

**COLLABORATIVE PRODUCT DEVELOPMENT IMPLEMENTATION BETWEEN
MALAYSIAN AUTO SUPPLIERS AND THEIR CUSTOMER**

PROF. DR. MOHD RAZALI MUHAMAD

Paper Presented at the Proceedings of the 2nd IIEC – 2004, December 19 – 20, 2004
Riyadh, Kingdom of Saudi Arabia

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

COLLABORATIVE PRODUCT DEVELOPMENT IMPLEMENTATION BETWEEN MALAYSIAN AUTO SUPPLIERS AND THEIR CUSTOMER

N. Mohamad

School of Electrical and Electronic Engineering
Universiti Sains Malaysia, Engineering Campus
Malaysia
norizahm@hotmail.com

M. R. Muhamad

Faculty of Manufacturing Engineering
Malaysia National Technical University College
Malaysia
mohdrazali@kutkm.edu.my

H. Hussain

A.R. Songi

S.N.Othman

Business Advanced Technology Centre
Universiti Teknologi Malaysia
Malaysia

ABSTRACT

Whilst the evidence indicated that supplier involvement in product development resulted in reduced development cost, improves product quality, reduces lead time and enhances flexibility, the mechanism for adapting and managing it to fit another culture and organisation is a challenging endeavour. In the Malaysian automotive industries, this collaborative effort had been mostly motivated by the government policies and initiated by the anchor firms. The work reported in the paper describes features of this collaboration carried out by Proton, the pioneer automotive manufacturing company in Malaysia. The objective of this paper is to examine the factors for successful collaborative product development endeavours. The study identifies how collaborative product development is presently being organized and managed in the automotive industry in Malaysia. The product development process is traced to the three aspects involved in collaborative product development; the buyer, the supplier and the process that involves both parties. The findings from this study suggest that from the buyer perspectives, selection of suppliers determines the success of this effort. For the supplier, it is important for them to have technical and design expertise. Factors that involve both the suppliers and buyers include early supplier involvement and buyer-supplier relationships.

KEYWORDS

Suppliers, automotive industry, product development, collaboration, manufacturing capability

1 INTRODUCTION

The 1990's have witnessed an increasingly competitive market generally perceived to be demanding higher quality and higher performing products in shorter and more predictable development cycle time. In this fluid industrial environment, the significant role of new product development for organisational survival is generally acknowledged. In fact, generation of new products has become so important to the livelihood of companies that without them they could barely survive. Examples can be cited from 3M Company that targeted thirty percent of sales are to be generated from new products in its four years of business whilst Hewlett Packard's new products in the last two years represent sixty percent of sales (Stevens, 1998). Such successes have been partly attributed to the development and implementation of collaborative product development. Close working partnership between suppliers and customers has brought about the necessary synergy or strategic advantage for improved manufacturing performance. Supplier involvement in new product development has enabled assemblers in the automotive industry, for example, to improve time, cost and quality performances (Clark and Fujimoto, 1991).

In view of the current trend in the automotive industry, the strategy to include suppliers in the product development by Proton conforms to the strategy used by other global car manufacturers. In this paper, a brief overview of the development of the Malaysian automotive industry is provided. A literature review on collaborative product development is presented. This is followed by the reasons for conducting the study. The objective of this study is to identify the factors that contribute towards successful collaborative product development. These have been identified from literature review, the customer's criteria (check list) for selection of suppliers and interview with a few managers involved in product development. The brief profiles of the three companies that form the case study are also included. We will then discuss how the three companies demonstrate these factors.

2 THE MALAYSIAN AUTOMOTIVE INDUSTRIES

The history of the automotive industry in Malaysia had started before the 1960s when it imported completely build-up units (CBU) from Europe, Japan and the United States. The industry has significantly contributed to the development of the national economy in terms of manufacturing output and employment. It is also seen as a catalyst for industrial growth that has spin off many new businesses in various related industries such as the steel, electronics, metal, rubber and textile industry. The various policies implemented by the government such as the Local Content Programme and the Mandatory Deletion Programme have helped to promote the industry. This has contributed towards a tremendous transformation in the way the automotive industry is run. The industry has moved from an assembly based in the 1960s and 1970s into the manufacturing of motor vehicles and component parts in the 1980s and the 1990s.

