2002). The ability to learn from customers and integrate with customers is a unique form of firm capability. The ability to respond to customers’ changing demands also helps firms create new products and processes. Therefore, maintaining good CR and getting customer feedback represents valid dimensions of SCMP. This construct also captures the capability notion of RBV. Analyzing the empirical data collected from Hong Kong, Chin et al. (2004) have identified that maintaining effective CR will be able to promote open communication among members of supply chain and eventually engage in joint problem solving effort with long-term commitment. Therefore, customer relation practices can bring significant impact in managing the total value chain entities across the supply chain in order to improve the performance of the total supply chain. Based on the above discussion, this study consequently proposes the following hypothesis:

H2. The CR has positive relationship with SCPs.

3.1.3 Information sharing. IS refers to the extent to which critical and proprietary information is communicated among supply chain members with regards to market, product, and customer information (Mentzer et al., 2001; Li et al., 2006a). The RBV emphasize on the ability of firms in generating new knowledge and ability in facilitating IS. Knowledge acquisition, assimilation, transformation, and exploitation which are termed as absorptive capacity in the RBV literature are important dimensions of organizational capability. Therefore, IS with partners is considered as important elements of supply chain capability. Wu et al. (2006) conceptualized information exchange as one of the constructs representing supply chain capabilities. The effort in providing information and making it visible to other parties in the supply chain allows for faster and accurate business decisions that translates as a source of competitive advantage (Moberg et al., 2002). As such, IS is regarded as the terminator of “bullwhip effect” (Fiala, 2005) that reduces the total cost of the supply chain in delivering efficient SCP (Gavirneni, 2006). This study therefore proposes the following hypothesis:

H3. The IS has positive relationship with SCPs.

3.1.4 Information quality. IQ refers to the extent of which the information flow and exchange is accurate, timely, adequate, and credible (Li et al., 2006b). Numerous studies
(Li et al., 2006a; Lyons et al., 2004; Moberg et al., 2002) have shown that well-managed IQ within and across the organization will directly lead to improved SCP. Further, Forslund and Jonsson (2007), through their recent research, have indicated that different IQ deficiency could impact the usefulness of forecast and its ability to influence SCP. Hence, this will also provide managers to make precise business decision for effective management of supply chain (Raisinghani and Meade, 2005). Based on this assumption, the following hypothesis was developed:

**H4.** The IQ has positive relationship with SCPs.

3.1.5 *Postponement.* POS is defined as the practice of moving forward one or several operations or activities to a much later point in the supply chain (Beamon, 1998). From the RBV standpoint, POS capability characterize the organizational and strategic routines of firms by which they achieve new resources configuration especially in postponing manufacturing activities to meet changing market conditions. Increasingly, POS has become a manufacturing strategy at firm level (Yeung et al., 2007). POS enables an organization to meet a high level of product customization through production flexibility (Hoek et al., 2001). Inventories are kept undifferentiated for a certain period until customer demand is certain. Hence, this enables an organization to be highly responsive towards change in customer demand (Li et al., 2005, 2006b). Yang et al. (2010) compared the translating implementation of manufacturing POS to service POS and its benefit to members of the supply chain in total. Overall, POS can reduce inventory cost along the supply chain and eventually increase SCP (Yang et al., 2007). Based on existing work, this study consequently proposes the following hypothesis:

**H5.** POS has positive relationship with SCPs.

3.1.6 *Agreed vision and goals.* Successful and effective chain requires collaboration among partners (Boddy et al., 2000; Lambert et al., 1998). This collaboration is obtained through IS, trust, and commitment. Unfortunately, this cannot be achieved without agreed vision and common goals (VIGOAL) among members of the supply chain (Spekman et al., 1998). RBV emphasize the need to develop capability in the forms of integrating strategies and coordinating collective activities between partners. Agreed vision and goals capture such forms of capability. Several authors (Cooper and Ellram, 1993; Cooper et al., 1997a, b) concur strongly on the fact that agreed vision and goals are the key component of SCM. Therefore, agreed vision and goals are imminent to orchestrate the roles and responsibilities of the supply chain members. Subsequently, this will ensure the success of supply chain practices in capturing a high level of SCP (Wisner, 2003). As discussed, this study proposes the following hypothesis:

