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Business process management and supply chain collaboration: Effects on performance and competitiveness

Abstract

Purpose - This study examines the interrelationships among Business Process Management (BPM), Supply Chain Collaboration (SCC), collaborative advantage and organisational performance.

Design/methodology/approach - Data was collected from 204 manufacturing firms in Thailand, and the interrelationships proposed in the framework were tested via Structural Equation Modelling.

Findings - Our study highlights the role of intra- and inter-organisational practices, and clearly demonstrates the joint role and impact of BPM and SCC respectively. The results provide empirical evidence that BPM improves both organisational performance and collaborative activities. Also, SCC and collaborative advantage can have indirect positive impacts on organisational performance.

Research limitations/implications - This work could be expanded by adopting a supplementary dyadic or extended supply chain approach, and could also consider contextual factors, which were outside of the scope of our study.

Practical implications - The BPM approach has a positive impact on organisational performance, which is essential for collaborative activities between a firm and its supply chain partners. Further, effective BPM and SCC practices lead to enhanced performance and collaborative benefits. Practitioners should be better able to define and measure specific actions relating to their BPM and SCC practices.

Originality/value - This paper stresses the need to consider the interrelationships between BPM, SCC, collaborative advantage and organisational performance for both direct and indirect effects. Rather than focusing only on improvement at the individual firm level, SCC is vital to compete in the market. Improving the effectiveness of SC allows higher organisational performance levels than those that could be achieved in isolation.

Keywords Process management, supply chain management, collaboration, company performance, empirical study.

Paper type Research paper

1. Introduction

Supply Chain Management (SCM) literature indicates an increasing interest in Supply Chain Collaboration (SCC) (Ramanathan and Gunasekaran, 2014; Lavastre *et al.*, 2014), articulating the need for close relationships among Supply Chain (SC) members (Zacharia *et al.*, 2009; Nyaga *et al.*, 2010; Zhao *et al.*, 2011). In terms of intra-organisational development approaches, Business Process Management (BPM) has been seen as a methodology that allows a faster organisational response to the continuously changing market requirements. It strives for a better understanding of the key business mechanisms, improving, and in some cases, radically changing the business performance by identifying opportunities for new business, outsourcing,

improving business efficiency and using technology within different business areas to support relevant processes (Lindsay *et al.*, 2003).

Prior research has suggested that both BPM and SCC are important for improving performance and competitiveness (e.g., Simatupang and Sridharan, 2008; Zacharia *et al.*, 2009; Nyaga *et al.*, 2010); however, it lacks empirical testing of their relationship. The identification of such a link based on empirical evidence can provide a better understanding of how intra-organisational development, regarding BPM practice, can help with collaborative activities, and of the benefits that can, thereby, be achieved. Additionally, prior studies (e.g., Hung, 2006; Maddern *et al.*, 2007; Kumar *et al.*, 2008; Skrinjar *et al.*, 2008) did not formulate a BPM construct to include all the main attributes as identified in the literature, hence, they did not frame BPM in a holistic manner. Our paper contributes to the topic of SCC, which remains of high interest (Soosay and Hyland, 2015), and considers the need for organisations to develop both intra- and inter-organisational capabilities and competitiveness (Trkman *et al.*, 2015). The purpose of this paper is, therefore, by means of empirically testing a conceptual framework, to identify the interrelationships between BPM, SCC, collaborative advantage and organisational performance in manufacturing companies operating in Thailand.

The following section provides the theoretical background and the rationale for the hypotheses development. The literature was collected by using a multitude of sources, including books and academic journals. Online databases, namely ABI/INFORM Global, EBSCO and ScienceDirect, assisted in the collection of relevant research papers. We identified such papers using the keywords “business process management”, “supply chain management”, “supply chain collaboration”, “collaborative advantage”, “organisational performance” and “intra- and inter-organisation”. Then the methodology is described, followed by the results of the analysis. Finally, the research findings and implications for theory and practice are highlighted.

2. Literature review and hypotheses development

2.1 Business Process Management and its elements

BPM is a process-oriented organisational approach used to design, analyse and improve business processes to more effectively manage and improve organisational performance (Chang, 2006). BPM is focused on continuous evolution and not on one-off changes to processes as Business Process Re-engineering (BPR) is (Vergidis *et al.*, 2008; Trkman, 2010). It uses various methods and technologies to support business process changes, encouraging employees to become more involved. Thus, BPM covers both incremental (e.g., Lean and Total Quality Management) and radical (e.g., BPR) methodologies to implement process improvement (Lindsay *et al.*, 2003; Chang, 2006; Vergidis *et al.*, 2008). It integrates such methodologies to achieve customer satisfaction, focusing on the process, encouraging people involvement and using Information Technology (IT) to create customer value.

