Adoption of Global Operations Strategy: *A Resource-based View Perspective*

Tritos Laosirihongthong
Department of Industrial Engineering, Thammasat University
Klong Luang, Pathumtanee, Thailand
E-mail: ltritos@engr.tu.ac.th

Atthawit Techawiboonwong*[1]
College of Innovation, Thammasat University
2 Prachan Road, Bangkok, Thailand
E-Mail: atthawit@hotmail.com

ABSTRACT:

This study examined the extent to which lean supply chain management practices are adapted and adopted in manufacturing organizations and their impact on plant performance. Three factors, representing this global operations strategy, were extracted by using the exploratory factor analysis on 187 datasets from manufacturing firms in Thailand. These are (1) *JIT,* (2) *waste minimization*, and (3) *flow management*. The comparative analysis between small and medium enterprises (SMEs) and large enterprises (LEs) were investigated in the context of resources based view (RBV) theory. Finally, multiple regression models were developed to explain the effects of those three factors on plant performance. The results showed that *JIT* and *waste minimization* contribute significantly to plant performance of SMEs, whereas, only *JIT* contributes significantly to plant performance of LEs.

Keywords: Lean Supply Chain; Thailand; Resource Based View; JIT; Performance.

1. INTRODUCTION

One of the most significant business realizations of recent years is that companies can now no longer compete as autonomous entities, but as supply chains/networks (Christopher and Juttner, 2000; Amasaka, 2007). The supply chain provides the structure to capture the synergy of intra and inter-company integration and its resulting benefits (Lambert et al., 1998). Supply chain management is more than managing physical inventories and coordinating the physical/information flow of product through development stage and ensuring physical sales but also includes managing relationships with suppliers and customers (Liker, 2004; Goldsby and Martichenko, 2005). This strategy for doing business also involves integrating planning and the execution of functions within and between firms. The benefits of this include "cost savings through reductions in inventory, reduction in transaction costs across the supply chain" (Langfield-Smith and Smith, 2005, p.39). It is through the integration of systems and processes that performance can be enhanced both within and between firms (Druker, 1970; Liker, 2004; Croxton et al., 2001). One strategy for coordinating these functions and processes within and between firms with a focus on achieving efficiency, eliminating waste or overburden and creating value in products is the concept of lean management (Womack and Jones, 1996). In order to achieve the promised benefits from adopting this strategy, firms need to provide the infrastructural resources including human, technology, and finance.

* Corresponding author

The resource-based view (RBV) theory is one of the well established organizational behaviour (OB) concepts. There are many researchers used it as the research domain to identify key factors to enhance the competitiveness at firm level (Barratt and Oke, 2007, Zhang and Dhaliwal, 2009). From the perspective of the RBV, firms are being considered as the entities that acquire, utilize, and evaluate their potential resources in order to be able to compete in the market and achieve the goal of the firms. RBV has influence the adoption of the global operations strategy such as total quality management, supply chain management, technology management, and lean manufacturing. By adopting this concept, firms are able to identify the strategic resources. In addition, these firms can isolate the critical knowledge elements from the overall resources to support the implementation of such global operations strategy leading to the business outcomes (Wernerfelt, 1984).

Hence, the purpose of this study is to explore the implementation of lean supply chain management practices in manufacturing industry in Thailand, and identifies the impact of these practices on plant performance. RBV theory was considered as the structure to compare how different in implementing lean supply chain management between SMEs and LEs. The rest of the paper is organized as follows. Section 2 describes the importance of a lean strategy to implementing effective supply chain practices. Section 3 explains how scales representing lean concepts were developed. Section 4 explained the concept of Resource-based view theory while section 5 presented the important of SMEs and LEs in economic growth. Research methodology, findings, and discussion are presented in sections 6, 7, and 8 respectively. The conclusions and practical implications are drawn in section 9.

2. THE IMPORTANCE OF LEAN THINKING TO THE SUPPLY CHAIN MANAGEMENT STRATEGY

A primary objective of lean thinking is increasing manufacturing flexibility, removing non-value adding activities, and reducing work-in-process inventories. This concept also leads to increase in velocity and material/information flow along the supply chain (suppliers – focal firms – customers). Reichhart and Holweg (2007) discussed the concept of lean management within the supply chain and suggested that it was difficult to extend lean principles downstream of the supply chain. Furthermore, in order to evaluate the efficiency and effectiveness of supply chain management implementation, the concept of "total cost" has become an important focus as large organizations such as automotive OEMs seek continual cost reductions and supply chain support from Thailand and other low cost countries (Laosirihongthong et al., 2008). This implies that lean supply chain implementation in emerging economies will become an important issue for industry.

