Supply Chain Collaboration: Impact of VMI concept on e-procurement in Thai SMEs Organization

Pipattawade Wannaree & Khattiya Surarak

Rajamagala University of Technology Lanna, CISAT Faculty,Department of Pre-Business A dministration, Chiang Mai 50220, Thailand

Abstract : Organizations today can no longer ignore that the world economy has been significantly revolutionized with constantly changing customers' demand, shorter product life-cycles and speed time to market. In order to continually succeed in the market, supply chain management concept has become vital. This study is conducted to identify main advantages of supply chain collaboration on e-procurement theoretically by taking concept of VMI into account. Primary data were collected from Thai SMEs and further statistically analysed with one-sample t-Test. The findings indicated that organizations with VMI concept reported a higher degree of satisfaction in regard to inventory performance, purchasing performance and suppliers' service performance.

Keywords : Supply chain collaboration, E-procurement, Thai SMEs

*Corresponding Author : pip_wannaree@hotmail.com Tel.091-859 5902

1. Introduction

Organizations today are very complex and work in a complex environment. For instance, they constantly confront with a growing pressure of changing customers' demand, higher uncertainty, speed time to market, and shorter product life cycles. To survive in such volatile and competitive environment, organizations aim to generate values for their supply chains (Sahay, 2003). William and Presutti (2003) indicated that 70% of a firm's average sales revenues are spent on supply chain-related activities from material purchases to distribution. No wonder that firms, to date, reverse their attention to supply chain management. To gain more market share and be more competitive, some companies simply focus on production costs. They shift their manufacturing or production base to a lower labour cost countries, leading to an extension of supply chain network. In effect, supply chains become more complex and vulnerable to the world disruption. For instance, Ericsson lost 400 million Euros after their supplier's plant of semiconductor in New Mexico got fire in 2000 (Tang, 2006). In 2007, Mattel Toy, a toy company, had to recall over 18 million toys back from around the world because its suppliers could not deliver their promise. The latest event occurred when Japan, the world third biggest producer of many key components, was severely hit by an earthquake and tsunami. Many plants in USA and around the world such as Boeing, General Motors and Siemens have had to stop their operation because they have to wait for the components from Japan. Moreover, global economic crisis in 2007 had an immense impact on many companies around the world. Firms saw their sales drop by more than 40 percent. As orders are cancelled, companies confront with inventory pile-up, cash trapped and inability to use the capital. However, some companies did receive this impact and still able to survive because they have had a better and responsive supply chains (RBI, 2010).

The concept of supply chain management has been widely studied and has come to be well recognized in the past 30 years. The impact of supply chain also has been identified by numerous scholars. For instance, Mangan et al. (2008) stressed that the best practice of supply chain management can lead to both cost reduction and add value to the final customers. Christopher and Gattorna (2004) further revealed that by managing supply chain effectively, companies can reduce significant costs and could increase organizations' profit. Additionally, Muckstadt et al. (2001) indicated that over the last decades firms have adopted supply chain management as a critical element of their corporate strategies and as means of becoming more competitive in the challenging environment.

Despite significant benefits gaining from collaboration with supply chains, this concept has not been widely acknowledged by most Thai SMEs. The study of Visara and Hunt (2008) indicated that Thai entrepreneurs still lack relevant background and business experiences, including ability to manage supply chain effectively. Owners of local businesses often overlook supply chain management and critical success factor of timely delivery of raw materials. This is the main cause that Thai SMEs have to suffer from low competitive advantages comparing to larger enterprises.

1.1. Supply chain collaboration

At present, supply chains are packed with complexities. To gain more market shares, companies focus on reducing production costs by looking for better and more efficient suppliers and by shifting their manufacturing to the lower labour cost countries which, therefore, extend the supply chain network. In effect, supply chains become vulnerable and considerably exposed to the global risk and the consequence is massively severe. For this reason, to mitigate supply chain risk while remain competitive, organizations are required to become more involved in supply chain collaboration with their partners.