BPM research has typically been narrowly defined and focused within the organisational boundaries. Several such studies have revealed that BPM has a positive impact on organisational performance, while others examined ‘*process*’ concepts of BPM: its elements and the links between these elements and benefits such as organisational performance and customer satisfaction (Maddern *et al.*, 2007; Skrinjar *et al.*, 2008; Kumar *et al.*, 2008; Smart *et al.*, 2009). However, there is limited research on the links between BPM elements and a lack of studies that include all the elements needed to cover the full scope of BPM. To capture all these essential attributes, that is to cover the entire scope of BPM, we defined BPM to incorporate

the four main elements accumulated from a variety of literature sources (e.g., Chang, 2006; Smart *et al.*, 2009): *strategic alignment, IT, process orientation and improvement, and people involvement.*

Strategic alignment: This has been identified as a core BPM constituent (Jeston and Nelis, 2006; Smart *et al.*, 2009; Burlton, 2010; Trkman, 2010). It refers to long-term goals, consideration of customer requirements and the internal characteristics of organisations (Smart *et al.*, 2009). It involves developing specific strategies and plans to maximise the value from process redesign and improvement. The literature has highlighted the importance of BPM for or achieving business success by enhancing adaptability and responsiveness to changing market conditions (Scheer and Brabander, 2010). BPM has to be seen as a tool used to translate a company's strategy into specific needs and to put that strategy into operation (Jeston and Nelis, 2006). The BPM approach connects the deployment from the strategic level to the task level in a more efficient way.

Information technology: IT plays a vital role in BPM (Paper and Chang, 2005; Poirier and Walker, 2005; Jeston and Nelis, 2006; Ahmad *et al.*, 2007; Trkman, 2010). It can be developed as part of the design-implementation-analysis and improvement of business processes (Chang, 2006), used not only within an organisation but also involving external IT interfaces and SC engagements (Poirier *et al.*, 2004; Qrunfleh and Tarafdar, 2014). For instance, Enterprise Resource Planning (ERP) can integrate all relevant information such as planning, resource allocation and control activities for all the different departments within a firm and its SC partners (Powell, 2013).

Process orientation and improvement: These are central to BPM and include key elements such as process view/documentation, value stream mapping, process ownership and process measurement (Smart *et al.*, 2009). BPM represents a convergence of previous improvement approaches as it provides information and a process management infrastructure for improvement (Chang, 2006; Smart *et al.*, 2009). Effective process management and improvement are vital to optimise processes and maximise value for an organisation (Reijers, 2006; Skrinjar and Trkman, 2013). Through the adoption of a process view of business (Škrinjar *et al.*, 2008), BPM is used to improve processes and effectively manage and enhance organisational performance.

People involvement: Top management support and employee empowerment play critical roles in a BPM approach (Paper and Chang, 2005; Poirier and Walker, 2005; Jeston and Nelis, 2006; Chang, 2006; Al-Mudimigh, 2007). Executive commitment to employee empowerment allows the latter to participate actively and creatively. Top management must be committed and communicate to employees effectively, setting organisational values and developing a suitable management style to improve organisational performance (Chen and Paulraj, 2004; Al-Mudimigh, 2007). Employees are involved in the execution of processes (Lindsay *et al.*, 2003) and can be seen as valuable assets for any organisation.

2.2 Supply Chain Collaboration and its elements

Prior research has identified SCC in various ways, with common sentiments focusing on the *relationship* (Verecke and Muylle, 2006; Cao and Zhang, 2011), the *process* (Simatupang and Sridharan, 2008; Fawcett *et al.*, 2008, Cao and Zhang, 2011), and gaining mutual benefits from collaborating with SC partners (Fawcett *et al.*, 2015; Soosay and Hyland, 2015). SCC aims at mutual benefits and profit maximisation for the involved SC members through a well-

coordinated planning and delivery of offerings (Simatupang and Sridharan, 2008; Cao and Zhang, 2011). Firms may collaborate to gain access to resource combinations or improved capabilities that allow them to achieve a higher performance than when working in isolation (Paulraj *et al.*, 2008; Soosay *et al.*, 2008). Several studies have attempted to explain SCC by examining its individual elements and their performance impacts; however, few empirical investigations have used a multi-element approach (Cao and Zhang, 2011; Kumar and Banerjee, 2012). Our study aimed to capture the four important SCC elements commonly used in previous research (e.g., Barratt, 2004; Fawcett *et al.*, 2008; Nyaga *et al.*, 2010; Cao and Zhang, 2011): *information sharing and communication, sharing common goals, joint activities and incentive alignment*.

Information sharing and communication: Information sharing refers to the extent that important information is exchanged between a firm and its SC partners (Barratt, 2004), and it is a critical element of SCC (Barratt, 2004; Simatupang and Sridharan, 2008; Nyaga *et al.*, 2010; Cao and Zhang, 2011; Wu *et al.*, 2014). Effective communication methods facilitate information sharing, hence generating greater shared understanding within the SC partnership (Barratt, 2004; Fischer, 2013). Previous studies have taken a diverse approach to understand the key points of information sharing: for instance, the type of the information, namely private or public (Simatupang and Sridharan, 2004) and formal and/or informal (Min *et al.*, 2005), the quality of the information shared (Barratt, 2004; Cao and Zhang, 2011), and ways to improve visibility (Lejeune and Yakova, 2005; Simatupang and Sridharan, 2005; Simatupang and Sridharan 2008).

Joint activities: These involve joint decision-making and the sharing of resources between SC partners. The degree to which collaborative partners are involved in joint decision-making is typically based on the factors that affect their interconnected processes (Malhotra *et al.*, 2005). Joint decision-making should result in the development of deeper understanding between partners, leading to more efficient communication in a virtuous cycle (Malhotra *et al.*, 2005). It allows the SC partners to clarify any confusion and make effective decisions, resulting in closer relationships. Resource sharing refers to the process of leveraging capabilities and assets between a firm and its SC partners (Cao and Zhang, 2011). The resources can be both tangible and intangible (Ramanathan and Gunasekaran, 2014).

