

# THE EFFECT OF SUPPLIER INVOLVEMENT IN PRODUCT DEVELOPMENT TOWARDS SUPPLIERS' ORGANIZATIONAL PERFORMANCE: A CASE STUDY OF PROTON'S SUPPLIERS

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## Abstract

*The goal of this study is to identify the interrelationships between suppliers' involvement in product development at Proton and suppliers' organisational performance. Focusing on the 121 respondents from 114 suppliers companies registered with Proton, quantitative research methods through survey questionnaires were used to get an in-depth view about the problem. Overall, this study found that the level of suppliers' organisational performance is at satisfactorily level. Suppliers of Proton have the capabilities to meet Proton's requirement in term of design, quality, delivery time, and cost capabilities. This study also finds that suppliers' participation in joints strategic program, communication and information sharing, and design capabilities positively influence suppliers' organisational performance. The finding of this research might lead not only to a better understanding of suppliers' participation behaviour but also to better planning of suppliers' involvement from the suppliers side. In future, suppliers will have better on the expectation of Proton.*

Keywords: *Suppliers' Involvement, Proton, Joints Strategic Program, Communication and Information Sharing, Design Capabilities, New Product Development.*

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## 1. INTRODUCTION

Suppliers play an increasingly central role in helping firms achieve their new product development (NPD) goals. Numerous advantages can be associated with supplier's involvement such as higher return on research and development (R&D) investments, faster product development, reduced product development cost, increased flexibility, reduced risk, and access to product development capability of the supplier (Changyue et al, 2010). However, suppliers are encountered with many challenges as they strive to compete in today's dynamic and competitive market. There are many management challenges associated with achieving performance benefits from supplier involvement (Van Echtelt et al., 2008).

In Malaysian automotive industry, Proton depends heavily on suppliers' performance to supply quality parts to their factory to ensure Proton achieve high productivity and high quality output (Abdullah & Maharjan, 2003). Proton requires outside suppliers to provide high quality parts, at a competitive price, innovative features on the parts, and on time delivery. Proton's suppliers have responded to this competitive environment with numerous strategies in order to survive in the competitive market. Moreover, Proton has its supplier development programs in order to incorporate with its suppliers.

However, critics of the supplier development concept might argue that buyers can prompt increases in supplier performance by threatening to take their business elsewhere. Hence, this study argues that it is important to examine the involvement of suppliers in product development at Proton in order to provide a critical view on how suppliers' involvement in that

carmaker company may affect the organisational performance of suppliers.

## 2. SUPPLIERS' SELECTION AT PROTON

In the mid of 1980s, Proton through its Suppliers Development Program (PVDP) introduced a specific localisation programs for automotive industry. Under this program, more components were produced to cater to the domestic as well as export markets. Since then, many suppliers were born, and later developed and grew solely as a result of this program.

Proton acquires parts and components through three different activities, i.e. imports, in-house production, and local outsourcing. The two main choices for procurement activities are to import or to procure domestically. Domestic procurement can be divided into two practices, i.e.: (a) in-house production and (b) outsourcing through subcontracting relationships. The decision is not only based on commercial considerations but technological competency.

With almost all types of parts and components such as non-body, engine and transmission parts, Proton prefers to outsource domestically in order to reduce costs. The decision to produce in-house or outsource domestically will depend on the comparative costs and benefits of the alternatives.

Outsourcing is common practice in Proton corporate policy which looks into commercial advantages particularly related to cost reduction. Additional investment could lead to the increase in the overhead costs. Most of the automobile parts and components are customized items specific to the models. Therefore, this additional investment cost is

shifted to the suppliers, as they already possess lower overhead costs and their own expertise. At the same time Proton is willing to assist them in order to ensure quality and price and particularly, to comply with all the requirements.

Proton has to be very careful in the selection of suppliers and must control the quality of their suppliers in order to maintain high quality. Suppliers undergo a very harsh scrutinization process before being appointed as suppliers. Proton gets to know the suppliers through its own search process and the suppliers also introduce themselves to Proton. Some may approach Proton through the Vendors Development Department of the Ministry of Entrepreneurs Development (MED) or the Proton Vendors Association (PVA) may introduce them, but this is less common. Thus, suppliers have to be aware of, and familiar with, all the requirements of Proton before being appointed.