**H6.** Agreed vision and goals have positive relationship with SCPs.

3.1.7 *RR sharing.* The term risk is defined as the extent to which there is uncertainty about whether potentially significant or disappointing outcomes of decisions (Finch, 2004). What most definitions of risk have in common are the three dimensions (Juttner, 2005):

1. likelihood of occurrence of a particular event or outcome;
2. consequences of the particular event or outcome occurring; and
3. causal pathway leading to the event.
Previous studies (Cooper and Ellram, 1993; Cooper et al., 1997a, b) regarded the RR sharing among the supply chain partners as a collective effort in managing SCM. The capability to share RR will help to divide the level of risk and return between strategic partners on technology, customer, or market-focused initiatives (Hall, 1999; Ritchie and Brindley, 2007) whereby, it provides trustworthy and coordinated relationship partnering among members of supply chain. As a result, RR sharing practices act as an impetus for effective supply chain (Ellram and Cooper, 1990). Consequently, in the long run, this will be able to improve the SCP (Towill, 2005). Therefore, the following hypothesis was developed:

\[
H7. \text{RR sharing has positive relationship with SCPs.}
\]

### 4. Research methodology

#### 4.1 Development of the survey instrument

The questionnaire for this study consisted of three main sections, namely the background of the company, the motivation, and implementation of SCMP and specific questions designed to measure the SCP constructs. A total of seven-dimensional constructs (Table I) perceived to be important for effective SCMP were proposed to represent the SCMP. Construct measuring SSP, CR, IS, IQ, and POS follows Li et al. (2005, 2006a, b). As mentioned earlier, following Min and Mentzer (2004) and Bowersox et al. (1999), we included two other dimensions of SCMP namely, agreed vision and goals, and RR sharing.

Overall, this new SCMP are measured by considering SCMP from within the whole system of supply chain that includes upstream, downstream, internal process, across supply chain, and system orientation. Hence, the new SCMP could be viewed as a more comprehensive concept in comparison to the narrow view taken in previous researches (Alvarado and Kotzab, 2001; Basnet et al., 2003). All items of SCMP are measured using seven-point scales ranging from “strongly disagree” to “strongly agree”. Likewise, construct measuring dimensions of SCP were adopted from Koh et al. (2007). We use a seven-point scale as a unit of measurement ranging from “definitely worse” to “definitely better” in relative to their major competitor.

The collective evidence from past literatures (Li et al., 2005, 2006b; Min and Mentzer, 2004; Bowersox et al., 1999; Koh et al., 2007) suggested that the SCMP and SCP constructs demonstrate good measurement properties. Table I summarizes the variables and number of measurement items and supporting literature for each measurement variable[1]. In addition, the questionnaire was pre-tested by two professionals in practice for accuracy and validity of the question interpretation (content validity). Based on the opinions of the professionals and significant support from the previous literatures we find that the measurement fulfill the content validity and clarity of content.

#### 4.2 The sample

A total of 600 electronics firms were randomly selected from the Information Service of Statistical Department, Malaysia. The survey, through the mailed questionnaire, was carried out for a period of six months in early 2009. As a measure to speed up and improve response rate, follow-up calls with a promised presentation of findings to respective firms for managerial insights yielded encouraging results. However, only when there is no significant difference between the initial respondents and respondents
after the follow-up calls, will the findings be representation of the population. We tested for such difference between the groups but were unable to find any significant differences[2]. Finally, after eliminating incomplete survey, there were 110 complete and usable responses, representing a response rate of 18 percent. Demographic data showed in Table II depict that majority (60.3 percent) of the firms represent

