SUPPLY CHAIN MANAGEMENT PERFORMANCE: A STUDY OF ELECTRONICS MANUFACTURING INDUSTRY IN MALAYSIA

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ABSTRACT

Organizations have started to realize that it is vital to improve the effectiveness and efficiency of the organizational performance and supply chain simultaneously. However, only few manufacturing firms have obtained significant benefits by effectively utilizing supply chain management practices. Therefore, it is still not clear how supply chain management can be applied to enhance and improve the performance of the supply chain. Consequently, the purpose of this research is to investigate the effect of five different factors in supply chain on its performance. This research studies the relationship between the selected variables (i.e. quality, time, information, flexibility, and integration) and supply chain management performance. Respondents of a questionnaire from the electronics manufacturing industry in Malaysia show that information sharing is proven to be the most affecting factor which influence supply chain performance. The study shows that managing information will be the most beneficial factor in improving SCM performance.

Keywords: Supply chain management, performance, quality, time, integration, flexibility and information.

1. Introduction

Supply chain management (SCM) is one of the major issues in manufacturing, IT, and business for the last two decades. Over the years, several studies have been conducted to demonstrate the effect of supply chain management in different industries and numerous articles have been published to examine different issues related to SCM. Practicing supply chain management in an industry provides benefits to a company in terms of utilizing labour, machine, and materials. This study attempts to show how considering important factors in the supply chain can affect an organization. The SCM philosophy seems to be originated from Hobbs (1996) [1] organizational extension theory. Hobbs’ theory was developed within a marketing framework, advocated extending the organization include all members of the distribution channel, conceptually similar to Porter’s Value System (Porter, 2000).

Organizations today are trying seriously to improve their performances in all fields. Along to that, they aim to minimize the cost and maximize the quality. Enhancing the supply chain management is one of
the ways to overcome the problem. Thus, in this research, SCM performance and its effect on organization have been studied. There have been several studies on this topic and different variables were chosen and compared to measure performance. This paper does not base on a specific research conducted before, instead it is a comparison of previous studies and attempts to use variables which suggested frequently by other authors and seemed to influence manufacturing firms’ performance of the whole supply chain.

In this research, five variables have been chosen to measure performance in supply chain and a conceptual framework is introduced to investigate the relationship between these factors and the electronics manufacturing firms’ performance. The independent variables adopted are quality, time, information, flexibility, and the integration; meanwhile the dependent variable is the supply chain management performance.

2. Literature Review

In the past, firms improved competitive positions by aggressively pursuing different methods. This includes such as marketing and financial improvements to survive and to compete. Since competition is no longer between organizations, but among supply chains, the chain management has become a potentially valuable way of securing competitive advantage and improving organizational performance.

Although the concept of a supply chain in management was in the early 20th century especially with the creation of the assembly line, Larson (1998) mentioned that the term supply chain management was first invented by Keith Oliver in 1982 that discussed the potential benefits of integrating the internal business functions of purchasing, manufacturing, sales and distribution. The SCM philosophy seems to be originated from Hobbs (1996) organizational extension theory. The supply chain encompasses all efforts involved in producing and delivering a final good or service, from suppliers to customers. SCM includes sourcing raw materials, manufacturing and developing, warehousing and inventory, distribution channels, and delivery to customers.

The Council of Logistics Management defines SCM as: "it is a systematic, strategic coordination of the traditional business functions and the tactics across these functions within a particular company and across businesses with the supply chain for the purpose of improving the long-term performance of the individual companies and the supply chain as whole." According to the eighth edition APICS' Dictionary (1995), the supply chain is: "The processes from the initial raw materials to the ultimate consumption of the finished product linking across supplier-user companies." Berry and Naim (1996) [2] argue that SCM as a primary future trend important for purchasing and supply management professionals in the 21st century. Manheim (1999) [3] suggests integrated SCM as: "the alignment of buyers, suppliers and customers and their processes to achieve an advanced from of competitive advantage." Larson and Rogers (1998) [4] define supply chain structure as: "the organizational efforts by three or more firms to manage and integrate material and related information flows in order to get closer to customers." The definitions by Larson and Kulchitsky (2000) [5] and Barratt (2004) [6] emphasize customer service, an objective consistent with a marketing orientation. According to Heikikika (2002) [7], performance measurement is emphasizing the assessment of how well companies are managed and the value they deliver for stakeholders.
By diversifying companies, supply chain is transferred more relatively into integrated supply chain. This transition has demonstrated higher need for performance measurement system. According to the study of supply chain excellence in Michigan State University, performance measurement system is one of the top four factors in supply chain excellence (Zhao, 2002) [8]. The performance of a company depends on all the activities namely strategy, decision making, distribution, design, production and customer relation. In this manner, performance measurement can influence and change behaviors, improve activities as well as reveal where the problem is (AVIS, 1993) [9]. Performance measurement systems have been developed in such way to monitor and maintain the organizational control, therefore facilitates the identification of critical points which affect the performance and help to improve the process on implementation.