One of the most critical strategic decisions indicated by the informants is the selection of the “right” supplier to be involved in NPD. Besides that, Proton prefers to use standard criteria as devices in the selection of vendors. Table I present the criteria according to Proton’s preferences. The top priority given in selecting the supplier are criterion numbers 1, 2, and 3 and these are categorized as “usually practiced” by Proton (51 – 90% of the time). While factors numbered 4 and 5 were categorized as “occasionally practiced” (21 – 50% of the time). From the beginning Proton has given much attention to quality, cost, and delivery (QCD) matters.

**Table I: Criteria Commonly Used in the Selection of Suppliers**

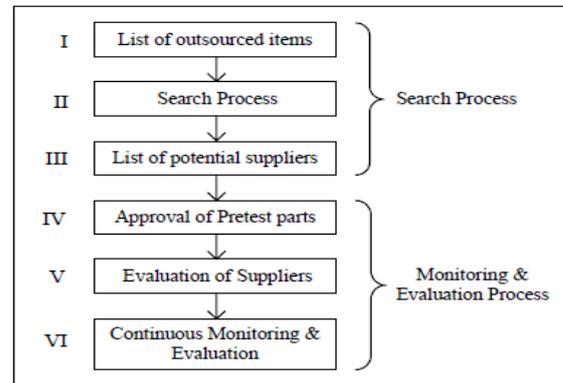
1. Technology (including tooling, design & development planning, and technology support);
2. Quality, Cost, Delivery (QCD);
3. Suppliers’ reputation (including mass production capability, ISO standards possessed, financial and management strength);
4. Degree to build team relationship; and
5. Overall value improvement (including R&D capability, &VA/VE practices).

Source: Abdullah & Maharjan (2003)

Selection and supplier development is a time-consuming processes taking almost thirteen months before they start the first trial production, followed by mass production. The typical lead-time from the pre-selection of a vendor to the mass production stage is between 15 and 27 months. Once the supplier has been selected and appointed by Proton, they will receive assistance from Proton in terms of financial assistance, technical assistance, and other-related assistance including technical or product management, financial management, information technology system, and the like. As the suppliers were showing good results in terms of cost and quality, Proton gradually outsourced more from them and also rendered assistance to improve the capability of the local vendors.

Although supplier selection and evaluation information is useful for supplier selection and supply base reduction decisions, it is also an important

information input for supplier development. Supplier evaluation, or grading, may thus be a part of a supplier development effort and should be a prerequisite to more extensive supplier development activity. The monitoring and evaluation process for suppliers in Proton is shown in Figure I below.



Source: Abdullah et al. (2008)

**Figure I: Monitoring and Evaluation Process of Suppliers in Proton**

As these products need high levels of capital investment and are highly capitalised, Proton implemented the “No Replacement for Investment” policy. This means that once particular suppliers invested capital to produce specific parts, Proton would not change to other suppliers or sources. It is important to note that, developing a new product locally requires a lengthy period of product development. While it depends on the type of product and the complexity of the technology applied, basic production will take about 18 months, and almost four years is needed for high technology products. Given this situation, one can easily understand why Proton tries to avoid making new investments in producing these parts and components.

### 3. LITERATURE REVIEW

Before the 1980s, automakers’ relationships with suppliers were characterised by short-term contracts, arms-length relationships and multiple suppliers per part (Helper, 1991). However, moving forwards, researchers have shown evidence of a movement to closer and more cooperative supplier-OEM relationships like those found in the Japanese auto industry (Cusumano & Takeishi, 1991; Dyer & Ouchi, 1993; and Helper, 1991). The close supplier-manufacturer relationships observed in Japan’s auto industry are thought to be a key factor in the success of Japanese manufacturers by contributing to decrease development time, lower costs, and increased product quality (Bozdogan et al., 1998; Clark & Fujimoto, 1991; and Dyer & Ouchi, 1993).

Recognizing the advantages of Japan’s approaches to supplier management in product development, American and European automakers have begun to adopt the Japanese practices (Bertodo 1991; and Ellison et al., 1995). This indicate that they are giving increased responsibility to suppliers and invite them to

be involved in product development more deeply at an earlier stage in new vehicle development. Several high profile companies that follow such initiatives are Dell, HP, and Wal-Mart, which have close collaborative arrangements with their trading partners (Prakash & Power, 2009).

