

CRITICAL SUCCESS FACTORS OF SUPPLY CHAIN MANAGEMENT: AN EMPIRICAL STUDY ON A MANUFACTURING COMPANY IN MALAYSIA

THOO AI CHIN, HUAM HON TAT, ROSMAN MD YUSOFF,
AMRAN RASLI, ABU BAKAR ABD. HAMID
*Faculty of Management and Human Resource Development,
Universiti Teknologi Malaysia*

ABSTRACT

The aim of this study is to shed the light on the critical success factors that lead to high supply chain performance in a manufacturing company. The critical success factors consist of relationships with customer and supplier, information communication and technology (ICT), material flows management, corporate culture and performance measurement. Questionnaire was the main instrument for the study and it was distributed to 84 staffs from departments of purchasing, planning, logistics and operation. Hypotheses were testing by using Statistical Package for Social Science (SPSS) of Windows software. Data analysis was conducted by employing descriptive analysis (mean and standard deviation), reliability analysis, Pearson correlation analysis and multiple regression. The findings show that there are relationships between relationships with customer and supplier, ICT, material flows management, performance measurement and supply chain management (SCM) performance, except for corporate culture. Forming a good customer and supplier relationship is the main predictor of SCM performance, followed by performance measurement, material flows management and ICT. It is recommended that future study to determine additional success factors that are pertinent to firms' current SCM strategies and directions, competitive advantages and missions. Further study is recommended also to examine a wider scope that includes more geographical data coverage, other nature of businesses and research instruments.

Keywords: supply chain management; critical success factor

INTRODUCTION

From the 1960s to the 1990s, companies focused on customer loyalty and retention. Subsequently, the focus was moved to producing high quality products at lower cost by introducing various quality initiatives such as total quality management (TQM) and International Organisation for Standardization (ISO) (Chandra and Kumar, 2000). After that, priority was placed by producing a diversified of products to fulfil various needs of customers. In the 1990s, companies started to realise that suppliers are playing an important impact on customers (Chin, Tumala, Leung and Tang, 2004). Producing high quality of products is no longer the major concern of the companies. Nowadays, the new challenge is more on delivering the right products to customers at the right time with a minimal cost (Altekar, 2005). The supply chain management (SCM) approach is progressively recognized by many organisations as a strategy to attain their business goals (Chin, et al., 2004; Altekar, 2005).

SCM has become one of new era manufacturing paradigms for organisational 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).

STATEMENT OF PROBLEM

Enhancing supply chain performance has become one of the critical approaches for achieving competitive advantages for companies (Cai, Liu, Xiao and Liu, 2009). This manufacturing company is truly striving hard to achieve superior supply chain performance in order to outperform its competitors. However, there are few SCM challenges faced by this manufacturing company.

Relationship between customers has been a challenge for the company. Customers are used to require products in a short time frame whenever they increase demands without prior alignment with the company. The demand from customers is variable and demand changes are always hard to anticipate (Lummus and Vokurka, 1999). Sometimes, the customer demand is unable to fulfill, thus it is affecting the relationship between the company and customers. Likewise, the company' relationship with some of the suppliers is inflexible as suppliers impose restricted conditions to the company. The conditions include non-cancellable, non- rescheduling and non-returnable. If a customer cancels the order, it leads to high inventory and high material exposure due to the restricted conditions.

The subsequent challenge is related to information communication and technology (ICT), both inside and outside the company (Ayers, 2001). There is no competent technology between the company and its suppliers. As a result, it causes lower supplier response time as they need to update the purchase order manually.

In addition, material flow is a concern to the company as well, especially the delivery reliability (Van Weele, 2005) and efficiency of forwarders. Forwarders fail to deliver raw materials to the company timely in order to meet production schedule. Therefore, shipment to customer is impacted. The flow of material in the company is really jeopardized with this unreliability delivery of forwarders.

In terms of corporate culture, there is a lack of commitment and cooperative between departments. The issue of materials default location, identification and traceability (Altekar, 2005) by material handling team are always happened. Lastly, the key operations are not being measured on timely basis. The metric for measuring the performance of capacity constraint, manpower issue, material quality problem and tester dysfunction or even delinquent shipment from supplier are not being deployed in the company. Measurement is 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).

