

A Proposed Conceptual Model of Determinants of Supply Chain Performance in the Malaysian Electronic Manufacturing Services (EMS) Industry

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Abstract

Electronic manufacturing services (EMS) provide electronics manufacturing services for other companies. This industry is one of the industries that require supply chain management (SCM) to optimize the operations. EMS focuses on printed circuit board fabrication, electronic design, assembly and testing. In this article, the authors propose a conceptual model by linking the relationships with customer and supplier, information and communication technology, material flows management, corporate culture, performance measurement; and SCM performance in a single study. The findings of this article would provide important implications for the management in the manufacturing companies to understand determinants that contribute to the SCM success. More importantly, based on the obtained results, these companies can enhance the SCM performance by improving the current practices/strategies through focusing on the determinants that significantly influence SCM performance.

Keywords: Electronic manufacturing services (EMS), Supply chain management (SCM), Supply chain performance, Manufacturing

1. Introduction

Supply chain management (SCM) approach is progressively recognized by many organizations as a strategy to attain their business goals today (Chin, et al., 2004; Altekar, 2005). It has become one of the new era manufacturing paradigms for organizational sustainability and competitiveness (Gunasekaran, 2004). In this aspect, many companies in electronic manufacturing services (EMS) industry of Malaysia have truly striving hard to achieve superior supply chain performance in order to outperform its competitors. Enhancing supply chain performance is a critical approach for achieving competitive advantages for companies (Cai, Liu, Xiao and Liu, 2009).

There are few SCM challenges faced by the manufacturing companies. For instance, the demand from customers is always variable or changing. According to Lummus and Vokurka (1999), demand changes are hard to anticipate. Customers are used to requiring products in a short time frame whenever they increase demands without prior alignment with the company. Beside that, there is high supplier dominance in the manufacturing company. This means that companies have no power to shape the relationship with the supplier and must accept quality, price decision and terms and conditions that are dictated by the supplier (Cox, Ireland, Lonsdale, Sanderson and Watson, 2003). The relationship with suppliers is inflexible as suppliers impose restricted conditions to the company such as conditions of non-cancelable, non-rescheduling and non-returnable.

Apart from that, there is lack of integrated software and system, both inside and outside the company (Ayers, 2001). Some of the suppliers are unable to access the company's supplier portal because they have incompetent technology. Therefore, it causes lower supplier response time as they need to update the purchase order manually. The other challenges are such as no shared value in corporate culture in terms of commitment and cooperative (Mello and Stank, 2005), key SCM operations like customer satisfaction, product quality, delivery precision, capacity constraint and manpower issue are not being measured on timely basis, likewise the flow of material in the company is jeopardized by the high inventory and unreliable delivery of materials/goods.

The literature has acknowledged the importance of relationship quality in the manufacturing industry for the SCM performance. Thus, relationships with customer and supplier are one of the major critical success factors for SCM efficiency. Previous research found that trust has strong prediction to a long-term relationship with customer and supplier (Sahay, 2003; Van Weele, 2005; Tumala, Philips and Johnson, 2006; Chandra and Kumar, 2000). Therefore, a good, trust-based and long-term relationship with customer and supplier will lead to high performance of supply chain. Besides the supportive relationships with customer and supplier, information and communication technology (ICT) is also one of the crucial factors of competitive advantages as ICT drives higher levels of supply chain integration. ICT is an enabler for organization to increase the communication and to disseminate information (Altekar, 2005).

In this article, the authors propose material flows management factor as an important predictor for SCM performance as well. The aim of a supply chain is to keep materials flowing from source to end-customer (Harrison and Hoek, 2005). Good flow of material ensures products are delivered to end customers on time or on schedule. Childerhouse, Lewis, Naim and Towill (2003) found that management of a smooth material flow is a key factor in achieving superior supply chain performance. A successful logistics network can reduce entire supply chain costs, including manufacturing and procurement costs, inventory handling costs, facility costs (fixed costs), labour cost and transportation costs (Simchi-Levi, Kaminisky and Simchi-Levi, 2000).

Corporate culture is another compelling factor for SCM successfulness. Organisational shared values in terms of extreme trust, commitment and collaboration, organisational capability and top management supports are essential for an effective SCM (Mello and Stank, 2005). Tony and Kelvin (2007) suggested that human factor is significantly affecting the SCM effectiveness. The human factors affect management of various stage and process in a supply chain as employees are the key asset to drive supply chain performance.