The concept of lean thinking developed from the Toyota Production System and is well documented in other studies such as Reichhart and Holweg (2007). Lean thinking is focused on eliminating waste from all processes while enhancing material and information flow along the supply chain (McCullen and Towill, 2001). The impact of lean thinking as a strategy for the supply chain and not just manufacturing is important and has received a lot of interest from both industry (including service) and academia.

Supply chain management, by definition, places emphasis on the utilization and development of inter-firm relationships as a mechanism for collaboration and coordination of activities (Stock and Lambert, 2001). Participation in such relationships is recognized as contributing to firm performance (Webster, 1992; Dwyer, et al., 1987; Frazier, 1999; Kalawani and Narayandas, 1995). To achieve waste and the inherent overburden reductions across the supply chain, coordination of supply chain activities is critically important (Xu and Beamon, 2006). Part of building coordinated links between chain partners involves communication and

information sharing with the intention of influencing trading partners to forge strong integrative relationships (Berry, 1995; Holden and O'Toole, 2004).

Achieving these strong relationships requires an understanding of the expectations of business partners (Hausman, 2001). The adoption of lean thinking among firms in the supply chain requires a continuous effort of improvement strategies and practices using these mutual focused relationships. Lean thinking also relies on relationships to enable these practices to be carried out (McIvor, 2001). An example of this dependence is the lean supply chain concept, which enables the supply chain partners to hold minimal inventories while still being able to react to pull strategies in relation to customer demand, and consequently enhance operational flexibility with competitive cost. Wal-Mart and Honda Motor are good examples to demonstrate how lean supply chain management could be implemented (Choi and Hong, 2002; Cook et al., 2005).

3. LEAN MANAGEMENT: SCALES DEVELOPMENT

Lean thinking is a multi- dimensional approach, which includes a set of management practices, tools, systems and principles (Womack et al., 1990). This approach also focuses on enhancing quality and flexibility, involvement of suppliers, managing supply chain cost, improving customer responsiveness, and reducing waste through such mechanisms as just-in –time (JIT) production system and material/information flow management (Shah and Ward, 2003).

The term JIT originates from the concept of reducing inventory holding by requiring that parts, components and, more recently, modules be delivered just as they are required for production and not before (Harrison and van Hoek, 2002). This concept has been broadened and now refers to postponement of unnecessary support activities and resources until they are required by the customer. Waste minimization refers to processes that seek to continuously reduce non-value adding activities in a process such as reactive mechanisms to customer orders (Sugimori et al., 1977; Lee and Ebrahimpour, 1984; Finch and Cox, 1986). Flow (material and information) management is considered to focus on simplifying and streamlining processes to be speedy (Watanabe, 2007), reducing management or coordination costs, for example, using small production runs or small lots (Voss and Robinson, 1987) and reducing coordination efforts by dealing with less suppliers (Coyle et al., 2003).

Shah and Ward (2003) used the marketing notion of "bundles" also utilized in human resources (MacDuffie, 1995), as a means of clustering related dimensions or attributes within the supply chain. This study uses the same concept in an attempt to group related dimensions. The three bundles identified as Flow Management, Waste minimization and JIT, are interrelated in their ability to reduce costs through enhanced process efficiency and effectiveness, consequently implying impact on operational performance.

There are several studies that have examined lean management and performance with many focusing only on limited aspects of lean management or implementation of lean in specific sectors (Shah and Ward, 2003; Found and Rich 2007; Biswas and Sarker, 2008; Taylor, 2009). This study therefore used a multi-dimensional approach to analyze the adoption of lean management in the study country. The study is based on the manufacturing sector using survey data gathering from an emerging economy country – Thailand - as opposed to the majority of research on lean and performance which tends to be case based on individual organization experiences (Shah and Ward, 2003).

Of the thirteen practices identified, several, including quick changeover techniques, preventive maintenance, and re-design production processes, relate directly to operations management of the manufacturing process, and ensuring its integrity. Several articles, drawn primarily from the literature on JIT systems, have empirically demonstrated that these practices, used as part of a broader execution strategy, can positively impact various measures of operational and financial performance (e.g., Flynn et al., 1995, Nakamura et al., 1998, Fullerton and McWatters, 2001). This study, therefore, tests the following propositions:

Proposition 1: For firms adopting lean supply chain management practices, JIT, waste minimization, and flow management directly affect plant performance.