BACKGROUND OF STUDY

Electronic manufacturing services (EMS) industry is one of the industries that require SCM to optimize the operations. EMS provides electronics manufacturing services for other electronic companies. EMS focuses on printed circuit board fabrication, electronic design, assembly and testing. EMS industry is aimed to achieve a large economy of scale and make the fullest use of capital-intensive manufacturing equipment, raw materials sourcing and pooling together resources, engineering design competency and provide post-manufacturing services including warranty and repairs.

The objective of SCM in the manufacturing company is to deliver high customer service at the minimal inventory and low unit cost by synchronizing the customers need with a smooth flow of material from suppliers. The structure of supply chain in this manufacturing company is driven by the design, planning and operation of four key drivers: the physical network, inventory management, transportation management and information systems. These four major drivers manage the flows of material and drive the flexibility and cost efficiency of the entire supply chain.

OBJECTIVE OF STUDY

- (1) To determine relationships with customer and supplier contribute to the SCM performance in the manufacturing company.
- (2) To determine information and communication technology contribute to the SCM performance in the manufacturing company.
- (3) To determine material flows management contribute to the SCM performance in the manufacturing company.
- (4) To determine corporate culture contribute to the SCM performance in the manufacturing company.
- (5) To determine performance measurements contribute to the SCM performance in the manufacturing company.

LITERATURE REVIEW

Supply Chain Measurement Approach

Performance measurement is the process whereby an organisation establishes the parameters to quantify the effectiveness and efficiency of its action (Neely, George and Platts, 1995). Effectiveness is to measure how a customer's needs are fulfilled and efficiency is to measure how a firm's resources are utilised when providing a pre-specified level of customer satisfaction. Performance measurement systems are defined as a completed set of metrics applied to quantify the efficiency and effectiveness of action (Shepherd and Gunter, 2006).

Balanced Scorecard

The Balanced Scorecard is a framework to measure the performance of an organisation and it was developed by Robert S. Kaplan and David P. Norton in 1992 (Kaplan and Norton, 1996). They had identified four major categories: financial measures, customer-related measures, internal performance and learning.

SCOR Model

The Supply-Chain Operations Reference (SCOR) model was developed by the Supply-Chain Council (SCC) to support organisations in enhancing the effectiveness and responsiveness of their supply chains (Stewart, 1997). According to Christopher (1998), the objectives of SCOR are to standardize an approach to measure supply chain performance and to employ common metrics to benchmark against other organisations. The SCOR model is based on four management processes:

- (1) Plan: equalize supply and demand
- (2) Source: procurement of raw material
- (3) Make: transforming of raw material into finished goods
- (4) Deliver: delivery of products and services

Benchmarking

According to Camp (1989), benchmarking consists of a systematic and standard procedure for determining the best practice to achieve superior performance and to help organisations to make better decisions. Benchmarking is a process for comparison against best practice. It is important to compare

between companies by using common performance metrics. Benchmarking has five basic purposes as defined by Splendolini (1992):

- (1) Strategy: planning for short and long term
- (2) Forecasting: forecast trends
- (3) New ideas: stimulate new view and idea
- (4) Process comparisons
- (5) Setting objectives and targets based on best practice

Previous Studies on Relationship between SCM Success Factors and SCM Performance

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.

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 network around the organisation 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) show 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).

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, Lewis, Naim and Towill (2003) studied the reengineering construction supply chain by using material flow control approach in nine different companies. Their study found that material flows played 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.

Corporate Culture

Corporate culture defines as those employees of an organisation have 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 organisational 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, channel support and infrastructural/governance support.

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 recognised as an appropriate measure for determining how well a particular organisation is accomplishing its mission and while customer satisfaction surveys provide valuable information and may be used to improve the entire operation. Besides, 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 that have been addressed, 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.

RESEARCH METHDODOLOGY

Sample

The population of this study focused on departments of purchasing, planning, logistics and operation with total of 84 persons in the company. According to Issac and Michael (1995), sample size is determined based on sampling proportion with 95% level of confidence, so that in this study 80 respondents would be appropriate to allow inferences to a larger population from the sample. However, since the population is only 84 persons, so it was decided to take the whole population to be the sample of the study. Out of 84 questionnaires distributed, the entire questionnaires had been successfully collected via email. Profile of respondents is shown in Table 1. Most of the respondents were in the age from 21 to 30 (58.3%) and female (60.7%). Besides, Chinese respondents (46.4%), respondents with degree qualification (46.4%), respondents from purchasing department (45.2%), respondents holding officer or

executive position (81.0%) and respondents with working experience between 1 to 5 years (46.4%) were the majority group in this study.