Additionally, measurement is very important and is the only approach to understand whether process performance is improving or worsening and whether correction action is needed urgently (Roussel and Cohen, 2005). Metric in performance measurement is a number for measuring and reporting a key performance indicator for business, department, team, product line and individual. Performance measurements metrics could be customer satisfaction, product quality, delivery precision and cost reduction.

It is important to measure performance because it:

- (1) provides required direction and helps in setting priorities
- (2) Gauges and monitors progress
- (3) Focuses on key issues
- (4) Identifies areas acquiring attention for groups and individuals
- (5) Helps to communicate key issues and results
- (6) Measures and rewards people and teams (Ayers, 2001).

According to Zokaei and Simons (2006), supply chain performance can be divided into two dimensional: effectiveness and efficiency. Effectiveness is doing the right things and efficiency is doing things right. Supply chain effectiveness measures the consumer satisfaction. Supply chain efficiency measures the performance of the respective processes such as procurement, production and distribution (Hewitt, 1994). Efficiency is improved through waste reduction and process improvement, such as reducing the input levels while increasing the output levels.

There is a model to examine relationship between supply chain performance and degree of linkage among supplier, internal integration and customer (Lee, Kwon and Severance, 2007). In line with this knowledge, the authors propose that a model for manufacturing companies can be developed using correlational links between SCM performance and its determinants. The authors will also forward related hypotheses on the proposed relationship between the variables.

2. Literature Review

2.1 Previous Studies

2.1.1 Relationships with Customer and Supplier

A successful strategic alliance and integrated relationship with suppliers and customers must be revolved around trust, loyalty, positive sum game (a win-win relationship), cross-functional teams, achieving common goals and collaboration (Chandra and Kumar, 2000). Spekman, Kamauff and Myhr (1998) suggested that a firm's success is linked to the strength of its relationship with supply chain partners and it could reduce and increase revenue. Chandra and Kumar (2000) and Choy, Kenny and Victor (2003) found that the long-term success of a firm depends on the reliability of its suppliers and level of satisfaction of its customers. Previous research found that collaborative relationship between customer and supplier has positive significant influence to SCM performance improvement (Fearne and Hughes, 1999; Humphreys, Shiu and Chan, 2001; Valsamakis and Sprague, 2001; Vereecke and Muylle, 2006; Bartlett, Julien and Baines, 2007; Ounnar, Pujo, Mekaouche and Giambiasi (2007). Alfred Wong (2002) also explored that supplier satisfaction and contribution lead to customer satisfaction and SCM performance.

2.1.2 Information and Communication Technology (ICT)

Technology is an enabler in SCM for helping supply chain members to establish partnerships for better supply chain system performance (Boubekri, 2001; Yu, Yen and Cheng, 2001; Jonsson and Gunnarsson, 2005). Gunasekaran and Ngai (2004) explored that information technology is an essential ingredient for business survival and improves the competitiveness of firms. Dawson (2002) defined that efficient supply chain network can offer substantial improvements in productivity and in customer satisfaction by making available online, real-time information networked around the organization and giving full supply chain visibility. Beside that, McLaughlin, Motwani, Madan and Gunasekaran (2003) found that successful companies around the world are partly dependent on their ability to apply IT to SCM. In addition, findings from McLaren, Head and Yuan (2004) shows that operational efficiency and operational flexibility have high relationship with SCM information system. IT enhances the service level of SCM, improves operational efficiency and information quality (Auramo, Kauremaa and Tanskanen, 2005)

2.1.3 Material Flows Management

Spath and Baumeister (2001) suggested adaptable assembly systems are important to link between market and production. The synchronization of the material flow with the product reduces the non-value-adding efforts and the stocks within the assembly systems. Apart from that, Childerhouse et al. (2003) studied the reengineering construction supply chain by using material flow control approach in nine different companies. Their study found that material flow is playing a key enabler in achieving enhanced supply chain performance. Meier, Williams and Singley (2004) found that a logistic capability is important for SCM performance. The capabilities include ships materials according to target date, provide reliable delivery, possess broad geographic delivery capabilities, achieves accuracy in shipments and knowledgeable in logistics.

2.1.4 Corporate Culture

Corporate culture defines as those employees of an organisation are having common expectation, practices and goals (Deresky, 2008).