<table>
<thead>
<tr>
<th>Construct</th>
<th>Description</th>
<th>Numbers of items</th>
<th>Sample survey question</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSP</td>
<td>A long-term relationship designed to leverage the strategic and operational capabilities of individual participating organization to achieve significant benefits to each party</td>
<td>6</td>
<td>We regularly solve problems jointly with our suppliers</td>
<td>Li et al. (2005, 2006a, b)</td>
</tr>
<tr>
<td>CR</td>
<td>A practices to manage customer complaints, build long-term relationships with customers, and improve customer satisfaction</td>
<td>5</td>
<td>We frequently measure and evaluate customer satisfaction</td>
<td>Li et al. (2005, 2006a, b)</td>
</tr>
<tr>
<td>IS</td>
<td>IS refers to the extent to which critical and proprietary information is communicated to among supply chain members with regards to market, product, and customer information</td>
<td>6</td>
<td>Our trading partners keep us fully informed about issues that affect our business</td>
<td>Li et al. (2005, 2006a, b)</td>
</tr>
<tr>
<td>IQ</td>
<td>IQ refers to the extent of which the information flow and exchange is accurate, timely, adequate, and credible</td>
<td>5</td>
<td>Information exchange between our trading partners and us is timely</td>
<td>Li et al. (2005, 2006a, b)</td>
</tr>
<tr>
<td>POS</td>
<td>POS is defined as the practice of moving forward one or several operations or activities to a much later point in the supply chain</td>
<td>4</td>
<td>We delay final product assembly activities until customer orders have actually been received</td>
<td>Li et al. (2005, 2006a, b)</td>
</tr>
<tr>
<td>VIGOAL</td>
<td>An effort to establishing commonly agreed vision among supply chain partners to achieve specific common objectives</td>
<td>4</td>
<td>Our supply chain members have common, agreed to goals for SCM</td>
<td>Min and Mentzer (2004) and Bowersox et al. (1999)</td>
</tr>
<tr>
<td>RR sharing</td>
<td>A mutual sharing of risk factors and reward factors among members of supply chain</td>
<td>3</td>
<td>Our supply chain members share risks and rewards</td>
<td>Min and Mentzer (2004) and Bowersox et al. (1999)</td>
</tr>
<tr>
<td>SCP</td>
<td>A performance measure which enhances short-term goals (reduce cost) and long-term goals (increase market share and integration)</td>
<td>5</td>
<td>How did your business perform over the last three years relative to their major competitors in terms of increase in sales?</td>
<td>Koh et al. (2007)</td>
</tr>
</tbody>
</table>

Table I. Variable measurement
the component electronics industry. In terms of employment size the majority of the firms are in the category of 251-500 workers and greater. Almost 73 percent of the selected firms have between 10 and 20 years of operational experience.

4.3 Analytical procedures and variable measurements

Data processing involve two stages. In the first stage, descriptive statistics was employed to identify the characteristics of the sampled firms. The second stage involved estimating the measurements validity and reliability, structural parameters of the structural equation model, and testing the research hypotheses using the partial least squares (PLS) method (Chin et al., 2003). PLS method were preferred over the better-known LISREL method because its structural equation model allowed us to test the research model and, at the same time, assess the properties of the underlying empirical model. PLS has enjoyed increasing popularity in recent years because of its ability to model latent construct under the conditions of non-normality and ability of testing the theoretical framework partially without needing to fully crystallize the model (Chin, 1998). PLS is known to be particularly advantageous in the initial development and assessment phase of theory building (Fornell and Bookstein, 1982). Furthermore, the PLS method is more robust since its does not require either a large sample or a normally distributed data (Fornell and Larcker, 1981).