Sharing common goals: This concerns SC partners perceiving their own objectives as a direct result of working towards their SC objectives (Lejeune and Yakova, 2005; Cao and Zhang, 2011). It is necessary for all partners in a collaborative relationship to carefully clarify their expectations (Goffin *et al.*, 2006). Thus, good relationships require sharing common goals and working for mutual benefits (Lavastre *et al.*, 2014) through collaboration and joint learning. The firm and its SC partners will need to agree on key results-oriented metrics, such as retail in-stock, gross margins, fill rates and forecast accuracy (Simatupang and Sridharan, 2005; Cao and Zhang, 2011).

Incentive alignment: This refers to the degree to which participating SC members share costs, risks and benefits (Vereecke and Muylle, 2006; Simatupang and Sridharan, 2008; Cao and Zhang, 2011). It provides a system for repositioning the benefits and problems encountered when process changes occur within the SC. This motivates SC partners to equitably share the burdens and benefits that result from collaborative efforts, while seeking to align their individual decisions with the mutual objectives of the SC. Incentive alignment needs to be designed to attract, motivate and retain participating members to achieve the overall

performance by linking individual member's compensation to overall performance (Simatupang and Sridharan, 2008).

2.3 Collaborative Advantage

Collaborative advantage refers to the desired synergistic marketplace benefits achieved over competitors based on SCC activities that could not have been achieved by any organisation acting independently (Malhatra *et al.*, 2005; Li *et al.*, 2006; Vachon and Klassen, 2008; Nyaga *et al.*, 2010; Cao and Zhang, 2011; Wiengarten *et al.*, 2016). Benefits can result in the form of cost reductions, better decision-making, revenue growth through resource synergy, product quality, innovation (based on sharing ideas and joint decision-making), shorter times to market, and improved value to customers (Li *et al.*, 2006; Cao and Zhang, 2010; Zacharia *et al.*, 2011). There are also risks from SCC – for instance, risks of increased operational complexity and of failure from loss of investments in money, time and delays, especially in a case where collaboration is unsuccessful (Matopoulos *et al.*, 2007).

2.4 Organisational Performance

Organisational performance refers to how well an organisation achieves its financial and market-oriented goals (Li *et al.*, 2006; Qrunfleh and Tarafdar, 2014). Achieving SC performance is critical to improving firm performance. If the SC performs well, for instance if the firms in an SC are fully integrated, flexible to market changes, or responsive to customer needs, then the focal firm can improve its performance in terms of cost, quality and delivery of its products (Li *et al.*, 2006; Cook *et al.*, 2011; Qurnfleh and Tarafdar, 2014). Previous studies have examined organisational performance, using both financial and market criteria (Flynn *et al.*, 2010; Cao and Zhang, 2011), and metrics have included sales growth, return on investment, overall competitive position, core competencies and capabilities (Chen *et al.*, 2004; Chen and Paulraj, 2004; Flynn *et al.*, 2010).

2.5 Hypotheses development and research framework

BPM is widely seen as a vital approach for competitive success (Hung, 2006; Poirier *et al.*, 2004; Poirier and Walker, 2005) and enhanced organisational performance (Chang, 2006; Maddern *et al.*, 2007; Kumar *et al.*, 2008; Smart *et al.*, 2009; Vukšić *et al.*, 2013). However, there is limited and fragmented research on the link between some attributes of BPM on organisational performance. For instance, Hung (2006) included just two constructs: process alignment and people involvement, Skirinjar *et al.* (2008) used a construct based on business process orientation, while Maddern *et al.* (2007) and Kumar *et al.* (2008) focused on process concepts of BPM, its attributes, establishing the links between attributes and benefits, such as organisational performance and customer satisfaction. However, prior research has failed to unfold the entire scope of BPM, which is an abstract term that covers various aspects (section 2.1). Therefore, a more comprehensive, multi-dimensional and holistic construct is needed to increase understanding of the complete scope of BPM and the details of different aspects of each construct. A hypothesis was developed to confirm this relationship, and BPM was measured based on a comprehensive conceptualisation of its four main constituents:

H₁: *BPM has a positive impact on organisational performance.*

Firms must develop their internal operations capabilities and infrastructure to leverage SC relationships (Hsu *et al.*, 2009). For instance, intra-organisational capabilities are vital toward

