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The Impact of Supplier Relationship Management on Competitive Performance of Manufacturing Firms

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Abstract

Supplier Relationship Management is very important for manufacturing firms as it can ensure the supply of reliable and frequent deliveries in today's dynamic and competitive environment. For such relationship to be effective and long-term, it has to be beneficial for all parties, the buying and the supplier firms. This study attempts to examine the impact of supplier relationship management (SRM) on competitive performance in the manufacturing sector.

Based on the literature review, we measure SRM through five main practices: supplier quality improvement, trust-based relationship with suppliers, supplier lead time reduction, supplier collaboration in new product development, and supplier partnership/development. We measure competitive performance through cost, quality, flexibility, delivery, and on time product launch.

Using international data collected in Japan, Korea, USA, and Italy as part of round 3 of High Performance Manufacturing (HPM) project, and After using statistical package of social sciences (SPSS) to describe and analyze the data, the results show that two practices of supplier relationship management, supplier partnership/development and supplier lead time reduction significantly and positively affect the competitive performance of the buying firms. Discussion and conclusion are provided based on the results of this study.

Keywords: supplier relationship management, competitive performance, manufacturing firms, high performance manufacturing project

1. Introduction

Supplier relationship management (SRM) is an important perspective for manufacturing firms to ensure the supply of reliable and frequent deliveries in today's dynamic and competitive environment. For such relationship to be effective and long-term, it has to be beneficial for all parties, the buying and the supplier firms.

Supply chain could be defined as "The connected series of activities which is concerned with planning, co-coordinating and controlling material, parts and finished goods from suppliers to the customer" (Stevens, 1989).

Although the published research has pointed to the crucial role of SRM and assistance of suppliers for achieving superior performance, the practices that encompass such relationship still need more clarification. In this paper we attempt to identify the main practices undertaken by the buying firm to assure the supply of timely and flexible deliveries of quality materials by the supplier firm.

Shin et al. (2000) indicated that there is a need for empirical studies concerning buyer-supplier relationships as most of the existing studies are theoretical and conceptual with obvious lack of empirical evidence. In addition to that, the existing literature provides some contradicting results concerning the influence of SRM on competitive performance of manufacturing firms. Based on our international sample, we examine the impact of SRM on competitive performance of the buying firm directly.

To investigate this relationship, the data were collected from four large industrial countries: Japan, Korea, USA, and Italy. The findings of this research are expected to shed more light on SRM as an essential and powerful managerial aspect to improve the competitive performance of the buying firm. We also contribute to the literature by identifying the key practices of SRM and examine the impact of individual SRM practices on

competitive performance.

2. Literature Review

2.1 Supplier Relationship Management (SRM)

Supply chain management has long-term objectives and short-term objectives. The long-term objectives would include: creating value to customers, increase profits, improve efficiency of production operations, and increase market share (Williams, 2006). On the other hand, short-term objectives would generally include: improve productivity, reduce cycle time, and reduce inventory (Wisner & Tan, 2000). Firms willing to receive frequent deliveries have the incentive to assist and develop their suppliers and to establish close relationships with them (Scannell et al., 2000). Generally, the strong relationships with suppliers have been regarded as one major factor for the Japanese industrial competitiveness (Sako, 1992). MacDuffie and Helper (1997) indicated that suppliers in lean production setting are expected to have the ability of meeting quality, delivery, and responsiveness requirements. They further pointed out the difficulty for customers to meet these requirements unless suppliers themselves have adopted lean practices. This pointed to one key problem in just-in-time (JIT) environment associated with moving the inventories from the buyer's firm to its suppliers. Such a situation will reduce inventory and related costs in the buying firm while increase inventories and costs in the supplier firm (Romero, 1991). Handfield et al. (1999) argued that the effective incorporation of suppliers into the supply is a major factor for plants to maintain their competitiveness. In addition, Performance improvement and competitive advantage can be achieved by cooperative relations with suppliers, which include: trust, supporting suppliers to improve their processes, information sharing, supplier involvement in new products development, and long-term relationships (Langfield-Smith & Greenwood, 1998).

Krause et al. (2007) found that commitment of the buying firm to long-term relationships with major suppliers, shared goals and values with suppliers, and the involvement in supplier development initiatives were positively associated with the buying firm competitive performance in US automotive and electronics industries.