Convergent validity indicates the extent to which the measures of a construct that are theoretical related are also related in reality. Convergent validity can be evaluated by inspecting the factor loadings of the measures on their respective constructs (Chin, 1998; Hulland, 1999), and the reliability of the measures can be assessed using composite reliability and average variance extracted (AVE). Table III shows the results of the psychometric properties of the measurements. Most of the factor loading are satisfactory with the cutoff value above 0.7, except that the factor loading of two items are below the cutoff value but yet acceptable. Thus, overall measurement items have adequate item reliability. Similarly, for convergent validity (also referred to as composite reliability), the AVE should be at least 0.5 and the CR should be greater than 0.6 (Bagozzi and Yi, 1988). In all cases, the measurement model seems to have adequate convergent validity and reliability.

Discriminant validity can be verified with the square root of the AVE for each construct higher than any correlation between this construct and any other construct

<table>
<thead>
<tr>
<th>Business description</th>
<th>%</th>
<th>Number of employees</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component</td>
<td>60.3</td>
<td>Fewer than 50</td>
<td>–</td>
</tr>
<tr>
<td>Industrial electronics</td>
<td>22.3</td>
<td>50-100</td>
<td>13.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>101-250</td>
<td>18.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>251-500</td>
<td>39.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>501 or greater</td>
<td>28.9</td>
</tr>
<tr>
<td>Consumer electronics</td>
<td>17.4</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual sales (million)</th>
<th>%</th>
<th>Operating experience (years)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1</td>
<td>–</td>
<td>1-5</td>
<td>5.3</td>
</tr>
<tr>
<td>1-5</td>
<td>18.4</td>
<td>6-10</td>
<td>13.2</td>
</tr>
<tr>
<td>5-10</td>
<td>23.7</td>
<td>10-15 years</td>
<td>39.5</td>
</tr>
<tr>
<td>10-50</td>
<td>34.2</td>
<td>15-20 years</td>
<td>34.2</td>
</tr>
<tr>
<td>More than 100</td>
<td>7.9</td>
<td>More than 20 years</td>
<td>7.8</td>
</tr>
</tbody>
</table>