Table 1
Profile of respondents.

Demographic Variables	Frequency	Percentage (%)
Age		
21-30	49	58.3
31-40	28	33.3
41-50	5	6.0
51 and above	2	2.4
Gender		
Female	51	60.7
Male	33	39.3
Race		
Malay	31	36.9
Chinese	39	46.4
Indian	12	14.3
Others	2	2.4
Highest Academic Qualification		
SPM/STPM	10	11.9
Diploma	31	36.9
Degree	39	46.4
Master	2	2.4
PhD/DBA	1	1.2
Others	1	1.2
Department		
Purchasing	38	45.2
Planning	10	11.9
Logistics	21	25.0
Operation	15	17.9
Position		
Officer/Executive	68	81.0
Manager/Supervisor	16	19.0
Years of Working Experience		
Less than 1 year	2	2.4
1-5 years	39	46.4
6-10 years	28	33.3
11-15 years	11	13.1
16 years and above	4	4.8

Measurement

Basically, the instrument of this study was adapted from the study of Chin et al. (2004), Tumala, Philips and Johnson (2006), Davis, Bagozzi and Warshaw (1989) and Huan, Sheoran and Wang (2004). Respondents were asked to rate their agreement on the critical success factors and the company's SCM performance on a 5-point Likert scale (1 = "Strongly Disagree" to 5 = "Strongly Agree") and (1 = "Decrease" to 5 = "Increase"). In terms of reliability test, the alpha value of reliability analysis for the independent and dependent variables were more than 0.65 as shown in Table 2. This means the scales used are reliable and consistent.

Table 2
Cronbach's Alpha Scores of Variables.

No.	Variables	No. of Items	Cronbach's Alpha
1	Relationships with customer and supplier	13	0.698
2	Information and communication technology (ICT)	9	0.712
3	Material flows management	9	0.673
4	Corporate culture	16	0.732
5	Performance measurement	11	0.712
6	Supply chain management performance	9	0.773

RESULTS

Descriptive analysis was applied to examine the respondents' views on the importance of SCM critical success factors in their manufacturing company. It found that the distribution of the score was slanted towards agreement. The performance measurement factor is the main critical success factor as rated by the respondents.

Additionally, Pearson Correlation was used to explore the correlation between SCM performance and critical success factors in the study. Table 3 shows that there are significant positive correlations between SCM performance and critical success factors.

Table 3
Correlation of Critical Success Factors with SCM Performance.

		SCM Performance	Relationships with Customer and Supplier	Information and Communication Technology	Material Flows Management	Corporate Culture	SCM Performance Measurement
SCM Performance	Pearson Correlation	1	.735**	.428**	.527**	.369**	.569**
	Sig. (2-tailed)		.000	.000	.000	.001	.000
	N	84	84	84	84	84	84
Relationships with Customer and Supplier	Pearson Correlation	.735**	1	.303**	.378**	.302**	.414**
	Sig. (2-tailed)	.000		.005	.000	.005	.000
	N	84	84	84	84	84	84
Information and Communication Technology	Pearson Correlation	.428**	.303**	1	.169	.349**	.155
	Sig. (2-tailed)	.000	.005		.124	.001	.159
	N	84	84	84	84	84	84
Material Flows Management	Pearson Correlation	.527**	.378**	.169	1	.212	.271*
	Sig. (2-tailed)	.000	.000	.124		.053	.013
	N	84	84	84	84	84	84
Corporate Culture	Pearson Correlation	.369**	.302**	.349**	.212	1	.173
	Sig. (2-tailed)	.001	.005	.001	.053		.116
	N	84	84	84	84	84	84
SCM Performance Measurement	Pearson Correlation	.569**	.414**	.155	.271*	.173	1
	Sig. (2-tailed)	.000	.000	.159	.013	.116	
	N	84	84	84	84	84	84

** Correlation is significant at the 0.05 level (2-tailed).

Finally, multiple regression analysis was employed to test the hypotheses and to examine the strength of the relationships between SCM performance and critical success factors. The result is summarized in Table 4, it indicates that the final model accounted for 70.1 % of the variance (Adjusted $R^2 = 0.701$). In addition, relationships with customer and supplier factor demonstrated the greatest impact on the SCM performance, followed by performance measurement, material flows management and ICT.