4. SMEs and its contributions to Economics Growth

SMEs are the largest source of domestic employment in most developed countries, and of non-agricultural employment virtually in all developing economies (Asasen et al., 2003). They can be found across many industrial sectors ranging from both manufacturing-based and service-based. With the smaller size of firms, it helps increasing the flexibility in mobilizing the changes, shortening the process of decision making which lead to the faster response in the rapid changing economy. However, with the fast response, sometimes it might lead the firms to the wrong direction. Asasen et al. (2003) summarized the contributions of the SMEs in term of higher income growth, fuller employment of domestic resources, more gainful integration through global and regional trade and investment, and greater equity in access, distribution and development. As can be seen during the recoverable of the economic crisis, many countries try to solve this by refocus on their SMEs together with launching supporting policy. In ASEAN Region also have announced the ASEAN SME Development Decade (2004-2014) which aims to accelerate and elevate collaborative action, at both the intra- and extra regional levels, for SME sector development and integration.

The most challenging for SMEs in order to drive the economics growth is the limitation of infrastructural resources including financial resources. This is because of financial resources are typically in short supply virtually in all developing economies. SMEs are lacking of experiences in term of management they might even not have the reasonable business plan and any of the operations strategy. Hence, the government policies are needed especially in the direction of building up the capacity and skill capability on to their human resources. Also the training on the updated operations management technology to make them be able to develop the appropriated management strategy might help the SMEs in order to become more efficient in driving the economics for the country.

5. SMEs, LEs, and RBV PERSPECTIVES

The Resource Based View (RBV) described that the resources in every firms have the ability to make the firm be able to have the sustainable competitive advantage. However, those resources must be i) Valuable; ii) Rare; iii) Inimitable; and iv) Non-substitutable, which is sometime known as VRIN (Barney 1991). Some previous studies had developed the concept of the RBV and suggested more characteristics of the resources. Rungtusanatham et al. (2003) have included that the resource must be imperfectly mobile to discourage the ex-post competition for the resource that would offset the advantages of maintaining control of the resource. It was then abbreviated as VRINN (valuable, rare, imperfectly mobile, not imitable and not substitutable).

From the resource-based view theory, technologies are considered as the resources in the operations management that help the firms to gain the competitive advantages. The study of

Grant (1991) shows how RBV theory was implemented by looking at what resources the firm possesses. Then, assess their potential for value generation and end up by defining a strategy that will allow us to capture the maximum of value in a sustainable way. Barratt and Oke (2007) introduced the concept of distinctive visibility which follows the work of Rungtusanatham et al. (2003). Their study also suggested that the deployment of certain resources in supply chain linkage enables information to be shared which could provide an improved performance for the linkage and has the potential to improve the operational performance of the supply chain and lead to a sustainable competitive advantage. Zhang and Dhaliwal (2009) presented the benefit from both external and internal technology adoption to improve the operational performance of the firm. Their study show that RBV contributed as a solid theoretical backbone in pertaining to technology adoption for operational supply chain excellence.

For the RBV perspective, resources are including the capital, technology, physical assets, and human resources, used by the firm in their production process. The resource based perspective of the SMEs is normally different from those of LEs due to their characteristics. LEs seem to have more advantages in term of more efficient resources due to the larger capital. Recent study shows that there are a number of tangible and intangible resources known to be usually scarce or underdeveloped among SMEs such as financial resources, human resources, physical resources, technological resources, or organizational management resources (Buratti, 2001). In this study, try to point out the different of the organizational management especially the global operations strategy among the SMEs and LEs. The lean supply chain management was selected as the scope of this comparative analysis.

6. RESEARCH METHODOLOGY

Scales development

Shah and Ward (2003) identified twenty one management practices that are associated with lean supply chain management. It is apparent that the list includes practices at operations level as well as higher level approaches. Kannan and Tan (2005) developed scales representing three set of manufacturing strategies: total quality management, JIT, and supply chain management. They not only found positive correlations between a firm's adoption of total quality management and JIT practices in the context of managing their supply chains, they also demonstrated the presence of direct relationships between practices and performance. Items they considered included those related to setup, changeover and lot size reductions, preventive maintenance, focusing on single supplier, and reduction of cycle time.

In summary, regardless of the specific paradigm or philosophy driving manufacturing strategy, JIT, waste minimization, and flow management appear to be common themes within the concept of lean supply chain management. From the literature review described above, this study therefore identified thirteen practices representing lean supply chain management. Pre-tested constructs from past empirical studies were used to ensure the validity and reliability of the survey instrument (Tata et al., 1999; Shah and Ward, 2003; Kannan and Tan, 2005; Shah and Ward, 2007). These are shown in Table 1. A 5-point Likert scale, which ranged from strongly disagree (1) to strongly agree (5) was used for evaluating *extent to which lean supply chain management practices/activities have been implemented in their company*.