developing inter-organisational information-based capabilities (Zhao *et al.*, 2011). Inter-organisational relationships are important to ensure business success and competitive advantage. Therefore, in practising BPM a firm could work to support collaborative activities with its SC partners. Previous research has emphasised the importance of working collaboratively with SC partners, which can result in mutual benefits that a firm cannot achieve by working individually (Vangen and Huxham, 2006; Paulraj *et al.*, 2008; Soosay *et al.*, 2008; Simatupang and Sridharan, 2008; Cao and Zhang, 2011; Yu *et al.*, 2013). Intra-organisational integration is a prerequisite for inter-organisational integration; hence, after internal development a firm should be able to collaborate with its SC members with less conflict (Zhao *et al.*, 2011). BPM approaches are effective in internal-departmental or business-unit cooperation, and they may enhance inter-company collaboration. For instance, Soosay *et al.* (2008) reported that collaboration with SC members is necessary to achieve objectives, open communication and the sharing of resources, risks and rewards. Companies need to involve external partners in the processes of developing their internal operations capabilities. Collaboration is viewed as the moderating effect between the antecedents (e.g., strategic intent, internal alignments) and consequences (e.g., efficiency, profitability) (Min *et al.*, 2005). Simatupang and Sridharan (2008, p. 403) highlighted that “*The prominent element of SCC used to leverage performance is BPM.*” In summary, although some evidence has suggested BPM as a driver of SCC (Min *et al.*, 2005; Simatupang and Sridharan, 2008; Hsu *et al.*, 2009), there is no empirical evidence regarding this relationship. Therefore, we developed the following hypothesis:

H₂: *BPM has a positive impact on SCC.*

Practising BPM is expected to increase organisational performance (Chang, 2006; Kumar *et al.*, 2008; Smart *et al.*, 2009; Vukšić *et al.*, 2013). When firms work collaboratively with suppliers/customers on reducing inventory or improving quality, the SC should benefit (Qrunfleh and Tarafdar, 2014). High organisational performance is associated with a greater extent of internet-enabled collaborative activities conducted with key customers (Rosenzweig, 2009). Min *et al.* (2005) suggested that SCC has a mediating effect on the relationship between internal operations and organisational performance. The relationship between SC integration and business performance is mediated by manufacturing capabilities (Rosenzweig *et al.*, 2003), while SCM practices mediate the impact of operational capability on organisational performance (Hsu *et al.*, 2009). Intra-firm collaboration directly affects performance, while inter-firm collaboration only has an indirect impact (Sanders, 2007). Considering these various indications of indirect impacts on organisational performance, we explored if the linkage between BPM and performance was mediated by SCC. Therefore, the following hypothesis was proposed:

H₃: *The positive influence of BPM on organisational performance is mediated through SCC.*

As suggested above, many studies indicate a positive link between SCC and collaborative advantage. Firms with high levels of collaboration have greater benefits than those in less collaborative SCs (Singh and Damien, 2009). Collaboration is important for exchanging information, which in turn can lead to demand forecasting accuracy (Ramanathan, 2013). Information sharing helps SC partners to be involved in inventory planning and joint replenishments (Ramanathan, 2012). Work by Cao and Zhang (2011) also supported a positive influence of SCC on collaborative advantage. However, such research has tended to focus on companies in developed economies (Nyaga *et al.*, 2010; Cao and Zhang, 2011). We wished to

confirm that such a direct relationship exists in the context of a developing economy, namely Thailand. This led to the following hypothesis:

H₄: SCC has a positive impact on collaborative advantage.

Research has shown that SCC can improve organisational performance (Vachon and Klassen, 2008; Nyaga *et al.*, 2010; Cao and Zhang, 2011; Schoenherr and Swink, 2012) by reducing ambiguity and identifying priorities, which can speed up business operations, and ensure that the business runs smoothly. SCC may also involve transferring knowledge and technological skills between engaged firms, creating further opportunities to achieve their joint objectives (Cao and Zhang, 2011). Collaboration activities are essential to facilitate collaborative actions and impacts on overall performance (Simatupang and Sridharan, 2008). They should lead to trust and commitment, which result in improved satisfaction and firm performance (Nyaga *et al.*, 2010). However, there has been little attention paid to the mediating effect of collaborative advantage on the relationship between SCC and organisational performance. There is only one past study by Cao and Zhang (2011), which showed that collaborative advantage partially mediates the relationship between SCC and financial performance. We aimed to identify any mediation effect of collaborative advantage between SCC and organisational performance which includes both financial and non-financial performance. Thus, we hypothesised that:

H₅: The positive influence of SCC and organisational performance is mediated through collaborative advantage.

Figure 1 illustrates the research framework incorporating four main constructs: BPM, SCC, collaborative advantage and organisational performance, capturing both direct and indirect effects.

- Insert Figure 1 here -

Our research contributes to the Resource Based View (RBV), which is concerned with how individual companies develop competitive advantage from resources and capabilities owned and controlled within the company (Wernerfelt, 1995), as well as to the Relational View (RV), which regards collaboration as a way to develop complementary capabilities to achieve competitive advantage (Dyer and Singh, 1998). RV moves beyond the individual firm and is concerned with the dyad/network (Dyer and Singh, 1998; Chen and Paulraj, 2004). In contrast, RBV offers theoretical support to the reasons why firms need to collaborate, so they can get access to resources and capabilities that they do not possess. RV suggests that organisational capabilities can be developed by combining resources from different companies (Dyer and Singh 1998), and explains the contribution of collaboration as a means for the development of complementary capabilities that would lead to the development of competitive advantage (Zacharia *et al.*, 2009). The conceptual framework examines the effect of intra- and inter-organisational relationships. Drawing upon RV, it is proposed that when firms collaborate with SC partners, they will achieve more benefits than when they operate in isolation. In a similar vein, past research has used these two perspectives to explain the link between intra- and inter-organisational levels and performance (Vachon and Klassen, 2008; Zacharia *et al.*, 2009, 2011; Cao and Zhang, 2011; Ramanathan and Gunasekaran, 2014).