In today's competitive business climate, firms collaborating with their suppliers have emerged as a dominant theme in the supply chain management literature (Burt et al., 2003; and Horvath, 2001). Suppliers' involvement is becoming more important in the development of new products and technical innovations in vehicles (Helper & Sako, 1995; and Keenan, 1996). Suppliers' involvement in product development has commonly been defined as the extent to which a buyer organisation shares responsibility with a supplier organisation for the development and design of the subsystems (or components) of a new product (Takeishi, 2001).

It involves long-term cooperative efforts between the primary firm and its suppliers to upgrade the suppliers' technical, quality, delivery and cost capabilities, and foster on-going improvements (Hahn et al., 1990). The ultimate goal of these programs is for mutually beneficial relationships that will help both firms to compete more effectively in the marketplace (Watts & Hahn, 1993).

Numerous scholars have argued that buyers can benefit from involving suppliers in the development process rather than working independently (Prakash & Power, 2009) when it comes to market timing of new products, product quality, technologically advanced, defect-free products, development cost, and product cost (Handfield et al., 1999; and Wynstra et al., 2001). Further, cross-sectional studies show that collaboration between buyer and suppliers has a positive impact on the financial performance of firms (Johnston et al., 2004; Vickery et al., 2003; and Wisner, 2003). In addition, comparative studies show that firms in supply chains with high levels of collaboration have greater competitive advantage than those in less collaborative supply chains (Myhr & Spekman, 2005).

However there were also studies showed negative results from the suppliers' involvement in product development. For instance, it may be costly and slower since supplier involvement can add more complexity to management (Littler et al, 1998). Moreover, the supplier involvement in product development resulted in increased product and development cost, worst product performance, and longer development times (Von Corswant & Tunailv, 2002).

One of the key issues in managing suppliers' involvement is determining which type of involvement a manufacturer should have with the various suppliers that may be engaged simultaneously in a development project.

The extent of supplier involvement varies significantly across organisations. Supplier's involvement in new product development should not be restricted to a relationship between supplier and customer at one specific level of the above-mentioned

chain. Rather, a supplier is well-advised to consider information provided by customers at all levels further down the chain of relationships (Brockhoff, 2003). Flynn and Belzowski (1996) suggested that first-tier suppliers are taking on larger responsibilities for design and quality. In some cases, first-tier suppliers are performing the functions of systems integrators for the second- and third-tier suppliers.

Takeishi (2011) found that the quality of the component design developed jointly by an automaker and a supplier is related to three areas of the automaker's supplier management. The three areas are problem solving pattern, communication pattern, and knowledge level. In particular, the automaker's early, integrated problem-solving process with the supplier, frequent face-to-face communication between the automaker and the supplier, and the level of architectural knowledge for component coordination by the automaker's engineers; all have a positive effect on component design quality (Takeishi, 2011).

Buyer-supplier collaboration implies that all project members contribute their ideas in the process of resolving issues and making decisions (Ford & Randolph, 1992), develop higher levels of support and trust for each other (Sethi, 2000), establish a positive affective tone among the project members (Wech et al., 1998), improve their identification with the joint-decisions, and hence directly support their implementation (Vroom, 1987).

Consistently, a central message of Clark and Fujimoto (1991) is the importance of integrated problem solving in product development. Along with problem solving, communication is another key variable for suppliers' involvement in new product development research (Brown & Eisenhardt 1995). The importance of both internal and external communication for the performance of product development organisations has been long emphasized by various researchers (see Ancona & Caldwell, 1992). Dyer (1996) reported that Toyota and Nissan had more frequent face-to-face contact with their suppliers than US automakers, and that this contributed to their shorter model cycle. He also found that the two Japanese automakers had more guest engineers at their sites than the US firms, indicating the importance of extensive communication between co-located engineers.

### **Conceptual Model**

Considering the issues that emerged from literature, the proposed relationships among suppliers' involvement in product development and suppliers' organisational performance is modelled in Figure II. In this study, the suppliers' involvement can be seen from five areas, i.e. communication and information sharing, participation involvement in different stages of NPD, joints strategic program, and design capabilities.