Table 1: Lean Supply Chain Practices (adapted from Shah and ward, 2003)

Lean Supply Chain Management
Reducing production/distribution lot size
Reducing set-up time
Focusing on single supplier
Implementing preventive maintenance activities
Cycle time reduction
Reducing inventory level
Using new process equipment/technologies
Using quick changeover techniques (SMED)
Continuous/one piece flow
Using pull-based production system/KANBAN
Removing bottleneck
Using error proofing techniques/Poka-Yoke
Encouraging suppliers to eliminate waste

In order to understand the success of lean supply chain management implementation, four measures of plant performance were used in this study. These measures were derived from several criteria, which have been conceptualized and used in previous empirical studies of lean manufacturing and supply chain management (Tan, 2002; Shah and Ward 2003, 2007). Perception data were used in which respondents were asked to evaluate their plant's performance against a major competitor in their industry. This approach was used to minimize the possibility of bias from subjective answers. These four plant performance measures were quick delivery, total unit cost of product relative to competitors, overall productivity, and degree of customer satisfaction. The survey respondents were asked to rate plant performance on a Likert scale from 1 (''Poor, low end of industry'') to 5 (''Superior''). Consistent with Flynn and Flynn (2004), and Rossetti and Choi (2008), this study used a formative measure of plant-level competitive performance. Table 2 presents these measures.

Table 2: Plant Performance

Performance Measures (rated from 1 (''Poor, low end of industry'') to 5 (''Superior'')
Quick delivery compared to competitor: • We can depend upon on-time delivery to our customers; • Our customers seem happy with our responsiveness to their changes in delivery.
Total unit cost of product relative to competitors: • Standards cost is always met by our plant
Overall productivity: • We usually meet the Inventory turnover for each particular period. • Our daily schedule is reasonable to complete on time.
Overall customer satisfaction: • Our customers are pleased with the products and services we provide them; • Our customers seem happy with our responsiveness to their problems.

Source of empirical data

The survey was conducted among the plant managers in the manufacturing industry in Thailand. All respondents attended a 2-day public training program which was organized by

the Technology Promotion Association (Thai-Japan). The Technology Promotion Association is recognized as the largest training organization in the country. The focus of this training program was on aspects such as manufacturing strategy, total quality management, logistics and supply chain management, lean manufacturing, 5s, small group activities, continuous improvement, and operational excellence. The participants came from various manufacturing firms and sectors (discrete manufacturing process) including automotive, electronics parts and components, food, and textile. A total of 424 questionnaires were distributed to the participants and out of these 187 questionnaires were completed and returned, a response rate of 44.10%. Table 3 presents key characteristics of the respondents.

Table 3: Key characteristics of the respondents

Characteristics		**Frequency**	**Percent**
Number of employees	<= 200	35	18.7
	> 200	152	81.3
Ownership	Thai-owned	44	23.5
	Foreign-owned	69	36.9
	Joint venture	74	39.6
Quality management systems certification(s)	ISO 9001: 2000	40	21.4
	ISO/TS-16949	3	1.6
	ISO 14001: 1996	8	4.3
	Integrated management systems (more than one standard)	136	72.7

Table 3 shows that a vast majority of the respondents represent large companies (81.3%). The responding companies also belonged to three categories of firms based on their ownership, and are distributed almost evenly (Thai-owned – 23.5%, foreign-owned – 36.9% and joint venture - 39.6%). Among the respondents, forty percent have more than five years of working experience in the manufacturing industry suggesting a good level of knowledge of the industry and the issues involved in the study. Finally, all companies had been certified to at least one internationally recognized standard such as ISO9001: 2000, ISO 14001: 1996, and ISO/TS 16949: 2002 with the majority of the firms (72.7%) certified to multiple standards.

This study employed a widely used technique to investigate for non-response bias in the survey data (Lambert and Harrington, 1990; Hair et al., 1998). Specifically, the data was tested for statistical differences in responses and firm characteristics between the early and late waves of returned surveys. The last wave of returned surveys was considered to be a good representation of non-respondents. Independent samples t-tests did not yield any statistical significant difference between the two groups, suggesting that non-response bias was not an issue in this study.

7. FINDINGS

Scale validity and reliability tests

The thirteen lean supply chain practices were subjected to principal component analysis with varimax rotation to examine their unidimensionality. Reliability analysis was then conducted by examining the value of Cronbach's α (Cronbach, 1951) for each construct. Results showed that in each case, values of Cronbach's α exceeded the suggested threshold value of 0.6 (Nunnally, 1988). Critics have argued that Cronbach's α may underestimate errors caused by external factors such as differences in testing situations and respondents over time. Hence,

composite reliability and average variance extracted are included since they are more parsimonious measures of reliability (Podsakoff et al., 2003). Statistics for composite reliabilities (Tables 4 and 5) for the extracted constructs exceed the required threshold value of 0.60, providing further evidence of scale reliability. All average variances extracted also exceeded the threshold level of 0.50.

