

# Supply Chain Management, Product Quality and Business Performance

Arawati Agus<sup>1</sup>

Graduate School of Business, Universiti Kebangsaan Malaysia, 43600 Bangi, Malaysia (araa@ukm.my)

**Abstract.** Supply chain management (SCM) has been increasingly recognized as critical factors in improving bottom-line performances. In addition, more and more firms are increasingly making use of SCM to improve their performance. The study aims to understand and determine critical variables of SCM that would be able to enhance product quality and business performance in manufacturing companies. The study measures senior production or SCM managers' perceptions regarding SCM and level of performances in their companies. Two hundred and fifty responses are received and analyzed using SPSS. The study specifically investigates relationships between SCM, product quality and business performance and these associations are analyzed through structural equation modeling (SEM). The SEM result demonstrates that SCM dimensions namely 'lean production', 'new technology and innovation', 'strategic supplier partnership' and 'postponement concept' appear to be of primary importance and exhibit significant effects on product quality and business performance. Findings of the study provide a striking demonstration of the importance of SCM in enhancing bottom line performances of Malaysian manufacturing companies. The result indicates that manufacturing companies should emphasize greater attention to the waste elimination program through lean production as well as the technological aspects of SCM and a greater degree of management support for SCM enhancement initiatives.

**Keywords:** Supply chain management, product quality, business performance, Pearson's correlations and structural equation modeling.

## 1. Introduction

As global competition increases, manufacturing companies should be more involved in how their suppliers and customers conduct their businesses. To compete successfully in today challenging business environment manufacturing companies should be able to effectively integrating the internal functions within a company and effectively linking them with the external operations of suppliers and supply chain members. They need to focus on supply chain management practices that have impact on enhancing SCM activities and ultimately performances. The process of making and distributing products and services to customers is becoming the most effective and efficient way for companies to stay successful and is central to the practice of SCM. Despite variable evidence regarding performance improvements related to SCM, relatively few empirical study exist to measure the extent of performance improvements resulted from the SCM programs especially in the Malaysian context. We seek to address this apparent gap in literature by examining the performance implications of implementing SCM in the context of Malaysian manufacturing industry using structural equation modeling (SEM).

Empirically, the purpose of this study is to present an explicit result on the relationship between SCM and performance where other researchers have perhaps known or describe them only implicitly. There are studies which suggest that SCM improves performance but, with a few exceptions, rarely support it with statistical evidence. This study is one of few attempts to estimate the effect of implementing SCM programs

---

<sup>1</sup> + Corresponding author. Tel.: + 60389213721; fax: +60389213161.  
E-mail address: araa@ukm.my.

on product quality and business performance. It fills a gap that exists in the literature on SCM in the manufacturing industry in Malaysia. The main objectives of this study are:

- To empirically assess the importance of each SCM dimension on performance.
- To empirically determine whether SCM has significant impact on product quality.
- To empirically determine whether SCM has significant impact on business performance.
- To empirically discover whether product quality has significant impact on business performance.
- To empirically test whether there is a mediating effect of product quality in the linkage between SCM and business performance.

This study explores the possibility of adopting SCM as the basis for enhancing product quality and business performance in Malaysian manufacturing companies. First, this study proceeds with a brief explanation on the SCM principles and literature review; second, it discusses the methodology adopted. Third, it presents the result of the structural equation modeling (SEM). Finally, the overall results are then discussed and implications highlighted.

## 2. Supply Chain Management (Literature Review)

Supply chain management includes managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer. The term SCM was first used in the 1980s and as such is a relatively new discipline within management theory with tools and concepts still being developed. As with most management subject areas, many definitions have been used to explain the term SCM. The frequency with which the term “supply chain management” (SCM) is used in today’s environment would suggest that it is a well understood concept accompanied by an accepted set of managerial practices. However, definitions of and approaches to SCM vary substantially from organization to organization. Tan, et. al. [1] defines SCM as the simultaneous integration of customer requirements, internal requirements and upstream supplier performance. Ellram and Cooper [2] identify SCM as an integrating philosophy to manage the total flow of a distribution channel from supplier to the ultimate customer. Robinson and Kalakota [3] view the supply chain quite simply as a “process umbrella” under which products are developed and delivered to customers. From a structural viewpoint, they argue, the supply chain refers to the complex network of relationships that organizations maintain with trading partners to source, manufacture and deliver products.