Until the 80's, performance measurement was a predominant use of financial measures such as return on investment, sales return, profit and sales per employee Tracy & Lim (2005) [10]. Recently, many authors have argued that financial measurement is not sufficient to cover all aspects of performance measurement and will not give a precise overall picture in the long-term.

Balanced Scorecard (BSC) model is developed by Kaplan and Norton (1992) [11], after conducting a one year multi company study. The study was motivated by the idea that existing performance measurements primary relying on financial accounting measures cannot cover all the aspects of supply chain management performance.

Neely (1995) presented a few of the categories in the literature which include quality, time, flexibility, and cost. This categorization is a useful tool in system analysis. Neely (1994) [12] studied the effect of information structure in supply chain performance. Zhao and Zhang (2002) [8] investigate the effect of information sharing on supply chain performance. This research paper presents five metrics for measurement systems; each of these metrics represents one independent variable. These factors are: quality, time, flexibility, information, and integration. Each of these metrics will be briefly explained and supported by pervious conducted studies and literatures.

2.1 Quality

Fisher (1997) [13] introduces a relevant definition of quality for performance measurement system design. He says that: "many companies fail to integrate the cost of quality model with their management process. That is, although managers estimate the cost of quality they fail to take appropriate actions to reduce it." By introduction of total quality management (TQM), this emphasis has shifted away from "conformance to specification" and towards customer satisfaction.

2.2 Time

An increasing number of firms plan to become time-based companies which consider time as the main issue of their business strategy. However, such a change in approach, in order to be effective, must be supported by a performance measurement system focused on time.

According to Kotler (1984) [14], time has been described as both a source of competitive advantages and the fundamental measure of firm’s performance. He argues that time is the major source of competitive advantage and describes how this factor affects the firm’s performance. Papps (1995) [15] believes: "Under that just-in time (JIT) manufacturing philosophy, the production or delivery of goods
just too early or just too late is seen as waste”. Suhaiza & Premkumar (2005) [16] emphasize that one of the objectives of optimized production technology (OPT) is the minimization of throughput times. Galloway and Papps (1995) have developed a time-based costing system known as throughput accounting.

2.3 Flexibility

Due to the fast growing and changing of business environment, companies need to adopt themselves to these changes and new conditions. Many companies face bankruptcy or failure because of market shock or change in regulations and conditions as they cannot recognize this need or reflect properly. Barratt (2004) [6] defines the flexibility as a measure of the efficiency with which the manufacturing process can be changed. He concentrates on the issues of product mix and volume flexibility and argues how these issues can be managed to get a better result. Manheim (1999) [3] defines flexibility as manufacturing objectives. He identifies range, cost and time as dimensions of flexibility.

2.4 Information

Every firm needs information on its own internal processes in order to ensure efficiency and effectiveness. Information is important as well in organization’s environment in order to respond to the actions of external agencies such as governments, and social groups. According to Lee and Rogers (1998), in the sake of improving the performance of supply chain under demand uncertainty, companies in the supply chain need to share information and co-ordinate orders among them.

Fawcett and Magnan (2002) study the implementation of information technology and the effect of it on several companies in different industries. They highlighted three of practices encountered in their study which are the development of the web catalogues for all standard purchases that occur within a company, the development of web-based systems which enables suppliers to obtain the latest sales data and up-to-date rolling forecasts, and the establishment of proactive supplier selection policies regarding technology adoption.

2.5 Integration

The benefits of supply chain integration can be attained through an efficient linkage among various supply chain activities. This linkage should be subject to the effective construction and utilization of various supply chain practices for an integrated supply chain. It means that a firm which pursues the effective construction of SCM practices needs to pay attention to SC integration. Slack (1991) asserts that the focus on the utilization of competition capability can be different according to the development stage of SC integration.

2.6 Performance (Dependent Variable)

Any business entity is always looking forward for a higher performance in the competitive business environment. Nowadays more than ever, companies face an increasing pressure of customers' requirements for product customization, quality improvement and demand responsiveness. On the other hand, firms need to reduce the cost, shorten the lead time, and lower the inventory level to ensure profitability. Measuring supply chain management performance of other companies will help to identify how their business is practiced and how improvement can be made. Historically; performance
measurement system was developed to sustain the organizational control. However, performance measures system until 80’s had been prominent of financial measures as return on investment, sales return, profit, and sales per employee (Da Silveria and Cagliano, 2006) [17]. Recently more authors are concentrating on using these financial measures relating to new environment business. They argue that these financial measures have some limits such as lacking in flexibility, high cost, not adapting to new business environment, and difficulty to track improvement.