3. Methodology

3.1 Survey development

The survey was developed to cover the main constructs of the study. The items used to measure each construct were extracted from previous studies, as summarised in Table I. BPM was measured using second-order constructs of the four first-order constructs: strategic alignment, IT, process orientation and improvement, and people involvement. SCC was also measured as a second-order construct of the four first-order constructs: information sharing and communication, sharing common goals, joint activities and incentive alignment. Items were developed to measure the construct of collaborative advantage, as well as performance using both financial and market criteria. Items were scored using a five-point Likert scale (from 'strongly agree' to 'strongly disagree'). The initial survey was evaluated by four academics and five practitioners who offered presentation and wording improvements. A pilot study of 25 companies followed for item refinement and content validation, further improving the final survey instrument.

3.2 Large-scale data collection and respondent profiles

The large-scale survey was conducted from July to November 2012. In total, 1,363 Thai medium and large manufacturing firms, which had attained ISO standards (indicating a basic level of commitment to process management), were contacted. Firm size is based on the number of employees: a medium-sized firm has 51-200 employees, whereas a large-sized firm employs more than 200 (Ministry of Industry Thailand, 2013). The company database was obtained from the Thai Industrial Standards Institute (TISI). To maximise the response rate, further approaches were used to motivate respondents (reminder telephone calls and letters). We obtained responses from top management, general managers, and SC managers. The final of 204 complete and useable responses (a response rate of 14.97%) was deemed acceptable (Van der Vaart and Van Donk, 2008). The majority of respondents were based in large-sized firms (73%). Further, 36.3% of the organisations were in the motor vehicle industry, 20.6% were electrical appliances & electronics organisations, and the rest were companies in the iron and steel, rubber and plastics industries. Non-response bias was assessed by using the chi-square test (Armstrong and Overton, 1977). The results showed no significant difference between the two groups, indicating that the data was free from non-response bias.

3.3 Data analysis method

To test the hypotheses, the Partial Least Squares approach to Structural Equation Modelling (PLS-SEM) was employed using SmartPLS version 2.0 (Ringle *et al.*, 2005). PLS-SEM is a variance-based approach suitable for research situations of (1) small sample sizes, (2) complex research models, and (3) datasets that do not require multivariate normal distribution (Henseler *et al.*, 2009; Chin, 2010; Peng and Lai, 2012). While fit for the purposes of our research, we should note that there are some limitations in using PLS-SEM. For instance, the use of a smaller sample size could lead to a higher sampling error, the biasing effect of a smaller sample size is more likely to occur especially when the data are extremely non-normal (Hair *et al.*, 2012), and PLS-SEM cannot be applied when the structural models include causal loops or circular relationships between the latent variables (Hair *et al.*, 2014). However, the overall complexity of a structural model has only little influence on the sample size requirements for PLS-SEM. Each multivariate technique is different from a statistical point of view, and researchers need to apply the one that best suits their research objectives and data characteristics. The PLS-SEM minimum sample size requirement is based on a factor of ten, for the most complex relationship within the research model (Chin, 1998; Henseler *et al.*, 2009; Hair *et al.*, 2011). A minimum

sample size requirement for this study was calculated at 30 observations. Our sample size was 204, well above this minimum. Considering model complexity, this study included the second-order constructs of BPM and SCC, while the hypotheses included tests for mediation effects (H₃ and H₅). Data normality was assessed, and the Kolmogorov-Smirnov and Shapiro-Wilk statistics revealed that all the items provided a significant value of 0.000 (< 0.05), suggesting that the normal distribution assumption is violated. Hence, PLS-SEM (as opposed to CB-SEM) was deemed appropriate for further SEM analysis.

4. Data analyses and results

4.1 Measurement model evaluation

The data analysis followed the guidelines by Hair *et al.* (2014). The measure of the reliability of each indicator is the item loadings, and construct reliability is measured by using Cronbach's α and composite reliability (ρ). The Average Variance Extract (AVE) criterion is used to evaluate convergent validity; the Fornell-Larcker criterion and cross loadings are assessed to measure discriminant validity (Hair *et al.*, 2011, Henseler *et al.*, 2009). The measurement model results (Table I) showed that most of the remaining item loadings were greater than 0.7, apart from 5 items where loadings were > 0.6, but these were also accepted (Chin, 1998; Hair *et al.*, 2011). The values of Cronbach's α and Composite Reliability (ρ) exceeded 0.6, indicating acceptable construct reliability (Hair *et al.*, 2014; Peng and Lai, 2012).

- Insert Table I here -

All AVE values were above the recommended value of 0.5, indicating convergent validity at the construct level (Peng and Lai, 2012). The results of the Fornell-Larcker criterion (Table II) showed that the square root of AVE for each construct was greater than the correlation between any pair of latent constructs, showing that no construct shared more variance with another construct than with its own indicators. Therefore, the constructs fulfilled the requirements for discriminant validity (Hair *et al.*, 2011; Henseler *et al.*, 2009).