Proton, the first National Car Project was launched in 1983. The first car that was rolled out in 1985 was a joint venture between Mitsubishi Motor Corporation and Heavy Industries Corporation of Malaysia (HICOM). During the initial stage, Proton's growth was driven by

strong domestic demand and support. However, during the recession, local demand had dampened and impacted Proton. The situation has since then recovered from 1987 onwards. Following Proton's success, the second national car project, Perodua was set up in 1993. Perodua was mandated to produce cars with smaller engines (below 1 000 cc) and targeting the lower income group of the domestic market.

The establishment of auto parts vendors that manufactured car parts only existed after the automotive industry materialised in 1983. Before that period, automotive parts and accessories were produced as replacement items for imported vehicles. The National Car Project has provided the basis for the development of local components industries as well as enhanced utilization of local components. In the Vendor Development Programme (VDP) launched in 1988 and monitored by the government, Proton guarantee the market to their vendors, while financial institutions provide loan to vendors. This policy has created new players as well as has given components parts manufacturers the scale of production necessary to become viable.

With the introduction of ASEAN Free Trade Area (AFTA), all trade barriers will be removed and this will inevitably have impact on the Malaysian automotive industry. In preparation for AFTA, Proton has propels itself to join the rank of other world player. Proton has focuses on putting more effort on R&D and also demands their vendors to put more emphasize on R&D. The Waja, which boasted 95 per cent local content and marketed as 'the locally designed car' was a concerted R&D effort between Proton and its suppliers. Other than cost and speed, Proton has also shifted its focus to the quality of its cars. This is to enable Proton to penetrate the global market. It is seen that by working closely with Proton and taking on more R&D, design and engineering responsibility themselves, these vendors can hasten the manufacturing process and improve on product quality whilst allowing the national car to better utilise its resources (Gabilaia, 2001).

3 COLLABORATION IN PRODUCT DEVELOPMENT

Collaboration as defined by Mowery (1988) is a venture between two firms that focus on long-term benefits and spanning activities such as product development, manufacturing and marketing. It also includes substantial contributions by partners of capital, technology, know-how, or other assets. There are various forms of collaborations, the most prevalent being joint venture, joint R&D agreements, technology exchange, direct investment, licensing agreements and customer-buyer relationships (Forest and Martin, 1992). These involvements can take at various phases of the supply chain: the purchasing, the product development process and logistics. Some literatures used more specific terms such as supplier involvement in product development and co-design. These terms are useful to avoid confusion when addressing collaboration. For example, there is collaboration with other global players to derive benefits that include economies of scale in production, access to market of the partner's territory, taking advantage of technological, production and design strengths of partner. In fact, collaboration has extended beyond partners to include competitors, for example the automotive trade exchange between General Motors, Ford and Daimler-Chrysler.

In collaborative product development, suppliers and customer are seen sharing and modifying design documents (Sahay, 2003). Supplier involvement may range from the simple consultation on design ideas and suggestions to making suppliers fully responsible for the complete development, design and engineering of a specific part or sub-assembly. (Ragtz et al., 2002; Wynstra and Pierick, 2000). The benefits of involving suppliers have been realised across the supply chain. These include; increased market share, inventory reductions, improved delivery service, improved quality and shorter product development cycles (Corbett et al., 1999). From a more specific level, it is seen that many leading companies in a variety of industries have made successful efforts in involving their suppliers in product development or outsourcing their product development to suppliers (Quinn, 2000). From their review of the various studies, De Toni and Nassimbeni (2001) have listed the following benefits of co-design effort to the buyer or customer such as;

- i. Take advantage of the technological competence of the supplier
- ii. Shorten the time to market
- iii. Improve the quality and lower global cost
- iv. Increase the level of motivation of suppliers, because the suppliers become responsible for the whole product and not just 'piece' of it.

Gugler (1992) views collaboration as a risk and cost sharing effort. With suppliers having to specialise and concentrate on a certain components or sub-system, they are able to develop in-depth knowledge, skills and innovative capabilities (Quinn, 2000). By partnering with customers, firms have access to improved information, capabilities and resources that would otherwise be unavailable. It is seen that involvement in product development has allowed suppliers to access new markets for their product (Littler et al., 1993). Although collaboration in product development has been widely used and assumed to bring the benefits, it was found that close cooperation with customers during collaboration in product development does not necessarily improve the effort as compared to product development performed in-house (Campbell and Cooper, 1999). Leakage of firm's skills, experience and knowledge (that form the competitiveness of the firm) to competitors via partners may occur due to the flow of information during the process (Hamel et al., 1989)