Table II. Description of the sampled firms
<table>
<thead>
<tr>
<th>Construct and items</th>
<th>Loading</th>
<th>SE</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SSP, ( \alpha = 0.789, CR = 0.869, AVE = 0.693 )</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization considers quality as number one criterion in selecting suppliers</td>
<td>0.906</td>
<td>0.011</td>
<td>81.223</td>
</tr>
<tr>
<td>Organization regularly solve problems jointly with its suppliers</td>
<td>0.900</td>
<td>0.009</td>
<td>90.345</td>
</tr>
<tr>
<td>Organization helps its suppliers to improve their product quality</td>
<td>0.851</td>
<td>0.055</td>
<td>9.976</td>
</tr>
<tr>
<td>Organization has continuous improvement programs that include its key suppliers</td>
<td>0.615</td>
<td>0.125</td>
<td>6.991</td>
</tr>
<tr>
<td>Organization include its key suppliers in its planning and goal setting activities</td>
<td>0.775</td>
<td>0.068</td>
<td>7.773</td>
</tr>
<tr>
<td>Organization actively involves its key suppliers in new product development processes</td>
<td>0.777</td>
<td>0.033</td>
<td>8.855</td>
</tr>
<tr>
<td>( CR, \alpha = 0.655, CR = 0.787, AVE = 0.692 )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization frequently interacts with customers to set its reliability, responsiveness, and other standards</td>
<td>0.815</td>
<td>0.048</td>
<td>17.022</td>
</tr>
<tr>
<td>Organization frequently measures and evaluates customer satisfaction</td>
<td>0.804</td>
<td>0.054</td>
<td>15.989</td>
</tr>
<tr>
<td>Organization frequently determine future customer expectations</td>
<td>0.811</td>
<td>0.039</td>
<td>18.756</td>
</tr>
<tr>
<td>Organization facilitates customers’ ability to seek assistance from it</td>
<td>0.885</td>
<td>0.044</td>
<td>17.567</td>
</tr>
<tr>
<td>Organization periodically evaluates the importance of its relationship with its customers</td>
<td>0.877</td>
<td>0.066</td>
<td>14.897</td>
</tr>
<tr>
<td>( IS, \alpha = 0.774, CR = 0.839, AVE = 0.637 )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization informs its trading partners in advance of changing needs</td>
<td>0.913</td>
<td>0.023</td>
<td>36.659</td>
</tr>
<tr>
<td>Organization’s trading partners share proprietary information with your organization</td>
<td>0.768</td>
<td>0.065</td>
<td>18.222</td>
</tr>
<tr>
<td>Organization’s trading partners keep your organization fully informed about issues that affect its business</td>
<td>0.816</td>
<td>0.044</td>
<td>21.677</td>
</tr>
<tr>
<td>Organization’s trading partners share business knowledge of core business processes with your organization</td>
<td>0.749</td>
<td>0.066</td>
<td>18.678</td>
</tr>
<tr>
<td>Organization and its trading partners exchange information that helps establishment of business planning</td>
<td>0.782</td>
<td>0.053</td>
<td>14.750</td>
</tr>
<tr>
<td>Organization and its trading partners keep each other informed about events or changes that may affect the other partners</td>
<td>0.668</td>
<td>0.095</td>
<td>9.878</td>
</tr>
<tr>
<td>( IQ, \alpha = 0.742, CR = 0.825, AVE = 0.707 )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information exchange between organization and its trading partners is timely</td>
<td>0.825</td>
<td>0.055</td>
<td>12.544</td>
</tr>
<tr>
<td>Information exchange between organization and its trading partners is accurate</td>
<td>0.742</td>
<td>0.023</td>
<td>14.893</td>
</tr>
<tr>
<td>Information exchange between organization and its trading partners is complete</td>
<td>0.882</td>
<td>0.047</td>
<td>12.672</td>
</tr>
<tr>
<td>Information exchange between organization and its trading partners is adequate</td>
<td>0.767</td>
<td>0.036</td>
<td>14.436</td>
</tr>
<tr>
<td>Information exchange between organization and its trading partners is reliable</td>
<td>0.876</td>
<td>0.062</td>
<td>12.725</td>
</tr>
<tr>
<td>( POS, \alpha = 0.615, CR = 0.773, AVE = 0.834 )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization’s products are designed for modular assembly</td>
<td>0.928</td>
<td>0.453</td>
<td>2.833</td>
</tr>
<tr>
<td>Organization delays final product assembly activities until customer orders have actually been received</td>
<td>0.743</td>
<td>0.339</td>
<td>2.987</td>
</tr>
<tr>
<td>Organization delays final product assembly activities until the last possible position (or nearest to customer) in the supply chain</td>
<td>0.777</td>
<td>0.375</td>
<td>2.118</td>
</tr>
<tr>
<td>( VIGOAL, \alpha = 0.789, CR = 0.869, AVE = 0.611 )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply chain members have common, agreed goals for SCM</td>
<td>0.711</td>
<td>0.044</td>
<td>17.342</td>
</tr>
</tbody>
</table>

Table III. Psychometric properties of measures of independent and dependent variables
As shown in Table IV, each construct shares a greater variance with its own measures than with any other construct. This reveals that each construct is more closely related to its own measures than to those of other constructs and thereby confirming the discriminant validity (Fornell and Bookstein, 1982; Fornell and Larcker, 1981).

5. Results

In this section, we discuss the current SCMP among electronics firms in Malaysia followed by the empirical results. Limited studies are available on the current SCMP for the electronics industry in Malaysia. Nevertheless, these studies reveal that SCMP are indeed significantly undertaken by MNCs and its suppliers especially in electrical and electronics industry. Rajagopal et al. (2009a) using a case study approach highlighted the efforts in improving supplier’s relationship, IS, and CR in two MNCs and among its suppliers. However, the study also cautions that the level of SCMP differs between the MNCs. Lacking the empirical evidence on the detail SCMP for the entire electronics industry, we first discuss the current state of SCMP in the electronics industry in Malaysia. Table V reports the mean values of all dimensions of SCMP.