- Insert Table II here -

4.2 Validation of second-order constructs

The assessment of the two second-order constructs followed the guidelines by Chin (1998) and Wetzels *et al.* (2009). This tested if the first-order constructs were loaded onto their perceived second-order constructs. Bootstrapping was used to assess a significant t-test via 5,000 bootstrapped iterations (Hair *et al.*, 2011). The results (Figure 2) showed that all the loadings of the first-order constructs on second-order constructs were higher than 0.6, all t-statistics were well above 2.57, indicating significance at 1%.

The composite reliability of BPM and SCC were 0.8643 and 0.9108 respectively, which were greater than the cut-off values of 0.6, giving substantiation of reliable measures. Convergent validity was also satisfied, as the AVE values of both BPM and SCC were 0.6161 and 0.7196 respectively, which were above the cut-off values of 0.5. Therefore, the measurement models for both first- and second-order constructs were deemed valid.

4.3 Structural model results

The structural model results (Figure 2) indicate that BPM had a modest direct effect on organisational performance ($\beta = 0.1992$, t -value = 2.9609), and a very high effect on SCC ($\beta = 0.6375$, t -value = 11.0664). The relationship between SCC and collaborative advantage was also highly positive ($\beta = 0.6587$, t -value = 16.0778) and significant at 0.01. The results supported the notion that BPM has a positive impact on SCC. Thus, it can be stated that the level of BPM practice within an organisation has a direct and positive influence on both SCC and organisational performance. Therefore, the results of the direct relationships provide full support for H₁, H₂ and H₄. The intra-organisational path coefficient, i.e. between BPM and organisational performance, is lower than the inter-organisational path coefficients, i.e. between BPM and SCC, SCC and collaborative advantage, SCC and organisational performance, and collaborative advantage and organisational performance. This result confirms that firms collaborating with their SC partners can achieve more benefits than when working in isolation.

- Insert Figure 2 here -

The results for the explained variance (R^2) of the endogenous constructs (SCC, collaborative advantage and organisational performance), the effect size (f^2), Q^2 and q^2 were evaluated. The outcome construct of this research framework, namely organisational performance, shows $R^2 = 0.5720$ and $Q^2 = 0.3450$, which are satisfactory values. Therefore, the explanatory power of our research framework is sufficient. For SCC, the results were $R^2 = 0.4060$ and $Q^2 = 0.1870$, which mean that SCC is influenced by 40.60% by the BPM construct. This also means that there are some other factors, outside of the scope of our study, that have an impact on SCC (by 59.40%). For collaborative advantage, the results were $R^2 = 0.4340$ and $Q^2 = 0.2320$, indicating that 43.40% of the explanatory power of collaborative advantage is influenced by SCC. Overall, the results show moderate explanatory power ($0.33 < R^2 < 0.67$) and acceptable predictive relevance ($Q^2 > 0$). The f^2 and q^2 of BPM ($f^2 = 0.0568$; $q^2 = 0.0092$), SCC ($f^2 = 0.1173$; $q^2 = 0.0489$), and collaborative advantage ($f^2 = 0.1329$; $q^2 = 0.0427$) suggested relatively minor influences on organisational performance. Goodness of Fit (GoF) was calculated as 0.5423, which exceeds the cut-off value for a large effect size of R^2 (Wetzels *et al.*, 2009). Therefore, the research model performed well compared to baseline values.

4.4 Mediation effects

We applied a step-by-step mediation assessment process (Baron and Kenny, 1986). The Variance Accounted For (VAF) value was used to estimate the magnitude of the indirect effect, to determine the size of the mediating effect in relation to the total effect (Iacobucci *et al.*, 2007; Klein, 2007; Helm *et al.*, 2010; Hair *et al.*, 2014). If the indirect effect is significant but does not absorb some of the exogenous construct's effect on endogenous construct, the VAF value estimate is low. Thus, $VAF < 20\%$, $20\% \leq VAF \leq 80\%$ and $VAF > 80\%$ indicate no mediation, partial mediation and full mediation respectively (Hair *et al.*, 2014). The results of the mediating effects are presented in Table III. Regarding the mediating effect of SCC on the relationship between BPM and organisational performance, the direct relationship without mediation effect was significant ($\beta = 0.5903$; $p < 0.10$). Next, the mediator (SCC) was included and the indirect relationships were analysed. We found the links between BPM and SCC ($\beta = 0.6379$; $p < 0.10$) and SCC and organisational performance ($\beta = 0.5432$; $p < 0.10$) were significant. After we included SCC as a mediator, the direct relationship between BPM and organisational

performance decreased but was still found to be significant ($\beta = 0.2367$; $p < 0.10$). Then the values of path coefficients and standard errors were used for the Sobel (1982) z-statistics test and the calculation of VAF values. The z-score test indicated a value of 7.0105 ($p = 0.000$). The indirect effect of SCC was 59.41% of the total effect of BPM on organisational performance (VAF = 59.41). Therefore, the relationship between BPM and organisational performance is partially mediated by SCC, which led to the acceptance of H₃.