Table 4
Regression Result of Critical Success Factors and SCM Performance.

Critical Success Factors	SCM Performance
	Beta (β) +
Relationships with Customer and Supplier	0.455**
Information and Communication Technology (ICT)	0.184**
Material Flows Management	0.234**
Corporate Culture	0.070
Performance Measurement	0.276**
Adjusted R^2	0.701
F Statistic	40.01
Sig. F	0.000

** p-value < 0.05
** Correlation is significant at the 0.05 level (2-tailed).

CONCLUSION

The summary results of the research hypotheses' testing are depicted in Table 5.1. The results indicate that relationships with customer and supplier, information communication technology, material flows management and performance measurement are imperative for overall SCM performance in an organisation. This means the study found significant empirical substantiations that there are significant positive relationships between relationships with customer and supplier, information communication technology, material flows management, performance measurement and SCM performance. Multiple regression analysis was used to test the hypotheses. Total of five hypotheses in the study, four hypotheses are accepted and only one hypothesis is rejected.

Table 5
Summary of Result for Research Hypotheses.

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

DISCUSSION AND IMPLICATIONS

This study substantiates the findings of Tumala et al. (2006) and Chin et al. (2004) that SCM critical success factors help manufacturing companies to reduce cost of operations, improve inventory, lead times and customer satisfaction, increase flexibility and cross-functional communication and remain competitive. The results are consistent as the research scope is focused on manufacturing operations with the aim to integrate suppliers and customers effectively. However, this study only focuses on SCM critical success factors and its influence on firm's SCM performance.

Results in the multiple regression analysis demonstrates that all of the predictors variables can be influenced the SCM performance, except for corporate culture which is positive significantly related to firm's SCM performance at p-value less than 0.05. It also found that relationships with customer and supplier had the highest beta value (0.455) that would impact the criterion variable the most.

This study finding shows corporate culture factor is not the critical success factor in the company's SCM performance. This mainly due to this company has many subcultures and the subcultures vary by divisions or by departments, moreover this company is a big multinational company with subsidiaries around the world. Each department has a unique culture and its own personality. Therefore, respective

department has its own folklore that illustrates company values and its own ways to do things, in terms of dealing with problems, making decisions and communicating with each others (Ross, 2000). The corporate culture is weak which leads to employee feelings of separateness from the organization (Smircich, 1983). As a result, weak culture seldom supports firm's strategy implementation.

As the finding of this study has proven that building a good relationship with customer and supplier is demonstrated the major success factor of SCM performance in this company. Success or failure in this company's SCM integration process hinges on creating a foundation of support with their key supply chain partners. The company should develop a support and trust relationship with customer and supplier, so that it is able to receive the data and visibility which generated by time-phased demand and supply planning.

In addition, performance measurement plays an important role in this company and it should measure the SCM key operations on timely basis. Of course, it requires commitment and cooperative from managers in respective functional departments (planning, purchasing, operation and logistics). Beside these, material flows management is the third major success factor of SCM for the company. Inventory management is vital and inventories should be kept in the lowest level in order to reduce the entire supply chain cost such as inventory handling cost. Furthermore, the company is required to have a technology that is scalable and can support a linked demand and supply process.

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This study implies some limitations and scarcity, suggest that future researchers to include more geographical data coverage, it is noted that this analysis is only based on the data collection in one manufacturing company. Therefore, it is of great importance to include more manufacturing companies in future research. The result would be much better if it is able to represent the entire Malaysia. Additionally, other business nature including food industry and cosmetic industry, likewise the comparison between industries should be examined too. Apart from the five critical success factors in this study, it is recommended that future study to determine additional success factors that are pertinent to firms' current SCM strategies and directions, competitive advantages and missions. Future researchers should also extend their research by investigating appropriate SCM strategies development. The strategies include leagile supply chains, web-based supply and demand integration, supplier partnership and logistic strategy. Further study could be conducted to identify the level of SCM performance of a company before and after the possible SCM strategies implementation. The effectiveness of strategies could be delved in more deeply by future study as well.

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