The traditional supply chains were a series of weakly connected actions and decisions from both within and outside the organizations. Consequently, it destroyed the value in supply chains. Collaboration in supply chains is, therefore, recognized as an important practice that maintains the value which can lead to effective supply chains (Fu and Piplani, 2004). Zacharia et al. (2011) concluded from their interviews with firms that, when companies confront with complicated challenges within the supply chains, they often turned to their suppliers to combine internal and external skills and knowledge for successful resolution. As a matter of fact, companies today no longer compete with each other, but rather become competition between total supply chains (Christopher and Peck, 2003). For this reason, in order to survive, grow and flourish, it requires all supply chain members to collaborate so as to generate more supply chain values, known as supply chain surplus, to organizations as well as to the final customers (Chopra and Meindl, 2007).

Collaboration means that organizations have to focus on joining planning, process and coordination within supply chains (McLaren et al., 2002). In other words, every entity must work together by sharing processes, technologies, and data as means to maximize value for the whole group and their customers. Manthou et al. (2004) further asserted that all members should be able to share their value information with trading partners and customers in real-time. It is believed that information sharing is a very powerful tool to cope with demand amplification effect, known as "Bullwhip Effect", and uncertainties in supply chain network (Lee and Whang, 2000). Sundarraj and Talluri (2003) further stated that timely sharing and coordination of information such as sales and stock levels across supply chain members can be a major factor to improve organizations' performance. In fact, information is considered the most valuable element in supply chains because it helps organizations to understand real demands and inventory level of their partners. Lacking of information and incorrect interpretation of the order can be a major issue. By sharing information, companies can optimize the entire supply chains, resulting in a better planned overall production and distribution. As a result, it can reduce supply chain costs and attractive end products that can eventually lead to better sales and better overall result throughout the chains (Brinkmann, 2008).

Given the fact that supply chain management is all about managing a good relationship between suppliers, distributors, customers and other members in supply chains, collaboration is, therefore, important. Obviously, supply chains cannot simply achieve its target through IT solutions

alone, massive investments on building trust and long-term relationships should also be organizations' top priority (Mangan et al., 2008). Collaboration requires all supply chain members to trust each other and try to generate win-win environment while moving forward in order to get multiplication effects. At this stage, supply chain success is measured in terms of supply chain profitability as a whole, not at individual level (Chopra and Meindl, 2007). Every supply chain entity should act like an "ant" that all of their actions aim towards survival of the colony, rather than benefit of a single ant, by using communication that allows them to perform a complex task (Silva et al., 2009).

There are numerous studies that identified the impact caused by lacking of trust and collaboration in supply chains. Bullwhip effect or demand amplification is a major problem for organizations that lack coordination with their suppliers, resulting in significant costs due to overstocking throughout the system, inefficient use of resources and massively reduced supply chain performances (Raghaven et al., 2004). Fisher (1994) indicated that poor collaboration performance among supply chain partners has wasted about $30 billion annually in food industry in the United States because of the mismatch between supply and demand, resulting in excessive inventory, stock out and markdown.

In contrast, close collaborative relationships between members generate a healthy supply chain, for instance, better inventory management, more efficient use of resources (Daugherty et al., 2006), faster inventory cycle through to customers (Fawcett et al., 2008), reduced costs associated with inefficient supply chain management, increased return on assets, streamlined purchasing procedures, improved forecast and central planning abilities (Chong et al., 2009), elimination of excess inventory and increased sales (Arshinder et al., 2008). The study of Daugherty et al. (2006) demonstrated that those collaborative companies tend to be more successful than isolated companies. The collaborative firms reported a very high success in regard to improvement of service level, information visibility and enhanced end-customer's satisfaction. Firms such as Procter & Gamble, IBM, Dell and Hewlett–Packard have a long-term relationship and collaborate with their suppliers. Effectively, they are able to thrive in the market and achieve a stronger competitive position (Chopra and Meindl, 2007). It is broadly recognized that, by creating a seamless and synchronized supply chain, it increases responsiveness, reduces inventory costs, and provides other benefits across many industry sectors (Holweg et al., 2005).