- Insert Table III here -

A significant relationship between SCC and organisational performance ($\beta = 0.6930$, $p < 0.01$) was identified. Next, the mediator was determined and the results showed significant relationships between SCC and collaborative advantage ($\beta = 0.6590$, $p < 0.01$) and collaborative advantage and organisational performance ($\beta = 0.3459$, $p < 0.01$). The direct relationship between SCC and organisational performance decreased but remained significant ($\beta = 0.4649$, $p < 0.01$), after including collaborative advantage as a mediator variable. The z-score test was calculated at 4.9169 ($p = 0.000$). The VAF indicated that the direct effect between SCC and organisational performance was significantly reduced (by 32.90%) when the collaborative advantage was introduced. This is evidence of partial mediation, supporting H₅.

5. Discussion and implications

5.1 Discussion of results

The results show that all hypotheses are supported, and are partially consistent with prior studies. However, there are some differences and significant new knowledge. Firstly, we considered the nature of the BPM construct. Several studies have linked BPM to organisational performance (Smart *et al.*, 2009; Vukšić *et al.*, 2013), typically focusing on subsets of the BPM domain. These studies did not formulate a BPM construct to include all the main attributes as identified in the literature and hence did not frame BPM holistically. A more comprehensive construct should increase understanding. To cover the entire scope of the approach, we conceptualised BPM as a higher-order construct, incorporating four constituent first-order constructs (strategic alignment, IT, people involvement and process orientation and improvement). Our results indicate a modest positive relationship between BPM construct and organisational performance, confirming H₁. The higher-order construct design and refinement process of BPM should be of particular importance to future research and also practitioners. Ultimately, considering an intra-organisational perspective, this study provides evidence that the four main elements of BPM are key ingredients in achieving improved organisational performance.

Secondly, previous studies have illustrated the importance of intra- and inter-organisational performance, and that both BPM and SCC are important for improving performance and competitiveness (Zacharia *et al.*, 2009; Nyaga *et al.*, 2010; Trkman *et al.*, 2015). However, there was limited empirical testing of the relationship between BPM and SCC. Our study explored this relationship: BPM and SCC are proposed as multi-dimensional constructs that provide a holistic representation to cover the entire scope of these approaches. The results provide strong evidence that by practising BPM, firms can make collaboration with their SC partners more effective. The results empirically identify the positive impact of BPM on SCC, and H₂ is supported. This is an important finding which indicates ways of enhancing SCC based on BPM practices.

Thirdly, we found that SCC partially mediated the relationship between BPM and organisational performance (H₃). Previous work has focused mainly on analysing the direct links between BPM and organisational performance (Maddern *et al.*, 2007; Skirinjar *et al.*, 2008) or alternatively, the relationship between SCC and organisational performance (Zacharia *et al.*, 2009; Cao and Zhang, 2011). Our study took a broader view, aiming to identify the mediating effect of SCC on the relationship between BPM and organisational performance. The results provide sufficient evidence that the direct relationship between BPM and organisational performance is better explained through the mediating impact of SCC. The partial mediating impact of SCC is supported with 59.41% of the total effect. The results reveal that in addition to directly improving organisational performance, BPM helps to develop SCC, while SCC in turn helps BPM to improve internal capabilities. This finding essentially confirms the interplay between intra- and inter-organisational development, indicating the importance of jointly implementing BPM and SCC for enhanced organisational performance.

Fourthly, firms which collaborate with SC partners are better positioned to achieve collaborative advantage (Nyaga *et al.*, 2010; Cao and Zhang, 2011). It should be noted that such studies have typically focused on developed economies, while our research was based on a developing economy. However, our results confirm that in this economy context, effective SCC leads to partnership synergy and the achievement of collaborative advantage (H₄). This finding contributes to understanding that the relationship between SCC and collaborative advantage remains important also in the context of developing economies.

Fifthly, the link between SCC and organisational performance is partially mediated by collaborative advantage (H₅). This aspect has been under-researched. Only Cao and Zhang (2011) showed collaborative advantage partially mediating the relationship between SCC and financial performance. Our results identified a mediating effect of collaborative advantage on the relationship between SCC and organisational performance (including both financial and non-financial measures). Hence, firms that practise BPM and also collaborate with SC partners develop collaborative advantage, which in turn leads to improved organisational performance. This finding indicates that benefits emanating from SCC allow firms to effectively manage their operations, leading to organisational performance benefits, both financial and non-financial.

5.2 Implications for theory

Confirmation of H₁ supports the RBV theory (Barney, 1991; Dyer and Singh, 1998). Furthermore, drawing upon RV, confirmation of H₂ to H₅ supports that firms which collaborate with SC partners will achieve more benefits than when they work in isolation (Dyer and Singh, 1998; Chen and Paulraj, 2004; Zacharia *et al.*, 2009). Considering that there is little empirical evidence available to explain how BPM and SCC interrelate to drive collaborative advantage and organisational performance, the most significant contribution of this study is that it enhances understanding of BPM, SCC, their relationship and benefits. Indeed, previous research has suggested that both BPM and SCC are vital for performance improvements and competitiveness (e.g., Min *et al.*, 2005; Simatupang and Sridharan 2008; Zacharia *et al.*, 2009; Nyaga *et al.*, 2010); however, these two approaches have been studied separately. This study stresses the need to test empirically both direct and indirect effects regarding the relationships under investigation.