4 COLLABORATIVE PRODUCT DEVELOPMENT STUDY

4.1 Scope of the Study

Studies in collaboration in product development will inherently involve three (closely related) aspects; the customer (buyer), the supplier and the relationship between the customer and the supplier. This study will focus primarily on the supplier and the relationships involved with the customer. It is important that both parties actively participate in the collaboration effort. But the onus is mostly on the supplier, since if they do not perform then they may not be considered for the next contract. Hence the decision to focus on the suppliers and not on the assemblers was taken for the following reasons:

- (1) Buying firm that encounter shortcomings in supplier performance and/or capabilities have several alternatives: (i) invest time and resources to increase the performance of their present suppliers (ii) manufacture the purchased items in-house; (iii) search for alternative supplier and (iv) choose some combinations of the previous three (Krause et al., 1998).

At Proton, the most likelihood of consequences of firm failing to deliver product as set in the requirement are (i) lose current contract and (ii) lose next contract. The most likely consequences if firm successfully deliver product is getting long term business.

Other automotive parts firms in the Asian region are also recognising the importance of taking substantial responsibilities in the design of products. Assemblers including Proton will be looking for suppliers that can deliver low-cost quality parts and at the same time able to take responsibility for development (Veloso and Kumar, 2002). Hence,

- (2) In view of the current market competition, Proton will outsource the parts and components to the most competitive suppliers. This means that the present suppliers will have to compete with other suppliers; local and outside Malaysia.

There is a need to identify the potential benefits and factors associated to the success of this effort from the perspectives of the suppliers, considering the urgent need for the present (local) to be more competitive. If managers are to employ this strategy and justify the considerable effort and costs required, the processes and the potential benefits of this approach must be better understood. The results of the research can be used to help the organisation in focussing on what areas to concentrate and what additional factors to be incorporated. It can only provide guidelines for the suppliers that are involved to improve their firm's standing and as a guide for those firm that are just beginning to venture into collaborative product development with customer.

In this study, self administered questionnaire and an open ended interview were carried out with managers involved in product development activities from companies involved as vendors to Proton. Customer's new supplier sourcing forms were also reviewed for the relevant information. Due to space limitations, only three companies will be discussed. Due to obvious reasons the names of the companies are not disclosed.

4.2 Factors for successful collaborative product development

The following factors are proposed and are deemed to be important for successful collaborative product development:

- (1) Supplier technical and design capability
- (2) Supplier management capability
- (3) Supplier manufacturing capability
- (4) Supplier financial capability
- (5) Specific buyer management techniques; early supplier involvement and integration of supplier in product development team
- (6) Specific buyer input; information from customer

(7) Specific relationship factor; trust and communication

Items 1, 2, 3 and 4 have been identified as the criteria (check list) used by the customer (Proton) in their initial stage of selecting suppliers. The other factors were extracted from literatures that demonstrate factors that contribute to successful in a various industries and have not been limited to the automotive industries. Literatures that discusses on problems associated with collaborative product development have also provided us with factors that can make this effort more successful. For example, lack of trust and communication can hinder collaborative effectiveness and efficiency (Wynstra, et al. 2001). Therefore, we have included trust and communication as the factors that are important for suppliers to be able to deliver good performance.

4.3 The Case Study Companies

Company A

The company's core business is in precision plastic injection moulding. It produces more than 200 types of products and supplying parts for the different section of the car. It supplies parts for the engine that include clutch reservoir and engine cover, interior rim part that include scuff plate and the exterior trim part which include parts like radiator grille. Whilst Proton remains as the company's main customer, it has over the years widened its customer base to include other customers in the local automotive and electrical industries. It has also ventured into business with other Asian countries. Realising the need to be in the forefront of technology, the company has put a strong emphasis on R&D. It has acquired a wide range of modern equipment and machinery including injection moulding machine and tooling injection machine to ensure its prominent status as one of the leading vendors in its area of expertise. Despite being a financially successful, the company is not public listed. The respondent is the R&D manager.

Company B

This company is a subsidiary of a bigger company that was initially involved in telecommunications and related IT business. Investments in the automotive metal industries have led to the incorporation of this company. Today, it manufactures and supplies numerous metal-based products for the automotive industry. These include system and sub-system assemblies such as coil springs and shock absorbers for the suspension system and brake drums and brake discs for the brake systems. Its customers include other automotive big names and it is also exporting some of the products manufactured. The company is public listed. Another subsidiary company set-up by the parent company is responsible for the R&D activities. The respondent is the general manager of the technical centre.