However, collaboration is not easy for organizations to implement and requires massive time and investments. However, the benefit is worthwhile. Companies like Dell, Wall-Mart and Procter & Gamble have been very successful because they share data with their partners in supply chains. Through collaboration, it really gives all members competitive advantage and generates more values to the end customers. Put this into perspective, the ability of organizations to collaborate with their upstream and downstream partners will obviously determine their success in the future market. Ramesh et al. (2009) stated that successful companies of tomorrow will be those

that continue use of supply chain collaboration more effectively to create new opportunities, efficiencies, and eventually achieve customer loyalty.

1.2. Concept of E-procurement

Traditionally, the function of procurement is simply done to ensure that there are enough materials available to support business operations and save money in the process. However, organizations still confronted with many problems, for instance, struggle to share information, unstable relationships, impossibility to track procurement, over-purchasing, slow manual and systematic process, human error, lack of prompt information, inefficient processes, and excessive complexities (Hawking et al., 2004).

Undoubtedly, the development of the Internet has offered an increasing opportunity for organizations to implement e-procurement. Firms tend to use e-procurement to increase the efficiency of purchasing and cut operational costs across all supply chains (Pearcy and Giunipero, 2008). Furthermore, E-procurement has been recognized as a powerful tool to obtain cost reduction by both buyers and sellers. Remarkably, companies that use e-procurement technologies reported a saving of 42 percent in purchasing transaction costs as a result of less paperwork and increased efficiency of purchasing process. In fact, General Electric reported a saving over $US 10 billion annually through its e-procurement activities (Hawking and Stein, 2004). Teo et al. (2008) revealed that organizations that adapt e-procurement tool have experienced business growth from 11% to 12%.

1.2.1 Vendor Managed Inventory (VMI)

Traditional supply chain environment where both buyers and suppliers frequently work in isolation is costly and frustrating. Effectively, different collaborative programs have been developed and implemented in various industries in order to improve performance of the entire supply chains. VMI is one of these initiatives which is pioneered during 1980s by Wal-Mart and subsequently has become well-known in many industries (Kiesmuller and Broekmeulen, 2009). It has emerged as the first step for organizations towards successful integrated activities and information across multiple organizations.

Under VMI practice, vendor decides on appropriate inventory levels for each product for itself and its retailers, as well as appropriate inventory policies to maintain these levels. The vendor will monitor buyer's inventory levels frequently and makes periodic resupply decisions regarding order quantities, shipping, and timing, whereas retailers are required to provide the vendor with access to its real-time inventory level (Simchi-Livi et al., 2003). However, the success of this approach is heavily depended on sharing timely information in regard to inventory level, promotional activity, and expected demand. By allowing vendor to get access to information about customers, they can work more proactively to keep customers satisfied. Sari (2008) perceived VMI as a partnership approach that was mainly developed to encourage retailers to share information with their suppliers. In addition, trust between each member is significantly important in order to

increase entire supply chain performances. Pohlen and Goldsby (2003) suggested that collaborative relationships, such as those involving in VMI, are unlikely to succeed without a foundation of trust.

There are a number of researchers who have found potential benefits from VMI adoption and several of these benefits have already been exploited by many organizations. Waller et al. (1999) concluded from his simulation that VMI leads to reduction in inventories, mainly resulting from more frequent inventory reviews, shorter order intervals, and more frequent deliveries. Other most obvious benefits of VMI are higher product availability, improved customer service and productivity, increase retail sales, lower supply chain total costs, decrease administrative costs, reduced manufacturing costs through more efficient production scheduling, reduced lead times, increased profit, reduced uncertain customers' demand, reduced need for large buffer stocks, and better resource utilization (Disney and Towill, 2003; Elvander et al., 2007; Guan and Zhao, 2010). Furthermore, VMI has been demonstrated to be the best effective approach to handle the bullwhip effect, in which inventory piles up along the chain, distortion and amplification, while product availability plunges (Lee and Whang, 2000).