Our research contributes to the work by Trkman *et al.* (2015) on the intra- and inter-organisational capabilities, and the extension of the body of knowledge on SCC argued by Soosay and Hyland (2015). The results show both mutual benefits in the form of collaborative

advantage, and individual benefits in terms of organisational performance. Improvements in organisational performance can be achieved not only from effective internal development (BPM) but also from external development (SCC). The direct inter-organisational relationships are stronger compared to the intra-organisational one, namely the relationships between BPM and SCC, SCC and collaborative advantage, SCC and organisational performance, and collaborative advantage and organisational performance (Figure 2). This empirically confirms that also in the context of a developing economy, firms collaborating with their SC partners can achieve more benefits than when working in isolation (section 4.3). While the results of this study underpin the importance of intra- and inter-organisational relationships, they also emphasise the indirect role of SCC as a significant mediator on the relationship between BPM and organisational performance (section 4.4). BPM contributes directly to the improvement of organisational performance, and, more essentially, it helps to develop SCC; SCC, in turn, helps BPM to improve internal capabilities based on the mutual benefits achieved, hence suggesting a virtuous cycle.

We hope this study contributes to the future growth and development of Thailand's manufacturing industries, and with some adjustments it could be used in other Asian countries whose manufacturing sectors share similar characteristics with Thailand's manufacturing, such as countries in the South-East Asia region: Philippines, Indonesia, Malaysia and Vietnam (Prajogo *et al.*, 2007).

5.3 Implications for practice

This study has clearly demonstrated the joint role and impact of BPM and SCC in the context of a developing economy. Based on these research findings, managers in such economies should realise the potential internal benefits of collaboration with SC partners. This research can help management appreciate the importance of the intra- and inter-organisational development, given that the premise of BPM is to improve organisational performance and to help in collaborative activities. Similarly, this study can expand management's awareness about the multidimensional nature of the BPM and SCC constructs. Given that the elements under consideration are the essence of the core BPM and SCC practices, and that this study's measurement model results showed that they are reliable and valid, management could consider implementing them in order to gain collaborative advantage and improve organisational performance. Results obtained from the scale development can be used as a self-evaluating checklist for managers wishing to evaluate their BPM and SCC practices.

Considering SCC, this study's results revealed the importance of BPM practices on this construct. This finding should problematise and alert management to recognise that BPM is a prerequisite for inter-organisational activities in SCC. These collaborative activities need to be divided into four main elements: information sharing and communication, joint activities, sharing common goals and incentive alignment. The indicators used to measure SCC elements were validated as reliable and valid. These could be also used by management to assess its progress regarding collaboration activities with SC partners. Management should not consider BPM and SCC as separate. BPM and SCC have to be implemented together to achieve superior performance in the intra- and inter-organisational relationship context.

Management could also reevaluate the potential internal benefits of collaboration with SC partners. The results from the mediation analysis showed the significance of SCC as a mediator variable of the relationship between BPM and organisational performance. Additionally, results confirmed that the relationship between SCC and organisational performance is mediated by

collaborative advantage. As such, management should take into serious consideration that the internal development based on BPM practices does not only have a positive impact on organisational performance, but also that BPM is essential for collaborative activities between a firm and its SC partners. Indeed, this study illustrated the benefits, in terms of collaborative advantage and organisational performance that can be achieved when a firm practices BPM, with regard to the four key elements and collaborative activities with its SC partners. Hence, in the context of a developing economy, a firm that practises BPM and works collaboratively with its SC partners can achieve superior performance.

6. Conclusion

Our study highlights the role of intra- and inter-organisational practices, especially in terms of BPM, SCC, collaborative advantage and organisational performance. It also investigated the mediating roles of SCC and collaborative advantage. Our results provide a better understanding of the performance and competitive linkages between individual firms and the SC, which should be of interest to both academics and practitioners. Using the SEM techniques with carefully developed constructs, we have revealed a nexus of interrelationships between BPM, SCC and their operational and strategic benefits. To conclude, the results demonstrated that (a) there is a positive relationship between BPM and organisational performance; (b) BPM has a positive impact on SCC; (c) the effect of BPM on organisational performance is partially mediated by SCC; (d) firms which collaborate with SC partners are better positioned to achieve collaborative advantage; and (e) the effect of SCC on organisational performance is partially mediated by collaborative advantage. This research provides a better understanding of intra- and inter-organisational development and provides new insights into theoretical and practical implications of BPM and SCC in manufacturing industries. We uncovered that BPM and SCC are second-order constructs and that they are incorporated with valid first-order constructs with multiple items, and our findings shed helpful insight to effectively utilise BPM and SCC. The four BPM dimensions provide a comprehensive view of intra-organisational development, leading to collaborative working with SC partners. This finding assists in recognising that BPM is a prerequisite for inter-organisational activities in SCC.

Limitations of this study must be acknowledged. Firstly, the data collection utilised self-reported responses from a single respondent in each firm (Rosenzweig, 2009) to evaluate indicators across the entire scope of BPM, SCC, collaborative advantage and organisational performance. Future research could use a broader range of respondents from each firm to enhance accuracy and reduce error. Secondly, this study used data derived at the individual firm level to explain SC collaborative relationships. Further studies might adopt a supplementary dyadic approach, engaging both supplier and customer, to explain the detail of inter-firm mechanisms. The data collection was entirely from manufacturing firms in Thailand. Future research could study a broader range of companies in both developed and other developing economies. Lastly, future research could consider contextual factors such as the type of ownership.

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