<table>
<thead>
<tr>
<th>SSP</th>
<th>CR</th>
<th>IS</th>
<th>IQ</th>
<th>POS</th>
<th>VIGOAL</th>
<th>RR</th>
<th>SCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSP</td>
<td>0.832</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR</td>
<td>−0.129</td>
<td>0.832</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS</td>
<td>0.201</td>
<td>0.083</td>
<td>0.798</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IQ</td>
<td>0.178</td>
<td>0.037</td>
<td>0.372</td>
<td>0.841</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POS</td>
<td>0.377</td>
<td>0.016</td>
<td>0.267</td>
<td>0.400</td>
<td>0.913</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIGOAL</td>
<td>0.307</td>
<td>−0.134</td>
<td>0.378</td>
<td>0.277</td>
<td>0.299</td>
<td>0.781</td>
<td></td>
</tr>
<tr>
<td>RR</td>
<td>0.276</td>
<td>0.177</td>
<td>0.114</td>
<td>0.267</td>
<td>0.323</td>
<td>0.416</td>
<td>0.809</td>
</tr>
<tr>
<td>SCP</td>
<td>0.112</td>
<td>−0.023</td>
<td>0.247</td>
<td>0.223</td>
<td>0.369</td>
<td>0.488</td>
<td>0.487</td>
</tr>
</tbody>
</table>

Note: The italics items on the diagonal represent the square roots of the AVE, and off-diagonal elements are the correlation estimates.
The results indicate that mean scores of SSP, IQ, and IS are much higher compared to other dimensions of SCMP. Relatively, mean scores of CR and PST were the lowest, indicating a lack in the use of such practices. However, consumer electronics firms have relatively higher CR scores than component and industrial electronics firms. This is consistent with previous studies (Rajagopal et al., 2009a; Omar et al., 2009; Sambasivan and Jacob, 2008) that highlighted the significant use of many of the SCMP among electronics firms in Malaysia. As a whole, we can conclude that electronics firms in Malaysia are inclined to engage in SCMP. The electronics industry in Malaysia is driven by few large MNCs that are export oriented. These MNCs increasingly engage in SCMP to form a global supply chain (Sambasivan and Jacob, 2008) and also require its suppliers (including local suppliers and producers) to do the same. Indeed, SCM is seen as a tool to cope with intense competition and pressure to bring the product to market faster (Rajagopal et al., 2009a). The government’s incentives and support also prepares local industries to adopt SCM in Malaysia (Rajagopal et al., 2009b).

We used a bootstrapping procedure to test the effects and the statistical significance of the parameters using t-test in the structural model (Chin, 1998). The variance explained ($R^2$) and the significance of the path coefficient indicates the quality of PLS model (Chin, 1998; Saade, 2007). Table VI shows the results of the model. The $R^2$ value was 0.469 and it indicates that the model explains a good amount of variance in SCP. The results provide significant support for some of the hypotheses proposed in this study. SSP, IS, IQ, POS, VIGOAL, and RR sharing were found to have significant positive effects on SCP. However, CR, although positive, lacks the significance. Managing CR require firms to extensively invest in enabling technology that supports...
customer interactions with firms (Jean et al., 2008). Challenges in effective implementation of such technology may have limited the building of better CRs that reduces its significance. Moreover, CR may also have an indirect effect on SCP moderated by technological initiatives (Jean et al., 2008). Indeed, Rajagopal et al. (2009a) lucidly argued on the role of technology in enabling SCMP in two electronics MNCs in Malaysia. In fact, it should be noted that the benefits of all SCMP, in this study, could have been potentially more significant if firms pose considerable IT capabilities (Jean et al., 2008). We suggest that future studies in emerging markets consider the impact of IT in facilitating the SCMP towards achieving greater performance.