Company C

The company belongs to a group of companies that are involved in automotive parts and components. The parent company is a leading name in automotive component manufacturer and has been supplying both the original equipment market and the replacement market to many well known automotive assemblers such as Audi, Ford, BMW and Mercedes. In fact, it has received

many outstanding certificates from other automotive assembler. The product of the company includes automotive suspension systems and heat exchange systems. The respondent for this study is the Assistant R&D Manager for a division supplying an engine part to Proton.

5 DISCUSSIONS

5.1 Outcomes of collaborative product development

From the interview it has been observed that the suppliers had given priority to satisfying the customer specifications in terms of cost, quality and delivery. All the respondents have identified a reduction in product development cost and time and improved quality as critical and important. One respondent has indicated that due to their good track record of satisfying customer's specification, the company will not have to go through the customer check-list again for selection purposes. The respondents have also indicated that the collaborative effort has also given positive financial impacts to their company; improved their market share and profit. All the respondents believe this effort is the start of working towards a long-term relationship - more collaborative projects with the customer.

Other benefits such as access to new markets and sharing of risk were not fully agreed. The respondents unanimously agreed that the customer's trust in selecting their company to develop the product has helped them to gain experience in product design. Company A and B which were fairly new in the automotive business, strongly agreed that the opportunity given by Proton is the much needed support for them to lift them to greater heights in supplying parts to other customers.

5.2 Supplier's technical and design capability and manufacturing capability

One of the main determinants of successful collaborative product development is the level of the supplier's in-house technical capabilities (Wasti and Liker, 1997). It is seen that all the companies were aware that customer had placed technical capability of suppliers as top priority for selecting them. Both company A and B have put emphasis on R&D with the aim of being in the fore front of technology and thus able to provide their customers with value-added and state of the art engineering standards. It is observed that company A and B are aggressively improving their technical capability thus positioning themselves as reputable suppliers. Both companies have acquired technical partners that are initiated by the customer, to help them with the technology know-how. This strategy has paid off. Company A has indicated that the improved capability of their designers to undertake future projects. In fact, both are currently given bigger responsibilities developing a complete systems for Proton.

Company C, due to their long standing in the automotive business (the longest among the three companies) had the advantage of a good reputation as suppliers of parts and components. They were supplying Proton the parts and components that they have already experienced supplying to other assemblers. Thus, there was less urgency on investment for technological know-how. Their current project that entails them to give more design input to Proton have

Company C, an established supplier in the automotive business (the longest among the three companies) had the advantage of having a good reputation as suppliers of parts and components. They were supplying Proton the parts and components that it has already experienced supplying to other assemblers. Thus, there was less urgency on investment for technological know-how. Their current project that entails them to give more design input to Proton have steered them towards establishing a new division to focus on the particular product.

All the companies had also invested in machines that will enable them to do prototyping jobs as well as speed up production. Although testing machines are expensive investments, all the three companies had subsequently acquired a few testing equipment over the years. This was to reduce their dependency on outside testing laboratory or company.

5.3 Supplier's management capability

Proton had asked suppliers to indicate the number of their employees; professional, non-professional and whether they are local or foreigner. The firm's organisation chart was also requested. Supplier's management capability will invariably include the top management support, which has been cited by many literatures as an essential factor for successful collaborative product development. In the interview, it is seen that top management support is demonstrated through (i) the provision of human and financial resources allocated for the project; for example, one of the respondent quoted an incident where management were not keen to invest in a testing machine which will invariably cut the time waiting for the product to be tested elsewhere, (ii) promoting shared entrepreneurial vision and (iii) giving clear strategic directions which include adequate strategy for technology and innovation management.

5.4 Financial capability

It is important that company that are involved in any development projects need to have sufficient fund. In the study, it is found that companies selected by Proton to supply parts and components are expected to have strong financial record. Companies need the financial capability to acquire technology, invest in new machines and employ more employees that are skilled. From the study, it is found that most companies acquire technology by collaborating with technical partners. This will inherently need a large investment since the association with technical partners sometimes spans a number of years. In fact, company A and B have cited relationship with technical partners as their major product development spending.

Since, company B and C were public listed, it is assumed that these firms will have more allocations for more extensive R&D. Up to this point, management in company A has no plan for listing but will continue to invest in R&D using the company fund. The company is confident it will still be able to progress in terms of R&D. It is envisage that the three companies are able to move forward in terms of R&D, which will give them a competitive advantage for future collaborative work with Proton.