Principal components analysis using Varimax rotation was used to examine the uni-dimensionality of the constructs. Factor loadings of all items within each scale were above 0.60, providing support for the validity of measuring the constructs using the respective sets of measured variables. Table 4 presents the three extracted constructs representing lean supply chain management practices.

Table 4: Three Higher-Level Constructs of Lean Supply Chain

	Construct		
Lean supply chain practice	**JIT**	**WM***	**FM****
Reduction of Inventory	.767		
Preventive maintenance	.761		
Reduction of cycle time	.742		
Implementing Modern tech.	.727		
Tech tool time reduce	.714		
Reduce Set up time	.617		
Eliminate waste		.756	
Error proof		.651	
Pull system		.637	
Eliminate bottle neck		.620	
Small lot production			.815
Single supplier			.693
One piece flow			.615
Total variance explained (%)	28.18	45.82	58.35
Cronbach alpha	0.863	0.724	0.827

Note: * Waste minimisation; ** Flow management

Table 5: Construct of Plant Performance

Performance measures	**PP***
Quick delivery compared to competitor	.817
Total unit cost of product relative to competitors.	.731
Overall productivity	.836
Overall customer satisfaction	.764
Total variance explained (%)	58.71
Cronbach alpha	0.759

Note: * plant performance

The three higher level constructs identified in table 4 are JIT (Just-in-Time - 6 scales), WM (waste minimization - 4 scales), and FM (flow management - 3 scales). The reliability analysis shows that the Cronbach alpha value for the three constructs are above the threshold value of 0.6 (JIT = 0.863; WM = 0.724; FM = 0.827). Thus these constructs are reliable (Nunnally, 1988). The four measures of plant performance - quick delivery compared to

competitor, total unit cost of product relative to competitors, overall productivity, and overall customer satisfaction - were also subjected to the principal component analysis. The results are shown in Table 5. This analysis produced a single higher level construct (PP – plant's performance), which is valid and reliable (Cronbach alpha = 0.759).

The relationships between lean supply chain and plant performance between SMEs & LEs

The responding firms were classified into two categories – small and medium-sized enterprises (SMEs) and large enterprises (LEs). Out of 187 responding companies, 35 (18.7%) are SMEs and 152 are LEs (81.3%). The relationships between implementation of lean supply chain practices and plant performance were analyzed separately for these two categories of firms. The relationship was investigated using multiple regression analysis.

Table 6: Relationship between Lean Supply Chain and Plant Performance

No. of employee	r	r- square	Adjusted r-square
<=200	0.656	0.430	0.371
>200	0.488	0.238	0.222

Table 7: Results of the ANOVA

No. of employee		Sum of Squares	F	Sig.
<= 200	Regression	13.201	7.290	0.001
	Residual	17.504		
	Total	30.705		
> 200	Regression	34.954	14.77	0.000
	Residual	112.035		
	Total	146.989		

For the cluster of SMEs, the regression analysis was conducted using data from the 35 SMEs. The adjusted r-square value (0.371) indicates that overall there is a positive relationship between lean supply chain practices and plant performance. The results of ANOVA show that this relationship is significant ($F = 7.290$, Sig = 0.001). Further, the results show that all three constructs (JIT, WM, and FM) impact plant performance (Table 8). However, these relationships are significantly higher in case of JIT ($p < 0.05$) and WM ($p < 0.01$) compared to FM ($p < 0.1$).

Table 8: Relationship between Lean Supply Chain and Plant Performance

No. of employee	Leans SC Practices	Beta	t value	Sig.
<= 200	JIT	0.391	2.715	0.011
	WM	0.414	2.935	0.006
	FM	0.265	1.837	0.076
> 200	JIT	0.462	6.274	0.000
	WM	0.136	1.858	0.065
	FM	0.126	1.711	0.089

For the cluster of LEs, the regression analysis was conducted using data from the 152 LEs. The adjusted r-square value (0.222) indicates that a positive relationship exists between lean supply chain practices and plant performance and the relationship is significant (*F = 14.77, Sig = 0.000*). However, compared to the SMEs, the relationship is weaker in case of LEs. The results of the regression analysis show that out of the three constructs only JIT construct is significantly related to plant performance ($p < 0.01$). Tables 6-8 show this result.