Langfield-Smith and Greenwood (1998) concluded based on a case study on Toyota Australia that the effectiveness of the supplier-buyer relationship was influenced by several factors, such as communication and information sharing, learning and the involvement of workers in the buying firm's programs, and similarities in technologies and industry.

Scannell et al. (2000) investigated supply chain management efforts with first tier suppliers in 57 automotive firms in the US. Using a survey questionnaire; they found that first tier supplier development is associated with innovation and cost measures, but not associated with flexibility and quality measures. They also found that the use of JIT purchasing by first-tier suppliers is strongly associated with their performance measures of flexibility, slightly associated with quality and cost, and not associated with innovation. They called for further research with larger sample in order to improve the generalizability of the results.

Shin et al. (2000) investigated supply management orientation (SMO) on supplier's and buyer's performances in 176 automotive firms in the US. They measured SMO in terms of long-term relationships with suppliers, supplier participation in new product development, limited number of suppliers, and selecting suppliers based on quality considerations. They found that SMO positively affected supplier's and buyer's performance in terms of quality and delivery. However, they found that SMO did not affect buyer's performance in terms of cost and flexibility.

Wisner (2003) found that supplier and customer management strategy have positive effect on supply chain strategy and on competitive performance. His empirical results were achieved using a data from 350 US and European manufacturing firms.

Echtelt et al. (2008) pointed to some major dimensions of SRM which included high levels of trust, information sharing, risk and reward sharing, cooperation, and involvement of suppliers in new product development.

Based on the above and after an extensive review of the published literature; we have identified the following five major dimensions of SRM: 1) supplier quality improvement 2) trust-based relationships with suppliers 3) supplier lead time reduction 4) supplier collaboration in new product development 5) and supplier partnership/development.

2.1.1 Supplier Quality Improvement

De Toni and Nassimbeni (2000) indicated that the elimination of inspections of incoming materials can be only achieved by considerably improving the quality of suppliers. Improving supplier quality includes activities such as certifying suppliers on quality and providing technical assistance to them. Supplier quality improvement

would result in improved quality and productivity, enhanced design of the parts, and reduced costs (Lee & Ansari, 1985). In addition, incentives such as long range relationship and contracts as well as commitment are expected to encourage suppliers to improve the quality of their products as suppliers account for almost 30% of quality related problems (Lyons et al., 1990; De Toni & Nassimbeni, 2000; Burton, 1988).

2.1.2 Trust-Based Relationship with Suppliers

MacDuffie and Helper (1997) discussed three main types of trust; Competence trust: where supplier believes that the buying firm is able to perform what promised to perform. Contractual trust: a belief that the buying firm will continue its contracts. And Goodwill trust: a belief that the buying firm will avoid taking unfair advantage, and will always act on mutual benefit basis. Moreover, Kumar et al. (1995) and Heikkila (2002) pointed to two types of trust that are very close to the above; Trust in partner's reliability: the trust that the other firm is reliable to do what it said. And Trust in the partner's benevolence: a belief that the other firm is interested in the partner's firm benefit and will not take actions that may unfavorably influence it.

Trust between the buying firm and its suppliers would improve cooperation, enhance satisfaction, reduce conflicts, facilitate information exchange, and lead to long-term relationships (Morgan & Hunt, 1994; Doney & Cannon, 1997). Trust was considered one major factor for the superior performance of Japanese firms compared to British firms (Sako, 1992).

Trust building should not be the concern of the buying firm only, Doney and Cannon (1997) concluded that trust is also essential and advantageous to the supplier firm, which has to make efforts to establish, extend, and retain the buying firm trust, especially when such trust can lead to more benefits for the supplier.

Although trust building is a costly, difficult, and time consuming procedure, it leads to strong, successful, and long-term buyer-seller relationships.

2.1.3 Supplier Lead Time Reduction

Burton (1988) indicated that suppliers account for approximately 80% of lead-time problems. In lean production environment, JIT purchasing requires the supplier firms to deliver frequent supplies in small lots. This would require perfect synchronization between the supplier and the buyer, which can be achieved by integrating their production planning and control systems (De Toni & Nassimbeni, 2000).

Heikkila (2002) pointed to reducing lead time as an essential approach to create responsive supply chain and avoid uncertainty. Hernandez (1993) pointed to the crucial role of reducing lead time on the ability of the supplier to become lean and responsive. He further indicated that supplier lead time reduction minimizes the potential problem of shifting inventories to the supplier firm and eliminates quality problems associated with holding buffer inventories.