5.5 Early supplier involvement and integration of supplier in product development team

While supplier input can be beneficial at any stage in the development process, early supplier involvement appears to offer greater advantages. Research to date demonstrates that early phases of product development have a strong impact on production cost, life cycle cost and a product's quality performance. Early involvement is vital if suppliers are to positively influence product design. As the development process continues, it becomes increasingly difficult and costly to make design changes. Firms seeking to reduce development time while increasing quality should include suppliers as part of their design team members which may be inculcated through frequent participation on team meetings.

In the study, the three companies agree that early involvement in product development and membership in the product development team can allow them to identify design problems earlier. This will enable them to suggest solutions and permits better focus on design for manufacturability. This will lead to reduced product development time, reduced cost and improved quality. All the three respondents admitted that their company's level of technological capability will influence Proton's decision to include them in the product development process.

5.6 Specific buyer input; information from customer

The effect of the changing supplier roles from supplying parts to collaborating in product development and design has inevitably changed the amount and the way information is handled. Furthermore, information provided by customer has effects on how the supplier can provide suggestions and recommendations for the product design. In the study, all the suppliers commented that they are sometime denied the opportunity of interjecting their expertise into engineering design because customer frequently fail to provide them with sufficient information pertaining to the function and fitness of the design project. Moreover, there are occasions when suppliers also have to cope with incomplete and changing information. This has impacted on the way company can contribute to the project.

In the study, customer did not share proprietary information with suppliers. This is to preventing leakage of information to competitors and safeguarding company's strategy. The three suppliers do not think that sharing of proprietary information will help them in the project. But, sharing of technology roadmap can be helpful in achieving long- term alignment between the two parties.

5.7 Specific relationship factor: trust and communication

Many literatures have emphasized and demonstrated the importance of relationship development as a precursor to effective supplier involvement in product development. Collaboration relationship requires trust. Trust is often included in most relationship models with empirical findings suggesting that trust is an integral factor of successful relationship. It is important to have a trusting relationship between partners so that the effort can be efficiently managed (Sahay, 2003). With trust, each party has a mutual confidence in other member's capabilities and action. Since, collaborative product development is perceived as a move towards a long-term

relationship, trust from business partners is not only important in the context of current relationships, but can also help organisation through tough times (Lusch, et al., 2003).

Effective formation of collaborative ventures requires efficient communication at all levels. If the communication is cumbersome, it can slow down the decision process during the collaborative effort. Differentiating the suppliers according to the complexity of the product being developed helps to determine the information's flow of direction, the modes of communication used and the amount of communication, the topics discussed and the functions involved (Wynstra and Pierick, 2000). The success of the supplier-customer relationship also depends on the frequency of interaction between partners (Sahay, 2003).

All the respondents agreed that a relationship that focuses on trust and has good communication can help them to perform better. Customer should place more emphasis on building and maintaining the strong relationships and focus on increasing the longevity of the relationship.

6 CONCLUSIONS

The study has shown the importance of suppliers' involvement in customer's product development activities. The collaborative relationship that occurs between the suppliers and customer during the product development activities had resulted in lower development cost, shorter product development time and improves the quality of the products. The main query is who should play the lead role- customer or supplier? Suppliers need to address and improve their technological, manufacturing and financial capability because these are the criteria required by the customer. Suppliers can also adapt and maximise its available technological, manufacturing and designing capability to accommodate and fulfil the customer's need. On the part of the customer, it can improve suppliers' contributions by including the suppliers early in its product development process and providing adequate product information to suppliers. More importantly, both parties need to work together towards strengthening the relationship factors such as communication and trust which are the basis for developing a successful relationship.

REFERENCES

- Campbell A. J. and Cooper, R. G., (1999), "Do Customer Partnerships Improve New Product Success Rate", *Industrial Marketing Management*, **28**, 507-519.
- Clark, K. and Fujimoto, T., (1991), *Product Development Performances*, Harvard Business School, Boston.
- Corbett, C. J., Blackburn, J.D and Wassenhove, L.N.V., (1999), "Case Study Partnership to Improve Supply Chains", *Sloan Management Review*, **40** (4), 71-82.
- De Toni, A. and Nassimbeni, G., (2001), "A Method for the Evaluation of Supplier's Co-Design Effort", *International Journal of Production Economics*, **72**, 169-180.
- Forest, J. and Martin, M, (1992), "Strategic Alliances between Large and Small Research Intensive Organisation; Experience in the Biotechnology", *R&D Management*, **22** (1), 41-53.
- Gabilaia, T, (2001), "Malaysian Proton and AFTA: Threat or Advantage?" TED Case Studies, June.