8. DISCUSSION

The study indicated differences between SMEs and LEs. The performance of the larger firms was more closely related to JIT and less on waste minimization and flow management. As a result the relationship between their lean practices and performance is weaker when compared with the SMEs. This may suggest that large organizations in Thailand are not getting the full benefits of focusing on multiple dimensions of lean management when compared to SMEs. The data may also suggest that the SMEs are under greater pressure from their larger customers or OEMs and are therefore more inclined to more fully embrace lean management practices in order to improve plant performance. Furthermore, the fact that the smaller organizations do not have the physical and human resources that the larger organizations have may drive the desire to exploit the benefits of lean management more. In contrast, the larger organizations are more likely to focus their operations on meeting the TAKT time demands of their customers and hence, the stronger relationship between JIT and plant performance.

The study shows a good degree of awareness and adoption of lean practices among manufacturing organizations in Thailand. It also suggests that emerging economies are successfully implementing lean supply chain management practices from more developed economies especially JIT and flow management. This, in part, is due to the setting up of foreign-owned firms and joint ventures that need to be investigated furthermore.

9. CONCLUSIONS AND IMPLICATIONS FOR INDUSTRY PRACTITIONERS

Using data from Thai manufacturing industry, this research examined the extent to which lean supply chain management practices are adopted in manufacturing organizations and their impact on plant performance. The responding firms were grouped as SMEs and LEs based on firm size and as Thai-owned, foreign-owned, and joint venture based on their ownership. Using multiple regression models the effect of lean practices on plant performance was investigated. From the thirteen lean practices used in this study, factor analysis produced three higher level constructs - JIT, waste minimization, and flow management. The results indicate that constructs such as JIT and waste minimization contribute significantly to the plant performance of SMEs, whereas, only JIT contributes significantly to operational performance of LEs. Also, the results suggest that the impact of JIT, flow management and waste minimization on plant performance is significant in case of foreign-owned firms, whereas only JIT impacts plant performance significantly in case of Thai-owned and Joint venture firms.

There are significant academic and industrial implications of this study. Firstly, industrial practitioners need to be fully aware of the multiple dimensions of lean strategy deployment and the relationship with plant performance. This study affirms that lean supply chain management strategy could be adopted and considered as a set of practices. This will ensure that the maximum benefits of lean management are realized. Secondly, organizations that are largely controlled by local managers need to be aware of the differences between themselves and those owned by foreign firms thereby creating a learning opportunity for emerging

economy managers. In order to implement lean supply chain management practices successfully, managers should provide following resources:

i. Organizational management resources:
   - Gain top management's commitment as the organizational management resources;
   - Understand the impact of the organization and culture on lean supply chain process design and operations;

ii. Human resources:
   - Build a multi-disciplinary team for the project that understands lean supply chain management as a set of management practices, tools, systems and principles;
   - Understand customers needs and expectations since the lean supply chain is built on customer pull;

iii. External resources:
   - Comprehend the complexity of supply chains with multiple suppliers, distribution centers and customers;

iv. Technological resources:
   - Incorporate lean supply chain technology (i.e. RFID, ERP, Information and Communication Technology - ICT), as part of the process improvement and re-designing of the firm's supply chain architecture. To adopt this technology, change and risk management analysis of the implementation program is also recommended for managers.

In conclusion, the study provides new insight into lean strategy development in emerging economies and suggests that there is still potential for improvement in many organizations even though awareness and deployment levels of lean management are high. Although multiple data sources are used for the survey and respondents were pre-screened to ensure they had the knowledge and expertise to provide valid responses, this study relied on a single respondent from each company. Therefore, it precludes testing for inter-rater reliability. This study also did not investigate the moderating effect of variables such as management systems certification adopted in the respondent's organization, and the maturity (years) of its implementation.

REFERENCES

Amasaka, K. (2007) 'Applying New JIT—Toyota's global production strategy: Epoch-making innovation of the work environment', *Robotics and Computer-Integrated Manufacturing,* Vol. 23, pp.285-293.

Asasen, C., Asasen, K., and Chuangcham N. (2003) 'A Proposed ASEAN Policy Blueprint for SME Development 2004-2014'

Barney, J.B. (1991) 'Firm resources and sustained competitive advantage' *Journal of Management*, Vol. 17, pp.99–120.

Barratt, M. and Oke, A. (2007) 'Antecedents of supply chain visibility in retail supply chains: A resource-based theory perspective', *Journal of Operations Management*, Vol.25, pp.1217–1233.

Berry, L. (1995) 'Relationship marketing of services – growing interest, emerging perspectives', *Journal of the Academy of Marketing Science,* Vol.23, pp.236-245.

Biswas, P. and Sarker, B. (2008) 'Optimal batch quantity models for a lean production system with in-cycle rework and scrap', *International Journal of Production Research*, Vol.46, pp.6585-6610.

Buratti, N. and Penco, L. (2001) 'Assisted technology transfer to SMEs: lessons from an exemplary case', *Technovation*, Vol. 21, pp. 35-43.