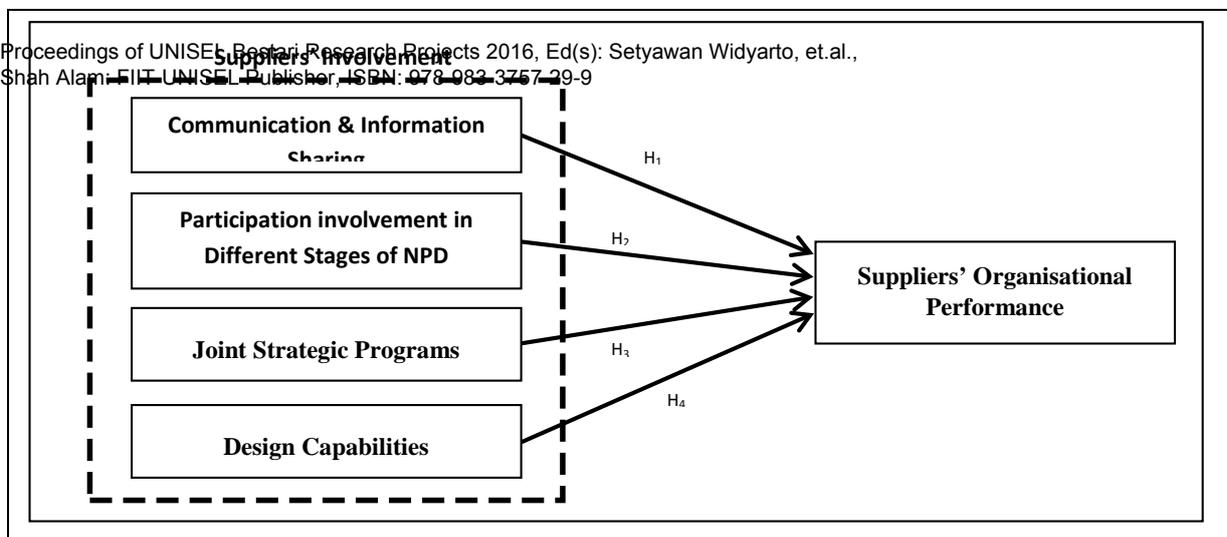


Figure II: Theoretical Framework

This model proposed that suppliers' involvement in those areas may have an influence on suppliers' organisational performance. The literature implicitly assumes that suppliers are able to meet or exceed the quality standards and technological expectations of the firm, and subsequently improve performance.

#### 4. METHODOLOGY

The population for this study is suppliers companies registered with Proton from all over Malaysia. The suppliers in the study are the automobile parts and component manufacturers supplying to Proton, also referred to as vendors. Currently, there are 114 Suppliers Companies of Proton and the sources of listing of these companies can be obtained from Proton's website.

The distributions of questionnaires are made during vendor briefing at the Centre of Excellence Proton Edar, Shah Alam. With liaison of Proton's personnel, the researcher takes the opportunity during the courses to have a special session with the Proton suppliers' staff for half-hour briefing about this study and the questionnaire.

For this study, 130 questionnaires are distributed to the selected suppliers' staff. After checking all the returned questionnaires, only 121 have been returned, making the percentage of response rate is 93%. It thus clearly supported within literature that response rate above 30% is good and acceptable level when the research uses survey questionnaire (Cooper & Schindler, 2003).

#### The Instruments

The questionnaire employed by the present study consists of four parts, starting from Section A to Section D. On top of that, a covering letter containing the purpose of the study, ethics approval, and researcher contact information was included on the front page of the questionnaire. Section A is focuses on the organisational information such as location, year of establishment, length of time as a vendor to Proton, number of employees, and type of industry involved. Section B captures information on the respondents'

demographic profiles such as gender, age group, marital status, ethnicity, education level, job position, working experience, and length of years in current position.

Further, Section C consists of 21 items regarding the four areas of suppliers' involvement. Finally, Section D refers to four items asking on the perception of suppliers' organisational performance. All items for Section C and Section D were measured on a six-point Likert scale with the anchors 'strongly disagree' (1) to 'strongly agree' (6). Six-point Likert scale is used in order to avoid respondents chooses the 'neutral' option such as in five-point Likert scale. This is done in order to extract a specific response from the respondents.

This study adapted the measurement used to operationalise the constructs included in the investigated model from relevant previous studies, making minor wording changes to tailor these measures to the Malaysian automotive industry context. Table II lists all the constructs, the definitions of the constructs, and number of items used to measure each construct.