Basically, SCM involves integration, co-ordination and collaboration across organizations and throughout the supply chain. Firms must achieve a relatively high degree of integration before implementing SCM. SCM has the potential to assist the organization in achieving both cost and a value advantage. To improve performance, organizations have to adopt SCM approach and consider the supply chain as a whole. Several researchers claim that SCM can result in better supply chain performance and bottom line results [4] [5]. In this study, in order to determine the domain that encompasses SCM practices, exhaustive theoretical, empirical and practitioner literature are reviewed. The supply chain management (SCM) dimensions included in the study are:

- **Strategic Supplier Partnership (MN1SSP):** Developing trust and collaboration among supply chain partners as well as customers [6].
- **Lean Production (MNB5LS):** Lean production is associated with continuous pursuit of improving the processes, a philosophy of eliminating all non-value adding activities and reducing waste within an organization [7].
- **Postponement Concept (MNB6PC):** Postponement involves the process of delaying final product configuration until the actual order requirement is specified by the customer. Keeping products in semi-finished would allow more flexibility and customization in completing the final products and also enables a company to respond more quickly to market demand [8].
- **New Technology and Innovation (MB7TECH):** New technology and innovation refers to the application of the latest scientific or engineering discoveries to the design of operations and production processes in SCM [9].

Meanwhile, product quality performance (PQUAL) are based on three pertinent product quality dimensions namely product conformance (CONFORM), product performance (PPERFORM), product reliability (RELIABLE) and product durability (DURABLE) [10] [11] [12]. Lastly, business performance (BUSPERF) in this study is derived from three important business performance indicators comprised of return on sale (ROS), return on asset (ROA) and market share (MKTSH).

### 3. Hypotheses

The researcher proposes that supply chain management (SCM) has an important influence on product quality and business performance results. A structural equation model is used in this study to analyze the structural effect of SCM on these performance results. In this study, firstly, the study aims to test the fitness of the overall SEM model based on the main null hypothesis:

$H_0$ : The overall hypothesized model has a good fit.

Then secondly, the study looks at the main research hypotheses of the study regarding the relationships between SCM and product quality and business performance. The first hypothesis states that implementing effective SCM can enhance product quality. The second hypothesis proposes that implementing SCM improves business performance. In addition, this study tries to test (third hypothesis) whether there is a direct effect of product quality on business performance within the context of Malaysian manufacturing companies. Lastly, it is interesting to investigate whether product quality mediates the linkage between SCM and business performance. Therefore, the following main research hypotheses are investigated:

$H_1$ : Supply chain management has a positive structural effect on product quality.

$H_2$ : Supply chain management has a positive structural effect on business performance.

$H_3$ : Product quality has a positive structural effect on business performance.

$H_4$ : Product quality mediates the linkage between supply chain management and business performance.

### 4. Research Method

The unit of analysis chosen for this study was company level and each company was being represented by either production or SCM manager. The sampling frame was derived from the Federation of Malaysian Manufacturing Companies Directory (FMM). The primary purpose of the research was to measure production manager's or SCM manager's perception of supply chain management initiatives and to gain insight into the benefits of adopting supply chain management in the manufacturing industry. The goal was to understand and determine critical variables of SCM that would be able to better enhance product quality and business performance. Face to face interviews with these managers were conducted for checking the information accuracy, validating the outcome of analysis and developing an understanding of practical aspects of SCM. Two hundred and fifty responses were received and analyzed using SPSS. The instrument used in this study was a structured survey questionnaire, which was designed to assess the companies in term of the described dimensions. The instrument developed consisted of two major parts. The first part comprised several constructs measuring SCM, and the second part comprised several performance measurements. To enable respondents to indicate their answers, seven-point interval scales were use for the questionnaire regarding the level of SCM dimensions and implementations (7-strongly agree and 1-strongly disagree). The performance measures namely product quality and business performance also used a seven-point interval scale, representing a range of agreement on statements whether over the past three years these performances were high relative to competitors after implementing SCM. Before creating the final scales, the data were checked for normality and outliers.