Choi, T.Y., Hong, Y. (2002) 'Unveiling the structure of supply networks: Case studies in Honda, Acura, and DaimlerChrysler,' *Journal of Operations Management*, Vol. 20 (5), pp. 469-493.

Christopher, M. and Jüttner, U. (2000) 'Developing strategic partnerships in the supply chain: A practitioner perspective', *European Journal of Purchasing and Supply Management*, Vol.*6*, pp.117-127.

Cook, R. L., Gibson, D., and MacCurdy, D., (2005) 'A lean approach to cross docking', *Supply Chain Management Review,* pp.54-59.

Coyle, J.J., Bardi, E.J. and Langley, C.J. Jr. (2003) *The management of business logistics: A supply chain perspective* (7th Edition). South-Western Thompson Learning, Canada.

Cronbach, L.J. (1951), 'Coefficient alpha and the internal structure of tests', *Psychometrika*, Vol. 16, pp. 297-334.

Croxton, K. L., Garcia-Dastugue, S. J., and Lambert, D. M. (2001). 'The supply chain management processes', *International Journal of Logistics Management,* Vol.12, pp.13-36.

Drucker, P. (1970). *Contributions to business enterprise*. New York University Press

Dwyer, F.R., Schurr, P.H. and Oh, S. (1987) 'Developing buyer-seller relationships', *Journal of marketing,* Vol.51, pp.11-27.

Finch, B. J. and Cox, J. F., (1986) 'An examination of just-in-time management for the small manufacturer with an illustration', *International Journal of Production Research,* Vol.24, pp.329-342.

Flynn, B.B., Flynn, E.J. (2004) 'An exploratory study of the nature of cumulative capabilities,' *Journal of Operations Management*, Vol. 22 (5), pp. 439-457.

Flynn, B.B., Sakakibara, S., Schroeder, R.G., (1995) 'Relationship between JIT and TQM: practices and performance', *Academy of Management Journal* Vol. 38 (5), 1325-1360.

Found, P and Rich, N. (2007) 'The meaning of lean: cross case perceptions of packaging businesses in the UK's fast moving consumer goods sector', *International Journal of Logistics Research and Applications,*Vol.10, pp.157 — 171.

Frazier, G.L. (1999) 'Organizing and managing channels of distribution', *Academy of Marketing Science Journal,* Vol.27, pp.223-240.

Fullerton, R.R., McWatters, C.S., (2001) 'The production performance benefits from JIT implementation,' *Journal of Operations Management*, Vol.19 (1), pp. 81-96.

Goldsby, T. J. and Martichenko, R. (2005) *Lean six sigma logistics: Strategic development to operational success.* J. Ross Publishing, USA.

Grant, Robert M. (1991) 'The resource-based theory of competitive advantage: implications for Strategy', *California Management Review.* Vol.33 (3), pp.114-135.

Hair, J. F., Anderson, R. E., and Tatham, R. L. (1998) *Multivariate Data Analysis*, Macmillan Publishing, NY

Harrison, A. and van Hoek, R., (2002) *Logistics Management and Strategy*, Pearson Education Limited, England.

Hausman, A. (2001) 'Variations in relationship strength and its impact on performance and satisfaction in business relationships', *The Journal of Business and Industrial Marketing,* Vol.16, pp.600-617.

Holden, M.T. and ÓToole, T. (2004) 'A quantitative exploration of communication's role in determining the governance of manufacturer–retailer relationships', *Industrial Marketing Management,* Vol.33, pp.539-548.

Kalwani, M.U. and Narayandas, N. (1995) 'Long-term manufacturer-supplier relationships: Do they pay?', *Journal of Marketing,* Vol.59, pp.1-16.

Kannan, V.R., Tan, K.C. (2005) 'Just in time, total quality management, and supply chain

management: understanding their linkages and impact on business performance,' *Omega: The International Journal of Management Science*, Vol. 33, pp. 153-162.

Lambert, D. M., Cooper, M. C., and Pagh, J. D. (1998) 'Supply chain management: Implementation issues and research opportunities', *The International Journal of Logistics Management,* Vol.9, pp.1-19.

Lambert, D.M. and Harrington, T.C. (1990) 'Measuring non-response bias in mail surveys,' *Journal of Business Logistics*, Vol. 11(2), pp. 5-25.

Langfield-Smith, K. and Smith, D. (2005) 'Performance measures in supply chains', *Australian Accounting Review,* Vol.15, pp.39-51.