Larson and Kulchitsky (2000) empirically found that lead time performance was affected by information quality and close relationships between the buying firm and the supplier firm.

De Toni and Nassimbeni (1999) pointed to the importance of the logistic link between the buyer and supplier, particularly under JIT system, where suppliers have to completely respond to the requirements of the buyer in terms of quality and quantity. They argued that such link would be enhanced by small lot size and coordinated schedules between the two parties.

2.1.4 Supplier Collaboration in New Product Development

Handfield et al. (1999) indicated that understanding design knowledge and competencies of suppliers are among the most essential aspects in new product development (NPD).

Smith and Reinertsen (1991) suggested that suppliers have to be incorporated in NPD, especially when advanced technologies are involved and the firm has little or no expertise in. Additionally, including suppliers in NPD and sharing technical information with them is valuable when advanced and complex technologies are applied (Petersen et al., 2003). Handfield et al. (1999) further indicated that when suppliers have familiarity with the customer firm's processes and goals, they can prepare in advance the necessary requirements for future product development efforts.

Ragatz et al. (1997) found that supplier involvement positively affected the success of NPD when the following factors were met: top management commitment, learning and training sharing, agreed upon performance measures, belief in supplier's qualifications, risk/reward sharing, and development of trust aspects.

Handfield et al. (1999) found that firms who involved suppliers in their product development teams achieved considerable improvements compared to those who didn't. They also concluded that understanding suppliers'

knowledge in design and their technological capabilities would facilitate their integration in NPD. These finding were based on a survey of 134 firms worldwide and 17 case studies. De Toni and Nassimbeni (2000) summarized some benefits of including suppliers in NPD process such as reduce development cost, early available prototypes, considering supplier capabilities in the design, reduce technical changes, increase quality, reduce development time, and increase product innovativeness. Echtelt et al. (2008) further indicated that supplier involvement in NPD efforts allow for establishing learning routines and matching capabilities of both parties.

Petersen et al. (2003) conducted several case studies in both Japan and the US and concluded that only trusted and carefully chosen suppliers have to be involved in NPD projects. They also stated that involving suppliers in NPD teams is critical when technology is advance or when the buying firm lacks sufficient knowledge or expertise, which is consistent with Smith and Reinertsen previous findings.

2.1.5 Supplier Partnership/Development

Langfield-Smith and Greenwood (1998) traced the origins of supplier partnership to Japanese automotive industry, and indicated that it was adopted by Western companies in the 1990s. They pointed to information exchange and cooperation as pillars of supplier partnership.

Supplier partnership and development involves cooperative efforts to improve supplier capabilities with respect to technology, quality, delivery, and cost. It also encourages continuous improvements (Watts and Hahn, 1993). Burnes and Whittle (1995) stated that the main dimensions that characterize successful supplier development would include, but not limited to: integrating and improving activities and processes, continuous cooperation and long-term relationships, mutual benefits as a result of any improvement efforts, and apparent structure for both companies with regard to cost, price, and profit.

Moreover, successful relationships in manufacturing setting are attributed by supplier development, cost savings and technology sharing (Handfield, 1993).

Lascelles and Dale (1990) indicated that buying firms should treat their suppliers as partners. Handfield and Bechtel (2002) argued that investments in supplier relationships will reduce risk; by involving in activities that is usually regarded in the area of the other firm. Vonderembse and Tracey (1999) indicated that supplier partnership enables both parties to improve decision making process, enhance knowledge sharing, advance communication, and improve the overall performance of both parties. MacDuffie and Helper (1997) argued that the buying firm will gain from efforts done to improve the supplier performance, as both will share the productivity benefits.

Also, Technical assistance provided to suppliers enables them to deliver frequent and JIT supply of materials, improves quality, reliability, and delivery by suppliers (Langfield-Smith & Greenwood, 1998; Carr & Pearson, 1999). Furthermore, when the buying firm provides technical assistance to suppliers, the performance dimensions of the buying firm will improve in terms of cost, quality, productivity, and design (Lee & Ansari, 1985). Supplier development results in reduced costs, improved communication, risk sharing, and improved problem solving (Quayle, 2000). Cooper and Gardner (1993) empirically found that supplier partnership is associated with higher competitive performance in terms of cost, quality, innovation, and flexibility performance. Also, partnership relations between the buyer and suppliers have been proved to positively affect financial performance of the buyer firm (Martine & Grbac, 2003; Johnston et al., 2004).