Table II: Operationalization of the Constructs

Construct	Definition	Items
Communication & Information Sharing	Perceived agreement on the supplier-buyer's method, phases of communication, & knowledge sharing.	6
Participation Involvement in Stages Of NPD	Perceived agreement on involvement in NPD such as in setting design and others.	5
Joints Strategic Program	Perceived agreement on the joint strategic programs such as in education & training, design modification, & problem solving.	5
Design Capabilities	Perceived agreement that suppliers' can be involved in design efforts in Proton.	5
Suppliers' Org. Performance	Perceived agreement of suppliers' performance in term of quality, design, cost, and time efficiency.	4

### Empirical Model

The relationship between the suppliers' involvement in product development and suppliers' organisational performance will be examined by conducting the standard multiple regression analysis. The model used to determine the influence of suppliers' involvement on suppliers' organisational performance is shown in the equation below:

$$SOPerf = \alpha + \beta_1 CIS + \beta_2 PIDSNPD + \beta_3 JSP + \beta_4 DC + \varepsilon$$

Where, *SOPerf* refers to the suppliers' organisational performance. The areas of suppliers' involvement are measured using *CIS* (communication and information sharing), *PIDSNPD* (participation involvement in different stages of NPD), *JSP* (joints strategic program), and *DC* (design capabilities).

## 5. RESULTS

### Suppliers' Organisational Profile

The result reveals that majority of the Proton's suppliers are located in Selangor (81.0%) while other five suppliers are located in Penang and Perak, respectively. Most of Proton's suppliers are very well-established with 16 to 35 years of establishment. Majority of the supplier companies has established a long-term relationship as supplier-buyer with Proton since 33.9% of the suppliers has been a vendor to Proton in between 16 to 25 years, while three of them have been a vendor to Proton for more than 36 years.

Most of supplier organisations with have employees in between 100 to 400 and less than 20% of the respondents from supplier companies with more than 701 employees. These suppliers of Proton are from diverse type of industries such as metal (27.3%), rubber and plastic (28.1%), electronics and electrical (15.7%), and other industries (28.9%). The reason for having suppliers from diverse industries is Proton have produce several parts classification such as body parts, engine parts, transmission and wheel rim, suspension parts, electrical parts, and general parts.

### Respondents' Profile

Respondents of this study consists of composition between 86.0% of male and 14.0% is female. Majority of them has been married (81.0%), while another 19.0% is single with most of the respondents' age is between 36 to 45 years. Respondent are from ethnicity of Malay (67.8%), Chinese (24.0%), and followed by Indian (5.8%).

57.9% of respondents had acquired education up to Bachelor's degree and most of them are in the position of executive constituting 34.7% of the sample, followed by manager (24.8%) and top management (19.8%). Nine (7.4%) respondents have served more than 25 years in the field of automotive industry, while almost 43.8% of the respondents work with this industry in between five to 15 years. A total of 48.8% individuals surveyed had been assigned in their current position for less than five years. Only ten respondents hold their current position for more than 15 years or longer.

### Overall Suppliers' Organisational Performance

As seen in Table III, the level of suppliers' organisational performance was measured using a six-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (6).

The results from the Table III show that the majority of respondents have a positive agreement about the overall organisational performance showed by supplier firms to Proton. The suppliers' organisational performance in term of comply with the design required by Proton shows the highest mean score with 4.86, followed by comply with quality output (4.85), produce at time required (4.68), and minimise cost (4.51), respectively. Overall, this result indicates that the level of suppliers' organisational performance is at satisfactorily level.

These results indicate that suppliers of Proton have the capabilities to meet Proton's requirement in term of design, quality, delivery time, and cost capabilities. This result is perhaps a successful outcome from the "ongoing assistance" effort introduced by Proton. The measures emphasized by Proton include factory layout, equipment and process, process control, production planning and control, utilization of manpower, materials handling and inventory, and most important is product quality (Abdullah et al., 2008).

**Table III: Degree of Agreement on Suppliers' Organisational Performance**

Attributes label	Mean*	Rank
Supplier is able to comply with quality output.	4.85	2
Supplier is able to comply with the design required.	4.86	1
Supplier is able to minimize cost.	4.51	4
Supplier is able to produce at time required.	4.68	3

### Suppliers' Involvement in Product Development

Table IV highlights the mean scores for the suppliers' involvement in product development. In general, all items have a mean higher than four (out of six). This indicates that suppliers of Proton are involved in all four areas under considerations.

The highest mean scores for areas of suppliers' involvement is communication and information sharing (4.77), and the lowest mean scores was design capabilities (4.17). It is possible to conclude that suppliers are able to communicate with Proton during several different stages such as concept, first prototype, and full production stage. This result can be supported by frequent visits practiced between Proton and its suppliers especially during new product development. According to Abdullah et al. (2008), automakers increasingly give suppliers more responsibilities with regard to the design, development and engineering of components.