### 5. Structural Equation Modelling (SEM)

The findings of the SEM model indicated that the resulting Chi-square value was 52.30 with 41 degrees of freedom and p-value of 0.111 (Figure 1). The result supported the main null hypothesis that the SEM model had a good fit ( $H_0$ ). The p-value was considerably substantial (p-value > 0.05), in supporting the proposition that the overall model fitted the data. Furthermore, other statistical structural indices such as goodness of fit index (GFI = 0.964), Bentler comparative fit index (CFI = 0.995), Bollen incremental fit

index (IFI = 0.995) and Tucker and Lewis index (TLI = 0.993) further suggested that the model had a satisfactory fit. Since the probability value and structural modeling indices were well above the recommended level, the model was considered to be a reasonable representation of the data [13] [14] [15].

The direct structural effect of SCM on product quality was high with a structural effect value of 0.76. The standardized structural coefficient of SCM on product quality was associated with a low standard error (0.095) and a non-zero critical ratio (10.582), which indicated that the structural effect between these two constructs, was positive and the relationship was significant. The direct structural effect of SCM on business performance was also high and significant (a structural effect value of 0.36) with a low standard error (0.149) and a non-zero critical ratio (3.849). In addition, product quality also exhibited a substantial and positive structural effect on business performance with a structural effect value of 0.39 (standard error = 0.106 and critical ratio = 4.340). Therefore, there were enough evidences to accept the first three hypotheses. Firstly, SCM had a positive effect on product quality ( $H_1$ ). Secondly, SCM had a positive structural effect on business performance ( $H_2$ ). Thirdly, product quality had a positive structural effect on business performance ( $H_3$ ). The result also indicated that there was a mediating effect of product quality in the linkage between SCM and business performance. The calculated indirect effect was 0.29 and the total effect was 0.66. Since the initial structural direct effect of SCM on business performance was also significant (0.36), therefore it was concluded that product quality had a partial mediating effect in the linkage between SCM and business performance ( $H_4$ ). Hence, all the four main hypotheses were supported ( $H_1, H_2, H_3$  and  $H_4$  were supported). Overall, it was essential to reaffirm that SCM can ultimately improve business performance of manufacturing companies in Malaysia.

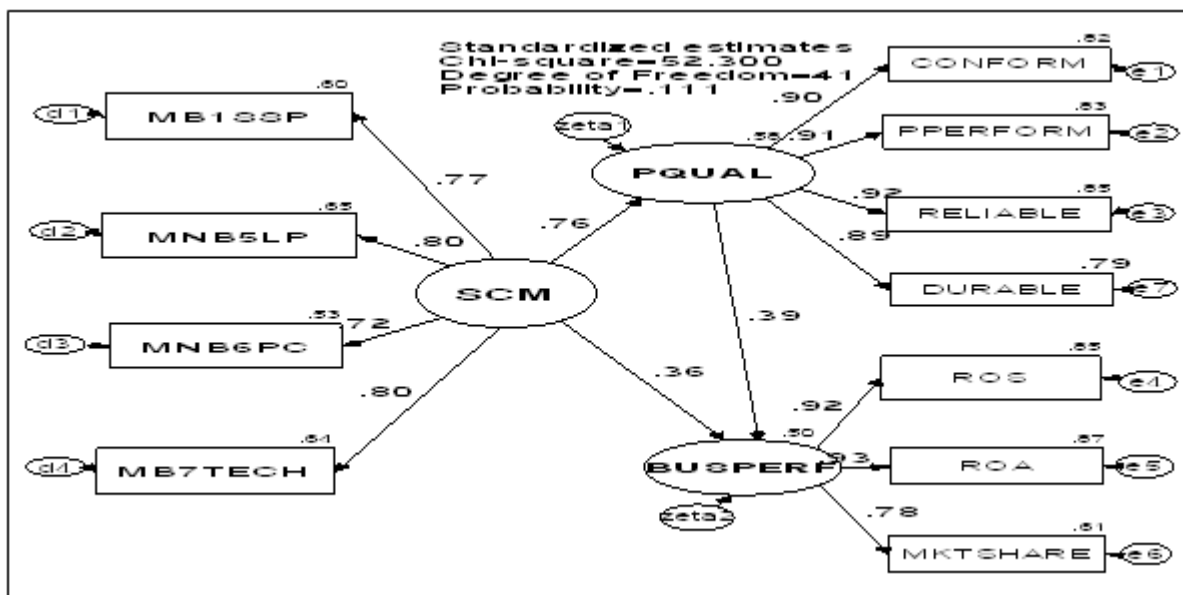


Fig. 1: The Structural Linkage between SCM, Product quality and Business Performance

Investigating the structural loadings of each SCM determinants (Figure 2) on the main construct, the result demonstrated that ‘lean production’ (structural loading = 0.804), had the highest contribution toward SCM implementation. It was followed by ‘new technology and innovation’ (structural loading = 0.798), ‘strategic supplier partnership’ (structural loading = 0.772), and lastly ‘postponement concept’ (structural loading = 0.725). All of these indicators had significant probability values (critical values  $\geq 2.00$ ), giving statistical evidences that the contributions of these determinants toward overall SCM implementations were significant and positive.