Agreed vision and goals ($\beta = 0.377, p < 0.001$), are the most influential factors in determining the SCP suggesting that VIGOAL is a powerful predictor of SCP. For instance, in Malaysia several firms share common goals like enabling the notification of shipping documentation via RosettaNet. This has enabled members of the supply chain to electronically correspond shipping documentation to the local customs officials. The established mutual goals benefited all within the system. Agreed goals also create mutual participation via planned collaboration and co-operation. When one firm moves to achieve its goals, the other member of the supply chain should do the same. Other factors having greater effects include IS ($\beta = 0.176, p < 0.01$), RR sharing ($\beta = 0.144, p < 0.01$), and IQ ($\beta = 0.125, p < 0.01$). Similar to previous studies (Jayaram et al., 2000; Mason-Jones and Towill, 1999), IS and IQ are found to be significant factors in enhancing the SCP of electronics firm in Malaysia. Additionally, Zhou and Benton (2007), also supported the proposition that good information management can lead to right supply chain practices and eventually create an effective and efficient supply chain. The findings of this study also concur with the studies from Cooper and Ellram (1993), Cooper et al. (1997a, b) that there is significant relationship between RR sharing practices and performance.

6. Discussion and conclusion
This study has provided empirical justification for a framework that identifies seven constructs of SCMP and describes the relationship among SCMP and SCP within the context of electronics manufacturing in Malaysia. Previous studies supporting the importance of SCMP mostly used case studies and relate SCMP to organizational performance and not SCP. The major contribution of the present study is the development of a set of SCMP constructs through comprehensive combination and, accordingly, examining its impact on SCP. Based on a survey data of 110 electronics manufacturing firms, the research framework was tested using PLS method, which is a variance-based structural equation modeling approach. This study carries more weight especially for generalization purpose due to the limited quantitative approach in the extant literatures. As a whole, effective SCMP have important implications for SCP.

This study offers a number of managerial implications. First, it provides SCM managers with an impeccable formula for evaluating the effectiveness of the new combination of SCMP. Second, the analysis also indicates that SCMP might directly influence SCP. Theoretically, this study offers empirical evidence suggesting that even in emerging markets better SCMP can yield good performance. These findings offer scholars new avenues for future research and consequently provide managers important insights on the effectiveness of SCMP. In the long term, the success of electronics manufacturing firms in Malaysia are heavily dependent on its
strategic supply chain factors such as agreed vision and goals, RR sharing, IS, and IQ. As such this study, inline with (Chandra and Kumar, 2000) concludes that the entire value chain along the upstream and internal process of the supply chain has to be effective. Since there are practices which are not consistent in their impact towards SCP, for instance customer relation, there is a need to test this practice for any indirect impact on SCP. However, this test will need to take consideration of the role of mediating effects of other variables such as IT initiatives, supply chain integration, or supply chain competitiveness. Apart from this, future research can also consider studying the synergies between total quality management practices and knowledge management as well as measuring how practices of other disciplines in combination with SCMP could affect the performances of supply chain. Future research can also focus on expanding the research scope to different industries or investigate the comparative implementation situations between different industries in terms of types of business operations, ownership, and firm sizes.

Among the limitations of this study is the use of only one informant per firm, which might be a cause for possible response bias. Thus, caution should be exercised when interpreting the results. Future research should endeavor to collect data from multiple members across the supply chain. Furthermore, this study reports from a questionnaire survey at one point in time and lacks trends or changes. Since only the electronics industry was considered, the conclusive evidence reported in this study is also industry specific. Despite these limitations, however, the new insights of this study could potentially inspire further empirical work within this area especially in emerging markets.

Notes
1. Details of the items measuring each construct are reported in Table III.
2. Data not reported due to space constraint but can be made available upon request.

References


**Corresponding author**

V.G.R. Chandran Govindaraju can be contacted at: vgrchan@gmail.com

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