Another area of suppliers' involvement that has low mean value is participation involvement in different stages of NPD. This result indicates that

suppliers are having lack of opportunities in participating in NPD team in Proton. Suppliers also are less likely to involve in defining architecture of new products, in setting and product design, and prototype building and small scale.

**Table IV: Descriptive Statistics for the Suppliers' Involvement in Product Development**

Variable	Mean	Min	Max
Communication & Information Sharing	4.77	1.00	6.00
Participation Involvement in Different Stages of NPD	4.19	1.00	6.00
Joints Strategic Program	4.37	2.00	6.00
Design Capabilities	4.17	1.00	6.00

**The Impact of Suppliers' Involvement in Product Development on Suppliers' Organisational Performance**

This section presents the results on the impact of suppliers' involvement in product development at Proton on suppliers' organisational performance. The results in Table V show that the regression of model ( $F(4, 121) = 30.264, p \text{ value} = 0.000$ ) is significant at the 1% level, and the overall fit of the model is moderate with  $R^2$  of 51.1% of the variation in the suppliers' organisational performance. This indicates that 51.1% of the variation in the organisational performance of Proton's supplier companies can be explained by the four independent variables specified in the model.

Result in Table V indicates that suppliers' involvement in *communication and information sharing*, joints strategic program, and design capabilities was positively related to suppliers' organisational performance, thus Hypothesis  $H_1$ , of  $H_3$  and  $H_4$  was supported. Unfortunately, the results in Table V reveals a negative influence on the suppliers' performance when suppliers' involved in different stages of NPD in Proton, and it is not statistically significant. Therefore, this result leads to rejection of hypothesis  $H_2$ .

When comparing the contribution of each independent variable to the prediction of the dependent variable (suppliers organisational performance), the Beta Value under Standardised Coefficient is referred to. Beta (Standardised Regression Coefficients) is a measure of how strongly each predictor variable (independent variable) influences the criterion variable (dependent variable). The higher beta value indicates the greater the impact of the predictor variable on the criterion variable.

Results in Table V show that the suppliers involvement in joint strategic program variable makes the strongest contribution to the prediction of suppliers' organisational performance ( $\beta = 0.413$ ), when the variance explained by all other variables in the model is controlled for, followed by the design capabilities ( $\beta = 0.348$ ), and communication and information sharing ( $\beta = 0.256$ ). On the other hand, the beta value for the participation involvement in different stages of NPD was the lowest ( $\beta = -0.176$ ), indicating that it made less of, and not a significant contribution with a  $p$ -value of more than 0.10.

**6. CONCLUSION AND DISCUSSION**

This research seeks to gains more comprehensive understanding on the achievement of suppliers' organisational performance due to the suppliers' involvement in product development at Proton. Focusing on the 121 respondents from 114 Suppliers Companies registered with Proton, quantitative research methods through survey questionnaires were used to get an in-depth view about the problem.

Overall, this study found that the level of suppliers' organisational performance is at satisfactorily level. Suppliers of Proton have the capabilities to meet Proton's requirement in term of design, quality, delivery time, and cost capabilities. Further, the results of the survey show that suppliers' participation in communication and information sharing, joints strategic program, and design capabilities with Proton have positive influence on the suppliers' organisational performance.

**Table V: Standard Multiple Regression Results between Suppliers' Involvement in Product Development and Suppliers' Organisational Performance**

	Hyp	Std. Beta Coeff.	t-statistic	p value
Intercept			4.080	0.000***
Communication & Information Sharing	$H_1$	0.256	2.920	0.004***
Participation Involvement in Diff. Stages of NPD	$H_2$	-0.176	-1.569	0.119
Joints Strategic Program	$H_3$	0.413	4.414	0.000***
Design Capabilities	$H_4$	0.348	3.654	0.000***
$R^2$ value (%)				51.1
F-value				30.264
Sig. value				0.000***
No. of Obs.				121

Note: Association is significant at \*\*\* 1% level, \*\* 5% level, respectively, using two-tailed tests.

Involvement in joints strategic program with Proton is the main area of suppliers' involvement that highly influenced suppliers' performance. This result is consistent with Abdullah and Maharjan (2003) where they argued that a supplier partnership is characterised by joint decision-making between the buyer firm and supplier. They make relation-specific investments such as sharing strategic planning, sharing production information, and utilizing each other's expertise in product and process design, thereby creating synergies between the buyer and suppliers firms. This subsequently will enhance suppliers' performance.