Remarkably, VMI has received considerable interests among supply chain managers in recent years. It has been broadly acknowledged and implemented by many industry leaders, such as Wal-Mart, Campbell Soup Company, Nestle, Quaker Oats, Nabisco and P&G etc. Even in a high-technology sector such as Texas Instruments, HP, Motorola, Dell and Apple, they also used VMI with some of their suppliers and their customers (Tyan and Wee, 2003; Lee et al., 2004).

2. Materials and Methods

This study aims to investigate whether the top three theoretical advantages of e-procurement; namely, improvement of inventory performance, purchasing performance and improvement of supplier service performance, can be recognized by Thai SMEs organization. Primary research is focused on Thai SME organizations which have less than 250 employees and annual turnover below 250 millions Thai Baht. Data was collected electronically from company by using questionnaire.

A five-point Likert scale was selected to display ranges of potential answers to questions. The five-point scale would allow for clear analysis of data. It seemed that a three-point scale would have been too limited, while a wider range would not only result in a crowded questionnaire but it would not offer additional information for analysis. The advantage of using this scale is that it is easy and quick to construct and makes it possible to collect a great volume of reliable data. Rating question will be used when the respondents are expected to give their opinions from "strongly disagree" to "strongly agree" for each statement.

To ensure the data collected is valid, which for the purposes of this study means that it is collected only from organisations that meet the critical criteria. It was essential that the questions were non biased towards any one organization. Being able to produce data that is free from bias, reliable, available and relevant gives the data its construct validity. Care was taken to minimize error in the collected data. The electronic questionnaire tool has an advantage of collating all the

data from completed questionnaires electronically and therefore minimizing human error in keying data into a system.

Questions in the questionnaire are set up to test the hypothesis concerning the main advantages of e-collaboration (Figure 1).

One-sample t-test is conducted to test the hypotheses whether Thai SMEs recognizes the benefits of VMI concept. Various researchers have used t-test to investigate and clarify their studies. This study determines $\mu_0 = \geq 3.5$, whereas each alternative hypothesis (H1) has the μ-value of smaller than 3.5 ($\mu_1 < 3.5$). This study uses a significance level of $\alpha = .05$, which means that the finding has a five percent chance of not being true.

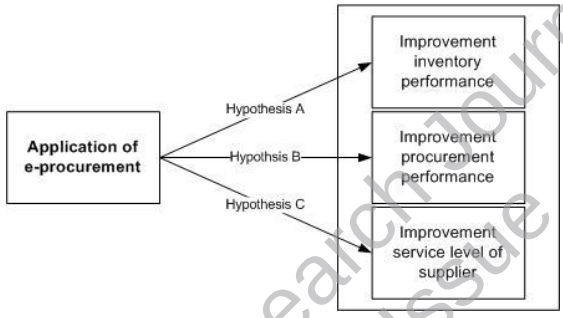

Figure 1: Research model

3. Result and Discussion

The questionnaires were sent to 500 companies electronically. A total of 14 questionnaires were eventually returned, yielding a return rate of 2.80 percent. Obviously, all respondents are engaged in either consumer goods or industrial goods sector. None of them are engaged in consumer or industrial service. The size of company in terms of number of employees is reported to have less than 100.

3.1. One-sample t-test

Based on the formulated null hypothesis A B and C, each hypothesis is tested by one-sample t-test with a significance level of $\alpha = .05$ and $\mu_0 = 3.5$ The sample size (n) is 14 for all tests. Each alternative hypothesis (H_1) has the μ value of smaller than 3.5 ($\mu_1 < 3.5$).

Results presented in Table 1 demonstrate that p-values of hypothesis A, B and C are all greater than significance level of 0.05. This means that the Null Hypothesis A, B and C are all accepted and the Alternative Hypothesis is rejected. In other words, there is a statistically positive relationship between the application of VMI and an improvement of inventory performances, procurement performance, and supplier services performances with a 95 per cent confidence interval.