Laosirihongthong, T., McLean, M.W. Leabsuetrakool, P., Chongjareonjai, T., and Leedhirakul, S. (2008) *Findings from Adoption and Adaptation of Japanese Manufacturing Management (JMM) to ASEAN and Australasian Automotive Manufacturers.* The 4th IEEE International Conference on Management of Innovation and Technology. Bangkok, Thailand.

Lee, S.M. and Ebrahimpour, M. (1984) 'Just-in-time production system: Some requirements for implementation', *International Journal of Operations and Production Management,* Vol.4, pp.3-15.

Liker, J.K. (2004) *The Toyota Way.* McGraw-Hill, New York.

MacDuffie, J. P., (1995) 'Human resource bundles and manufacturing performance: Organisational logic and flexible production systems in the world auto industry', *Industrial and Labor Relations Review,* Vol.48, pp.197-221.

McCullen, P. and Towill, D., (2001) 'Achieving lean supply through agile manufacturing', *Integrated Manufacturing Systems,* Vol.12, pp.524-533.

McIvor, R., (2001) 'Lean supply: The design and cost reduction dimensions', *European Journal of Purchasing and Supply Management,* Vol.7, pp.227-242.

Nakamura, M., Sakakibara, S., Schroeder, R.D. (1998) 'Adoption of just in time manufacturing methods at U.S. and Japanese owned plants: some empirical evidence,' *IEEE Transactions on Engineering Management,* Vol. 45 (3), pp. 230-240.

Nunnally, J., (1988) *Psychometric Theory*. McGraw-Hill, New York, NY.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y., Podsakoff, N.P.,(2003) 'Common method biases in behavioral research: a critical review of the literature and recommended remedies,' *Journal of Applied Psychology*, Vol.88 (5), pp. 879-903.

Reichhart, A. and Holweg, M. (2007) 'Lean distribution: concepts, contributions, conflicts', *International Journal of Production Research*, Vol.45, pp.3699-3722.

Rossetti, C.L., Choi, T.Y. (2008) 'Supply management under high goal incongruence: An empirical examination of disintermediation in the aerospace supply chain', *Decision Sciences*, Vol. 39 (3), pp. 507-540.

Rungtusanatham, M., Salvador, F., Forza, C., Choi, T.Y. (2003). 'Supply-chain linkages and operational performance: a resource based perspective'. *International Journal of Operations and Production Management*. Vol.23, pp.1084–1099.

Shah, R., and Ward, P.T. (2003) 'Lean manufacturing: Context, practice bundles and performance', *Journal of Operations Management,* Vol.21, pp.129-149.

Shah, R., and Ward, P. T. (2007) 'Defining and developing measures of lean production,' *Journal of Operations Management*, Vol. 25, pp. 785-805.

Stock, J.R. and Lambert, D.M. (2001) *Strategic logistics management*, (4th Ed), McGraw Hill, USA.

Sugimori, Y., Kusunoki, F., Cho, F., and Ushikawa, S. (1977) 'Toyota production system and kanban system: Materialization of just-in-time and respect for human systems', *International Journal of Production Research,* Vol.15, pp.553-564.

Tan, K.C. (2002) 'Supply chain management: practices, concerns and performance issuee' *Journal of Supply Chain Management*,' Vol. 38(1), pp. 42-53.

Tata, J., Prasad, S., Thorn, R. (1999) 'The influence of organizational structure on the

effectiveness of TQM programs,' *Journal of Managerial Issues* Vol.11 (4), pp. 440-453.

Taylor, D. (2009) 'An application of value stream management to the improvement of a global supply chain: a case study in the footwear industry', *International Journal of Logistics Research and Applications,* Vol.12, pp.45-62.

Voss, C.A. and Robinson, S.J. (1987) 'Application of just-in-time manufacturing techniques in the United Kingdom', *International Journal of Operations and Production Management,* Vol.7, pp.46-52.

Wanatabe, K. (2007) 'Lessons from Toyota's Long Drive', *Harvard Business Review.* July, pp.74-83.

Webster, F.E. Jr. (1992) 'The changing role of marketing in the corporation', *Journal of Marketing,* Vol.58, pp.1-17.

Wernerfelt, B. (1984) 'A resource-based view of the firm'. *Strategic Management Journal*, Vol.5, pp.171–180.

Womack, J.P., Jones, D.T., and Roos, D. (1990) *The Machine that Changed the World.* Maxwell Macmillan International

Xu, L. and Beamon, B.N. (2006) 'Supply chain coordination and cooperation mechanisms: An attribute-based approach', *Journal of Supply Chain Management,* Vol.42, pp.4-12.

Zhang, C. and Dhaliwal, J. (2009) 'An investigation of resource-based and institutional theoretic factors in technology adoption for operations and supply chain management' *International Journal of Production Economics,* Vol.120, pp.52-269.