## 6. Conclusion and Implications

To meet the increasing demands of high-quality and technological goods from sophisticated local and overseas markets, manufacturing companies must continuously improve their efforts in technological and quality operations. SCM provides a vision that focuses everyone in an organization on product, production

and quality improvements. The pursuit of these improvements is not only requested by the market but also driven by the need to survive. The importance of critical dimensions of SCM is highlighted by utilizing SEM. The results of the study assist in the understandings of how SCM determinants influence product quality and business performance. The result indicates that manufacturing companies should emphasize greater attention to the technology and lean production aspects of SCM and a greater degree of management support for SCM implementations.

The conclusion emerging from this study is that SCM would ultimately result in positive gains. The results validate some of the key linkages and support beliefs and evidences by researchers regarding the relationships between SCM, product quality and business performance. It is also important to note that this study attempts to enrich the literature review and make a contribution in supply chain management-related studies. This study to some extent helps in resolving controversy about the magnitude and measurements of performance gains from adopting SCM. By strengthening SCM, improved performance will likely to occur. In short, the findings of this study suggest that SCM enhances product quality and has a positive effect on business performance.

## 7. References

- [1] K.C. Tan, S.B. Lyman, and J.D. Wisner. Supply chain management: a strategic perspective, *International Journal of Operations and Production Management*.2002, 22(6): 614-31
- [2] L.M. Ellram, and M.C. Cooper. Supply chain management, partnerships and the shipper third party relationship, *The International Journal of Logistic Management*, 1990, 1(2): 1-10.
- [3] M. Robinson, and R. Kalakota. E-Business Road-map for Success, Wokingham: Addison-Wesley, 2000.
- [4] M. Christopher. Logistics and supply chain management: Strategies for reducing cost and improving service, *Financial Times*. Pitman Publishing, 1998.
- [5] S. Bhasin. Lean and Performance Measurement, *Journal of Manufacturing technology Management*. 2008. 19(5): 670-684.
- [6] S. Li, B. Ragu-Nathan, T.S. Ragu-Nathan, and S.S Rao, The impact of supply chain management practices on competitive advantage and organizational performance. *Omega*, 2006, 34(1):107-124.
- [7] James P. Womack, and T. Jones. Daniel. *Lean Thinking*. Free Press. 2003, p. 352.
- [8] R.I.Van Hoek, The rediscovery of postponement: a literature review and directions for research, *Journal of Operations Management*, 2001, 19:161-84.
- [9] A. Agus, *The Importance of Incorporating New Technology and Innovation In Supply Chain Management (SCM) Processes in Enhancing Performance*, Proceedings: 16 th PBEAM 2008: Innovation For Sustainable Future:Visions For 2020, QUT, Brisbane, Australia, July 2-4, 2008.
- [10] P. Kotler, *Marketing management analysis, planning, implementation and control*. Eight Edn. Prentice Hall. New Jersey, 2004.
- [11] N. McGaughey, Building competitive strength: Lessons from the chemicals industry. *Industrial Management*. 1991, 29(3): 36-41.
- [12] D. Pascucci, Up to date communications a must for keeping pace in the service business. *Air condition, Heating and Refrigeration News*. 1998, 205(16): 5-6.
- [13] J.F. Hair, R.E. Anderson, R.L. Tatham, and W.C Black, *Multivariate data analysis*, Englewood Cliffs, NJ: Prentice-Hall, 1998.
- [14] A. Agus. A linear structural modelling of total quality management practices in manufacturing companies in Malaysia. *Total Quality Management*, 2001, 12(5), 561-573.
- [15] A. Agus. *The importance of new technology and innovation in SCM in enhancing production performance and product quality performance: an investigation on mediating effect*, Proceedings of Fifth International Conference of Global Academy of Business and Economic Research (Gaberica), KL, 28-30 Dec 2009.