Table 1: T-test result of VMI organisation

Hypothesis	One-tailed Statistics			One-tailed Test	
	N	Mean	S	t	p-value
$H_{(A)}$: inventory	14	4.43	0.51	6.77	1.000
$H_{(B)}$:procurement	14	4.43	0.51	6.77	1.000
$H_{(C)}$:supplier	14	4.21	0.58	4.62	1.000

All respondents reported to be quite pleased with the fact that this concept does improve their inventory performance and purchasing performance. In terms of improvement of supplier service performance, there is only one respondent that reported to be neither satisfied nor dissatisfied but the remaining is all satisfied.

The main reason that most organizations are satisfied with their inventory performance are that VMI reduces inventory costs, increases level of product availability (from stock), and lowers inventory level, as more than 70 percent of VMI respondents have confirmed. The most recognized benefit is the increasing level of product availability because all organizations have shown the highest degree of satisfaction. Interestingly, 6 organizations or 42.90 percent are yet unconvinced whether it can, in fact, improve inventory cycle-time. As a matter of fact, there is one organization that clearly expresses its dissatisfaction towards this factor.

In terms of purchasing performances improvement, VMI respondents expressed a high level of satisfaction. All VMI organizations tend to agree that improvement of purchasing performances is due to the fact that it improves purchasing process and reduces administration costs. Only 64.30 percent agreed that VMI concept helps to reduce purchasing costs and increases quality of purchased goods. It is important to note that some organizations are still skeptical about this concept ability to improve purchasing costs as well as quality of purchased goods. In fact, one organization believed that VMI does not help its organization to reduce purchasing cots at all.

The hypothesized improvement of suppliers' performance is supported by the hypothesis testing with a significant proportion of respondents (92.80 %) who tend to be satisfied with VMI. Obviously this improvement can be reasoned by increasing order visibility, on time delivery with right quantities, increased information exchange and increased suppliers' relationship. However, concerning the factor of on time delivery with right quantities, there are 3 organizations that are still uncertain about the impact of VMI tool on this factor.

In general, VMI has immensely improved organization inventory performances, purchasing performances and suppliers' service performance. Obviously, all participants have strongly expressed their satisfaction.

4. Conclusion

Over the last few decades, the world economy has been significantly revolutionized, with constantly changing customers' demand, shorter product life-cycles and speed time to market. In addition, there are other concerns that constantly strike organizations worldwide; namely, the world natural disaster and terribly unexpected event. This can cause a severe impact on today organizations. For this reason, supply chain management has become more important and can no longer be ignored.

To date, organizations are calling for collaboration with their upstream and downstream partners in order to improve their services and generate value to the final customers. In effect, organizations are no longer competing with each other, but instead supply chain competes with other supply chains. Put this into perspective, supply chains that can add more value to the final customers and fully exceed customer's expectation is the outright winner in today market.

In recent year, the benefits of supply chain collaboration are widely studied and exploited by many firms such as Wal-Mart, Dell, Toyota and Tesco. However, in Thailand, the concept of supply chain collaboration does not gain enough attention. For this reason, this study is carried out to identify the main advantages of supply chain collaboration on e-procurement and subsequently examine these benefits by testing with primary data. This study has taken the concept of VMI into account. The results reported in this paper suggest that the top three advantages of e-procurement stated in theory are improvement of inventory, procurement and suppliers' service performance.

By giving the μ_0 -value of ≥ 3.5, the hypothesis A, B and C are all accepted because the p-values of theses hypotheses are all bigger than the significance level of α= .05. This means that the benefits of supply chain collaboration are proven in practice with Thai SMEs; namely, the improvement of inventory performance, procurement performance and suppliers' service performance.

The most recognized benefits concerning inventory performance are ranked from increased level of product availability (from stock), reduced inventory costs and lower inventory level. In terms of purchasing performances, organizations with e-procurement concept believe that it helps them to improve their purchasing process and reduce administration costs, whereas some companies are uncertain whether it can improve purchasing costs and quality of purchasing goods. Considering the improvement of suppliers 'service performance, most of them are satisfied with all aspects; namely, increased visibility of order status, on time delivery with right quantities, increased information exchange and increased suppliers relationship.

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