According to Supply Chain Council, SCOR is a process reference model that provides a language for communicating among supply-chain partners. The model is designed with four steps to describe and draw a guideline in order to achieve paper's hypotheses, it is appropriate to conclude that SCOR model focuses on integration of all supply chain members from suppliers of suppliers to customers of customers as well as the model considers information and quality as the factors affecting the performance.

Christopher & Tonnil (2001) [18] suggest a model for supply chain performance measurement which considers the supply chain as an extended enterprise. The authors argue that all firms dealing with SCM should focus and put effort on quality, dependability, flexibility, agility and cost efficiency. According to them, the approach will be effective when firms manage their supply chain considering market orientation. Barratt (2004) argues that there must be a balance between performance measures. He notes that using inadequate measures or giving too much weight to one, may cause problems. The author suggests companies should follow limited set of performance metrics while considering process level performance metrics as well.

This research will introduce a supply chain measurement framework according to the previous studies have conducted in this era focus on how some factors in supply chain can be managed to get better results on SCM performance.

3. Methodology

Performance measurement system designed for this research is a set of five metrics which were chosen regarding to the literature review and studies of previous researches. By proposing these metrics, the effect of each factor on the supply chain performance is compared and how these factors can be managed in supply chain in order to come up with more desirable results. The study is carried out by using the questionnaire survey method. The survey is conducted among managers in different levels to examine the research hypothesis. This research focuses on five important factors which influence the supply chain management performance namely quality, time, flexibility, information and integration. Regarding to that, the following hypotheses have been suggested in this research paper: According to the literature, the performance of supply chain in manufacturing firms is affected by several variables. As mentioned earlier, authors have discussed about different factors and have presented a number of performance measurement systems and frameworks. By reviewing the studies conducted on performance measurement systems and supply chain management, five variables affecting the performance of supply chain have been selected. These variables are: quality, time, information, flexibility and integration. Regarding to that, following hypotheses have been suggested in this research paper:
H1: Higher is the quality in every part of supply chain, the higher will be the manufacturing firms’ performance.

H2: Managing the time in supply chain has positive effect on the manufacturing firms’ performance.

H3: The better is the information sharing among the supply chain; the higher will be the manufacturing firms’ performance.

H4: Flexibility of the company is to the business environment changes, has positive effect on performance.

H5: Integration among supply chain has positive effect on manufacturing firms’ performance.

The data gathering method in this research is a primary data collection. Primary data were gathered from managers and executive who are familiar with supply chain management. For the purpose of analyzing the collected data, descriptive and empirical methods have been employed. Based on the descriptions above, the research have been decided to be undertaken by obtaining completed questionnaires from respondents and coded in numerical number and keyed into SPSS to be ready for analyzing the results. A significant challenge for this study is to find the appropriate managers who can answer variety questions spanning upstream till downstream supply chain process. Managers with appropriate titles (i.e., managers or directors of logistics, distribution, or supply chain management) are targeted. In order to increase participation of managers, they were informed that a copy of the study findings would be provided to them. This study used the individual such as managers related to the supply chain operations as the unit of analysis in this study. Companies from a variety of electronics industries such as computers, telecommunication, communications, and semiconductors were studied.

3.1 Theoretical Framework

This research takes a step forward to better understand the relationship between supply chain management factors and supply chain performance by incorporating these variables into the industrial landscape of electronics manufacturing in Malaysia. Specifically by using a combination model of a unified framework combining SCOR Model (Supply Chain Council, 1997) and system approach model (Min & Mentzer, 2004). As such, the analysis in this study contributes to the empirical literature of supply chain management, policy progress, as well as managerial implications.

3.2 Sample and data collection method

The sampling frame of this study consists of major firms with supply chain manager or a logistics manager from electronics manufacturing firms in Malaysia. The sampling frame is obtained from the Department of Statistics Malaysia. The key respondent for this study is high ranking managers of supply chain and logistics. However, if there are firms with no managers in such designation, then the survey seeks response of high ranking or top-level managers from other functions that have the requisite knowledge and well acquainted with most of the required information regarding the survey.
This study uses a written survey questionnaire as the methodology for data collection. Particularly, questionnaire survey will be deployed as its primary means of data collection. Data have been collected nationwide throughout Malaysia. The unit of analysis is the manufacturing firms in electronics industry, which is regarded as the focal firm in the electronics supply chain. Similarity exists in selecting the firm as a unit of analysis in previous studies as well. The data gathering method in this research is a primary data collection. Primary data is gathered from managers and executive who are most familiar with supply chain management. In this chapter, the authors intend to introduce three possible methods for data gathering in this study. This research project was conducted in order to discover the importance of some factors in supply chain management and their effect on supply chain’s overall performance.