2.2 Competitive Performance

Competitive performance is defined as: a manufacturer's attainment of common competitive priorities relative to its competition (Ahmad et al., 2010). Competitive performance has been measured using different measures in the published literature. The most commonly cited measures were cost, quality, flexibility, and delivery (Cua et al., 2001; McKone et al., 2001; Ahmad et al., 2010; Phan et al., 2011). In addition to these measures, we also considered "on time product launch" due to its importance in defining competitive performance in firms (Phan et al., 2011). we measure cost performance in terms of unit cost of manufacturing; quality performance in terms of product capability and performance; flexibility performance in terms of flexibility to change product mix; and delivery performance in terms of on time delivery performance.

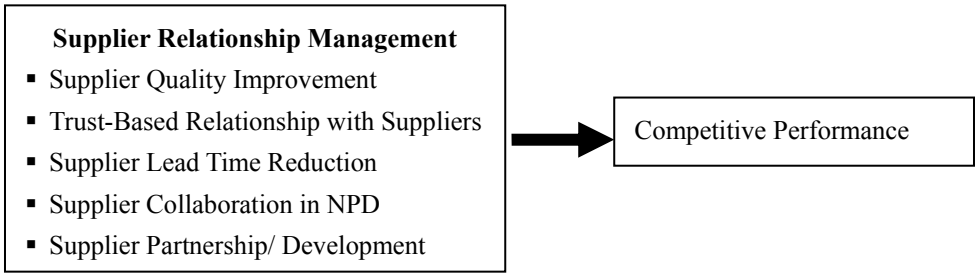

Figure 1. Research framework

3. Framework and Research Hypotheses

This research is based on the proposed framework (Figure 1). The framework considered the impact of supplier relation management practices on competitive performance of the buying firm.

Based on our literature review, the following hypotheses were derived:

H1: Supplier quality improvement has a positive direct effect on competitive performance at ($\alpha \geq 0.05$) significance level.

H2: Trust based relationship with suppliers has a positive direct effect on competitive performance at ($\alpha \geq 0.05$) significance level.

H3: Supplier lead time reduction has a positive direct effect on competitive performance at ($\alpha \geq 0.05$) significance level.

H4: Supplier collaboration in NPD has a positive direct effect on competitive performance at ($\alpha \geq 0.05$) significance level.

H5: Supplier partnership/development has a positive direct effect on competitive performance at ($\alpha \geq 0.05$) significance level.

4. Methodology

This study is a causal one, since it aims at identifying the effect of the independent variables on the dependent variable directly.

Based on the nature of data obtained from the HPM, this study is utilizing survey strategy. And since this study depends on empirical findings, it is of an inductive nature.

4.1 Study Sample and Data Description

The data used for this study were gathered through round 3 (aka part III) of High Performance Manufacturing (HPM) project. HPM is a well-known multinational research on the manufacturing practices, where firms (plants) are randomly selected from several records such as: Shingo award winners, industry week best plant list, general industry lists, and trade magazines. The project included members from different countries and the data were collected by those members. The sample of the project is a stratified random one. The unit of analysis is firm (plant) and only one plant per firm is considered. The project members personally contacted the manufacturing firms asking them for their approval to participate in the project, and to encourage contacted plants to participate, they were promised to receive a detailed report concerning their practices and performance compared to other firms. About 61% of the contacted plants decided to join the project. A packet of 21 questionnaires is sent to each firm of the sample, the target respondent included plant managers, human resources managers, quality managers, information system managers, new product development managers, production control managers, process engineers, plant accountants, inventory managers, plant superintendent, supervisors, and direct laborers. 238 plants actually responded in round 3, making the response rate of this for this round 65%. Round 3 of the project included the following countries: Austria, Brazil, China, Finland, Germany, Italy, Japan, Korea, Spain, Sweden, and the USA. The data were collected till 2010 and consisted of firms from three different industries; machinery, electrical & electronics, and transportation. Due to data access issues, our sample for this study only included the firms located in Japan, Korea, USA, and Italy, the total of 122 firms of the original 238. Table 1 shows the distribution of the firms classified by industry and country.