Hoek, Chatham and Wilding (2002) explored that SCM managers are a critical factor in achieving strategic and operational objectives and changes in the supply chain. It is supported by Meier, et al. (2004) that leadership management factors contribute to the effective business relationships of SCM. The leadership management encompasses compatible culture/values, respects confidentiality, accepts responsibility, demonstrates positive management skills, positive attitude, makes decisions quickly, demonstrates ability to evolve, behaves professionally, engages in ethical practices, provides an atmosphere of continuous improvement and regularly reviews performance and capabilities. Mello and Stank (2005) found that firms lacking in the appropriate cultural elements such as shared assumptions, values and artifacts are tend to fail when implementing SCM initiatives. On top of that, Fawcett, Ogden, Magnan and Cooper (2006) studied the organizational commitment and governance for supply chain success. The findings indicated that four types of managerial support are needed to achieve the highest levels of supply chain success: top management support, broad-based functional support, channels support and infrastructural/governance support.

2.1.5 Performance Measurement

Gunasekaran, Patel and Tirtiroglu (2001) explored that SCM needs to be assessed for its performance in order to evolve an efficient and effective supply chain. Swinehart and Smith (2005) found that customer satisfaction is increasingly being recognized as an appropriate measure for determining how well a particular organization is accomplishing its mission and while customer satisfaction surveys provide valuable information and may be used to improve the entire operation. Beside that, Liang, Yang, Cook and Zhu (2006) suggested that an appropriate performance measurement system is a critical requirement for the effective management of a supply chain. (DEA)-based approaches for characterizing and measuring supply chain efficiency when intermediate measures are incorporated into the performance evaluation. Shepherd and Gunter (2006) studied the performance measurement systems and metrics of supply chains by critically reviewing the contemporary literature and suggesting possible avenues for future research. According to Shepherd and Gunter (2006), there are a number of important problems have not yet address, including: the factors influencing the successful implementation of performance measurement systems for supply chains, the forces shaping their evolution over time and the problem of their ongoing maintenance.

2.2 Proposed Conceptual Model

The review of theoretical and empirical literature indicates that the above issues have been widely studied. However, to the best of the authors' knowledge, none of the previous studies had attempted to include all the five determinants of SCM performance, namely, relationships with customer and supplier, information and communication technology, material flows management, corporate culture and performance measurement into a single study. The framework of the proposed conceptual model is given below.

Insert figure (1) about here

The following hypotheses are formulated based on the above addressed issues:

- H1: There is a significant positive relationship between relationships with customer and supplier and SCM performance.*
- H2: There is a significant positive relationship between information and communication technology and SCM performance.*
- H3: There is a significant positive relationship between material flows management and SCM performance.*
- H4: There is a significant positive relationship between corporate culture and SCM performance.*
- H5: There is a significant positive relationship between performance measurement and SCM performance.*

3. Methodology

The sample of this study will focus on departments of purchasing, planning, logistics and operation in the manufacturing companies. Interview and questionnaire are the main instruments of this study. Reliability analysis will be used to test how well the items in a set are positively correlated to one another. The internal consistency reliability will be higher if the Cronbach's alpha is closer to 1 (Sekaran, 2003). In addition, Pearson correlation analysis is used to compute the correlation between variables and multiple linear regression is used to analyze the relationship between a single dependent variable and the five independent variables in the study.

4. Conclusion

The proposed model provides correlational link amongst relationships with customer and supplier, information and communication technology, material flows management, corporate culture, performance measurement and SCM performance. SCM has become one of the new era manufacturing paradigms for organizational sustainability and competitiveness (Gunasekaran, 2004). SCM has been taken as one of the corporate strategy for enhancing flexibility of manufacturing operations and integrating suppliers and customers. A successful SCM is able to minimize inventory carrying cost and entire SCM cost as well (Chan and Lee, 2005). The critical success factors have proven can maintain high SCM performance for the manufacturing company. The authors' intention was to fill up the gap about the lack of research in supply chain management which investigates the role of critical success factors in manufacturing company of Malaysia. Furthermore, the study to be carried out resulting from the proposed model is expected to investigate the critical success factors that contribute to the SCM performance in order to increase the competitive advantage of manufacturing companies in Malaysia.

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Figure1. Proposed Conceptual Model