4. Finding & Discussion

This research project was conducted in order to discover the importance of some factors in supply chain management and their effect on supply chain’s overall performance. According to the regression analysis as well as factor analysis conducted in this study, information was proven to be more effectively influencing the supply chain performance. The analysis of the data illustrated that managing information in supply chain is more important for the firms in order to achieve higher performance. According to data analysis, the researcher believes that although the selected independent variables for this research paper were all supported by the literature review, they may not be the preeminent combination of variables to investigate the supply chain’s performance. By considering the result of the data analysis in support of or against the research hypotheses, the accepted hypothesis is:

H3: The better is the information among the supply chain; the much higher effect will be the supply chain management’s performance.

4.1 Reliability analysis

Reliability analysis refers to the test for consistency of respondents' answers to all the items in a measure, or the degree to which an instrument measures the same way each time it is used under the same condition with the same subject. In short, it reflects the degree that items are independent measures of the same concept; they will be correlated with one another. The appropriate test for reliability is inter-item consistency reliability which is popularly known as the Cronbach's coefficient alpha which is used for multipoint-scaled items.
Table 1: Internal Consistency of the Constructs

<table>
<thead>
<tr>
<th>Construct</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>0.794</td>
</tr>
<tr>
<td>Time</td>
<td>0.684</td>
</tr>
<tr>
<td>Information</td>
<td>0.752</td>
</tr>
<tr>
<td>Flexibility</td>
<td>0.694</td>
</tr>
<tr>
<td>Integration</td>
<td>0.857</td>
</tr>
<tr>
<td>Supply Chain Performance</td>
<td>0.826</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>0.767</strong></td>
</tr>
</tbody>
</table>

Table 1 also shows that generally mean scores of all the dimensions of supply chain management factors (quality, time, information, flexibility, and integration), and supply chain performance were on average higher than 4.00 (neutral). This finding indicates that the majority of respondents agreed with the statements in the questionnaire. In other words, most of the supply chain practitioner cum respondents agreed that firms do implement the supply chain management practices and believe it could help to improve their supply chain performance. Therefore, the study concludes that the scales can be applied for the analysis with acceptable reliability.

4.2 Descriptive statistics & analysis

Profile of respondents shows no significant difference in the gender of respondents since 54.4% of the 68 respondents were male while 45.6% were female. The respondents’ age structure is mostly between 36 years old to 50 years. The results show that the respondents are mostly educated as mostly having bachelors or post graduate degrees. The command number of employees is mostly between 100 to 500 employees. The survey results would be more favourable when the respondents were mostly in companies with large number of employees. Almost 87% of the respondents are first or middle level managers and 41% has an experience ranging from 1 to 5 years. More than 70% of respondents claim that their knowledge about supply chain management is average or high which shows adequate proportion for conducted research. Among the respondents, only 32.4% of them are so familiar with SCM technologies, which indicate that SCM technologies are not well presented in the industry.

8. Conclusion and Future Recommendation

The information sharing in SCM has a strong positive direct and indirect impact on supply chain performance. Therefore, information is an important supply chain management factor to enhance the
performance of supply chain in the electronics industry in Malaysia. Nevertheless, there are several hypotheses which are not supported or found insignificant in this study which contradicts to the previous research study. The difference in some of the results comparing to the previous research is due the difference in terms of industrial classifications, firm sizes, country origin of study, and maturity of the respondent’s firm. Apart from these contextual factors, the insignificant results provided an insight that there must be some intervening factors that may help to translate the effect of supply chain management factors and supply chain performance.

Further studies are recommended on this topic but considering dissimilar variables as well as different combinations in order to refine the investigation on the factors affecting the performance and efficiency in supply chain. Moreover, further studies can be conducted by concentrating on different parts of the supply chain more distinctively than investigating supply chain as a whole namely:

- Investigating the relationship with suppliers and effect of it on organization.
- How to perceive different type of customers need in supply chain.
- How information technology can contribute in empowering the supply chain and enhancing the performance.
- Investigating effect of different factors in production line on supply chain performance.
- Being more flexible organization: is it advantage or disadvantage?
- Integration with suppliers or outsourcing. How to improve the relationship of the company with suppliers?

References