Table 1. Number of sample plants classified by country and industry

Country	Industry			Total
	Machinery	Electronics	Transportation	
Japan	10	12	13	35
USA	9	11	9	29
Korea	10	10	11	31
Italy	10	10	7	27
Total	39	43	40	122

The project members conducted a comprehensive review of related literature to develop the measurement instruments. To assure content validity, the measurement scales were pilot-tested by academics and were modified as required. The measurement scales were also pre-tested at some manufacturing firms and the required revisions were done. To assure equivalency, the English edition of the questionnaire was translated into the participating countries' languages by professionals from those countries and then translated back to English. To increase the reliability of the data and to remove possible respondent bias, the questionnaire was filled out by different respondents as mentioned above, respondents filled out different sets of question items depending on their positions and experience.

4.2. Measurement Analysis and Research Variables

We used five multi-item scales to measure supplier relationship management practices. To measure competitive performance, five single items were chosen. The average of competitive performance items was computed as an overall scale and was used in our subsequent analysis.

For supplier relationship management scales, respondents were asked to specify their agreement or disagreement with the question items using seven-point Likert scales, where 7 indicated strong agreement and 1 indicated strong disagreement. For competitive performance measures, respondents were asked to assess their performance compared to other competitors in the same industry, using five-point Likert scales, where 5 indicated superior to competitors and 1 indicated poor, low end of industry. The items used to measure the different practices of supplier relationship management and competitive performance measures can be available from authors upon request.

To ensure construct validity, factor analysis was carried out, with principal components analysis (PCA) as the extraction method. Only the items that had a factor loading of at least 0.40 and eigenvalue of at least 1 were retained.

To evaluate the reliability of the research constructs, Cronbach's α-coefficient was applied. Three scales, supplier quality involvement, supplier collaboration in NPD, and supplier partnership/development, have met the recommended standard of $\alpha \geq 0.70$ and have been considered to be internally consistent (Nunnally, 1978). Competitive performance overall scale has also met the recommended standard of $\alpha \geq 0.70$. The reliability of the other scales, trust-based relationship with suppliers and supplier lead time reduction was higher than 0.60. Nunnally recommended a minimum standard of 0.60 for newly developed scales; therefore, we decided to retain these scales. Table 2 below reports cronbach's α-coefficients for the research constructs, means, and standard deviations.

Table 2. Means, standard deviations, and cronbach's α-coefficient of the research constructs

Variable	Mean	Standard deviation	Cronbach's α-coefficient
Supplier quality involvement	5.06	0.465	0.764
Trust-based relationship with suppliers	5.37	0.452	0.666
Supplier lead time reduction	5.08	0.559	0.631
Supplier collaboration in NPD	4.84	1.202	0.829
Supplier partnership/development	5.00	0.439	0.772
Competitive performance overall scale	3.65	0.579	0.735

5. Results and Discussion

We started our analysis by carrying out bivariate correlation which included supplier relationship management

practices and competitive performance (Table 3). The correlation provides initial support for the hypothesized impact of supplier relationship management practices on competitive performance.

Table 3. Correlations among variables

	1	2	3	4	5
1. SQI	1				
2. TBRS	.456***	1			
3. SLTR	.252***	.321***	1		
4. SCNPD	.198*	.339***	.296***	1	
5. SP/D	.798***	.453***	.163*	.186*	1
6. Competitive performance	.276***	.229**	.305***	.097	.379***

*P≤ 0.1; ** P≤ 0.05;*** P≤ 0.01.

We used hierarchical regression analysis to test our hypotheses. In order to ensure the generalizability of the regression analysis, we tested the assumptions related to regression models. The residual analysis showed that the assumptions regarding linearity, normality, homoscedasticity, and independent error terms were not violated.

Overall competitive performance measure was used as a dependent variable and the five practices of supplier relationship management were entered as independent variables as shown in Table 4. It was expected that the five independent variables were highly correlated, and such a situation may cause unreliable results due to the existence of multicollinearity. We used one of the most popular tests to check for multicollinearity, the Variance Inflation Factor (VIF) test. VIF in the regression model ranged between 1.170 and 2.427. These values were lower than the 2.5 level suggested by Allison (1999) as an indicator of muliticollinearity; therefore, multicollinearity was not a problem in our analysis.

The results of the regression model showed that the combined effect of SRM scales resulted in a significant portion (17.4%) of the variance in competitive performance level (p-value for F change < 0.01).

As for individual SRM practices, the results showed that two practices, supplier lead time reduction and supplier partnership/development were positively and significantly associated with competitive performance overall scale. The other three practices, supplier quality involvement, trust-based relationship with suppliers, and supplier collaboration in NPD were insignificantly associated with competitive performance. Hypotheses H3 and H5 were accepted, while hypotheses H1, H2, and H4 were rejected.