**Suppliers' involvement in design capabilities** is another factor that may enhance suppliers' organisational performance. This strategy is consistent with the Japanese strategic industrial sourcing model which passing the responsibility for design and manufacture to the first tier suppliers (Rees, 1996). This is a sign of changing patterns in the buyer-supplier relationship observed in the Malaysian automobile industry where automakers increasingly give suppliers more responsibilities with regard to the design, development and engineering of components.

The study also suggests that communication and information sharing may be critical to the success of the suppliers' organisational performance. According to Ragatz et al. (1997), the more intensive and frequent the communication between channel members, such as buyers and suppliers, the more likely it is that ambiguity in the message will be reduced. When information about the content and the status of the joint work product is frequently shared, all project members are likely to be better informed and can incorporate this up-to-date information in their own work. Consistent with the findings of this study, Mohr and Nevin (1990) suggests that communication frequency and intensity have positive influences on channel results (e.g., coordination, satisfaction, commitment) and enhances channel (i.e. buyers and suppliers) performance in terms of effectiveness and efficiency.

Unfortunately, suppliers' participation involvement in different stages of NPD does not contribute to the performance of supplier companies. Perhaps, from Proton's perspective, local suppliers currently having lack of design capability and offered uncompetitive costs. The main causes leading to the former problem are lacks in several areas such as design engineering capability, application method for process and production technology, planning and management, particularly in production and process-management, experience, lower "catching up" capability and the like. The second key problem is due to suppliers having to make high royalty payments for technical assistance, insufficient machinery and tools, and having to depend on services provided outside of their own company, which leads to high overhead costs and uncompetitive cost proposals to Proton.

### **Practical Implications**

This study finds that suppliers' participation in joints strategic program, communication and

information sharing, and design capabilities positively influence suppliers' organisational performance. The finding of this research might lead not only to a better understanding of suppliers' participation behaviour but also to better planning of suppliers' involvement from the suppliers side. In future, suppliers will have better on the expectation of Proton.

One managerial implication is the need for suppliers to consider several improvements in their organisations. First, employees at all levels of the supplier firms must create such an atmosphere of earnest collaboration with Proton on a daily basis. In this regard, to ensure a partnership-like climate, it is important to counteract sentiments of buyer dominance over suppliers (e.g., "the customer is king") or any sense of technical superiority of any firm over the other.

Second, the management of supplier firms should take action to achieve a maximal level of communication between the buyer and supplier members. It is, however, important to ensure that management are aware that projects can suffer from too much communication and that the number of exchanges needs to be managed carefully. Finally, Proton should evaluate potential suppliers not only on the basis of technical competencies, product qualities, and/or price considerations for the future component but also in terms of a "collaborative fit" with its own development organisation.

### **Future Research**

The following limitations should be kept in mind as the reader evaluates the results reported in this study. First, given the small number of respondents from the total number of suppliers for all car manufacturers and car assemblers in the Malaysian automobile industry, a new theoretical conclusion is not able to be drawn still, but this study is able to provide the case of Proton exclusively as one of the car makers in the Malaysian automobile industry. However, this restricts the immediate generalisability of our findings by geographic region. Nevertheless, this study encourages further research to assess whether our findings replicate in other firms contexts (e.g. other car manufacturers) and other geographic areas.

Second, this study examined relatively simple hypotheses on relations among communication and information sharing, joints strategic program, suppliers' participation involvement in different stages of NPD, design capabilities and suppliers' organisational performance, based on a cross-sectional data set. However, it is likely that these factors are related in a more complicated and dynamic manner. For example, a certain nature of inter-firm relations would allow suppliers to improve certain internal capabilities, which then improve the quality of inter-firm relations in the next stage. Therefore, extending this study to further investigate what types of internal capabilities and inter-firm relations, and

how they interact with each other over time is a promising direction for future research.

Finally, in order to improve the relationship, there are other factors not included in this model that could impact the relationship between suppliers' involvement in product development and suppliers' organizational performance. Therefore, it is suggested to add other factors (such as efficiency, technology transfer, or technical competency) as independent variable. It can allow supplier-buyer to interact and exchange knowledge to each other and it will improve the supplier output. The limitation of the research is that this research did not use any secondary data (such as financial reports) to cross-check suppliers' organisational performance.

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