Table 4. Regression analysis of performance measures

Variables	Competitive performance	VIF
(Constant)	0.367	
Supplier quality involvement	-0.133	2.384
Trust-based relationship with suppliers	0.084	1.510
Supplier lead time reduction	0.258**	1.170
Supplier collaboration in NPD	-0.066	1.222
Supplier partnership/development	0.347**	2.427
R^2	0.174	
Adj. R^2	0.127	
F	3.701***	

*P≤ 0.1; ** P≤ 0.05; *** P≤ 0.01.

The results clearly pointed to the importance of SRM in today's competitive environment. Companies have the challenge to respond to varied customer requirements and demand uncertainty.

The wide variety of potential customer requirements makes it difficult for companies seeking efficiency and low cost to hold large inventories, thus, demand uncertainty results in supply uncertainty. Effective SRM strategy represents an ideal solution for such a paradigm and should be given first priority in order to avoid potential pitfalls associated with supply uncertainty. Our finding is in accordance with Chandra and Grabis, (2004) who

found that a comprehensive supplier relationship strategy is necessary in order to receive on time deliveries with the required quality levels and quantity amounts.

As for individual scales, Supplier partnership/development proved to be the most important practice that affected competitive performance (Beta 0.347, $p < 0.05$). This is in accordance with previous studies that found a positive relationship between supplier development and performance (e.g., Cooper & Gardner, 1993; Quayle, 2000; Johnston et al., 2004). Companies have to pay a considerable attention to developing their suppliers so that suppliers could become responsive and able to meet any fluctuations of the specifications, quantity, and quality of supplied materials. Also, Supplier partnership and development enables the supplier firm to gain technological and managerial advantage which increases its abilities to respond effectively and efficiently to the buying firm's requirements with regard to frequent reliable deliveries. Although such activities of supplier development are costly and need efforts and time; however, the obtained benefits justify such investments.

The following most important practice that affected competitive performance was supplier lead time reduction (Beta 0. 258, $p < 0.05$). Suppliers wouldn't be able to fully adhere to frequent timely deliveries without reducing their lead times. By reducing supplier lead time, it would be possible to receive frequent supplies of desired quantities and specifications. Companies are advised to exert enough efforts to assist their suppliers to achieve this goal. This is in accordance with Anderson (2004) and Pine (1993) who argued that supplier lead time reduction is an effective way to reduce risks associated with product shipments and to shorten the respond time to customer demand.

Three practices, supplier quality involvement, trust-based relationship with suppliers, and supplier collaboration in NPD did not contribute significantly to competitive performance. Obviously, we cannot suggest that manufacturing companies should neglect these practices because of their insignificant effect on performance in our sample. Different benefits have been reported in the literature as a result of adopting these practices. Our results suggested that these three practices were less important for improving competitive performance than the powerful two practices.

6. Conclusions, Limitation, and Future Studies

In this study, we investigated the impact of supplier relationship management practices on competitive performance in manufacturing companies in four countries, Japan, Korea, USA, and Italy. On the basis of our study, the following conclusions were drawn.

Our study revealed that the buying firm will improve its competitive performance by managing relationships with its suppliers. Companies cannot merely rely on their internal resources and capabilities to reach superior performance. Suppliers represent one of the fundamental pillars for improving competitive performance. Manufacturing companies are strongly recommended to consider the importance of SRM in order to attain high performance outcomes.

Two practices of SRM used in our study, supplier partnership/development and supplier lead time reduction proved to be associated with competitive performance of the buyer's firm performance. The former indicates that the supplier firm itself has modified its process and operations so that to be capable of meeting the buying firm's requirements in terms of technical specification, quality, cost, flexibility, and others. The latter implies that the supplier firm has become more responsive in terms of supplying frequent flexible deliveries.

The limitation of our study was that the measurement scales used for our research may not capture all the practices implemented by the manufacturing plants. Sample size of our study represents another limitation. We could not use structural equation modeling to investigate direct and indirect relationships among variables. Also, only three industries were included in our sample. The last limitation was that the data was collected from the buying firms only.

Similar research studies should be undertaken by collecting data form the buying firm and its suppliers. Also, additional research is needed in case of less developed countries to investigate to what extent SRM practices are implemented and how they affect competitive performance of the plant.

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