



Supply chain enhancement through product and vendor development programme

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Abstract

Purpose – This paper aims to review the methods used by an automotive manufacturer in enhancing the supply chain management (SCM) system through a set up termed product and vendor development (PVD) programme. PVD was developed to eliminate problems faced due to late delivery and poor quality of supplies and availability of supplies at the lowest possible costs.

Design/methodology/approach – The paper explores the step-by-step methodologies that have been employed by the PVD.

Findings – Results overtime show that the PVD has improved the SCM system especially in the areas of quality and delivery services, other services and cutting costs that manufacturers had to face due to problems that arose in the shortcomings of the supply services.

Research limitations/implications – The PVD has managed to promote the localization programme and has also been able to establish qualified vendors through the structured vendor performance evaluation.

Practical implications – Findings also establish that the PVD team is the key to success for development of the PVD programme.

Originality/value – The paper presents an original discussion about viewing PVD programme from a successful automotive manufacturer. The structured PVD programme helps the team better understand the product development process involving supplier selection and supplier performance measure.

Keywords PVD programme, Supply chain management, Automotive manufacturer, Automotive industry

Paper type Case study



1. Introduction

Owing to various dynamic competitions, many manufacturing firms have tried various approaches to remain competitive. Some of the quality improvement approaches that

have been implemented by manufacturing firms show outstanding results. However, not all success stories can be achieved easily (Worley and Doolen, 2006). Each manufacturing firm will have to try its own approach and which will enable it to improve productivity and gain a competitive edge against its competitors. This issue has attracted many researchers and companies to conduct research and identify the best approach to achieve better results which would be appropriate to its manufacturing environment and business culture (Appelqvist *et al.*, 2004; Schniederjans and Zuckweiler, 2004; Shepherd and Gunter, 2006; Bayraktar *et al.*, 2007; Ray *et al.*, 2008). This paper discusses the kind of strategy that a manufacturer could pursue to improve his supply chain management (SCM) system.

In general, the SCM is the oversight of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer. SCM seeks to synchronize an organization's functions and those of its suppliers to match the flow of materials, services, and information with the customer demand (Krajewski and Ritzman, 1999). SCM involves coordinating and integrating these flows both within and among organizations. It is said that the ultimate goal of any effective SCM system is to reduce inventory (with the assumption that products are available when needed). In short, this definition is fairly complete as it indicates that it is not only the flow of goods that is important, but the flow of information and money as well (Nahmias, 2001). Most manufacturing enterprises are organized as networks of manufacturing and distribution sites that procure raw materials, transform them into intermediate and finished products, and distribute the finished products to customers (Lee *et al.*, 2001).

To ensure that the SCM is properly managed, a manufacturer should have a qualified supplier (vendor). Connecting with reliable and trustworthy suppliers has become a key factor for successful organizations (Matook *et al.*, 2009). Svensson (2004) believes that supplier segmentation is a fundamental business activity to improve the outcome of a company's efforts to maintain and enhance its position in the marketplace, as well as customer segmentation, market targeting, and positioning (i.e. strategic marketing). Manufacturers are able to help their suppliers by providing them with the essential knowledge, skills, and experience in order to further improve their delivery performance. Besides that, assistance from organizations can decrease production disruptions that are caused by poor quality materials. In addition, such suppliers also gain a better competitive edge as compared to their fellow suppliers as their performance improves and reduces a manufacturer's cost. Thus, supplier development is a vehicle that can be used to increase the competitiveness of the entire supply chain (Lee *et al.*, 2001; Wu, 2003).

Supplier development is defined as any effort of a buying firm to increase the performance and capabilities of the supplier (Krause, 1997). In practice, supplier development activities vary significantly, ranging from limited buying firm efforts that might include informal supplier evaluation and a request for improved performance, to extensive efforts that might include training of the supplier's personnel and investment in the supplier's operations (Krause and Ellram, 1997). Ideally, manufacturers will try to select to involve those suppliers that have sufficient knowledge and skills, but this may not always be possible. In several industries, increased supplier involvement in product development is a relatively new trend and suppliers may not have the opportunity and time to align themselves with the new demands placed on them. Moreover, there is a lot of research related to supplier development that have been studied and reported

(Krause and Ellram, 1997; Krause *et al.*, 1998; Wagner, 2004; Wagner and Hoegl, 2006; Williams, 2007; Modi and Mabert, 2007; Krause *et al.*, 2007).

This paper provides an overview of how an automotive manufacturer, Isuzu Hicom Malaysia Co. Ltd (IHM) developed a supplier development programme called “product and vendor development (PVD),” in order to enhance the SCM system after undergoing a reform in the corporate restructuring. This paper is organized as follows: Section 1 explains the overview of supplier (vendor) development for capturing the key issues. Section 2 classifies the research methodology. Section 3 explains the case study at a selected manufacturing firm. Section 4 explores the PVD programme developed by IHM and the step-by-step methodologies of PVD with some other important issues. Section 5 discusses the findings and the information gained and the final part of this section provides some useful conclusions and suggestions/for future research.

2. Research methodology

An in-depth case study was conducted in January 2008 and one of the authors, Nurul Ain Mat Tahar had recently undergone industrial attachment at IHM, spent almost six months focusing on productivity improvement activities at the company. The research methodology comprises semi-structured interviews for the top management, focussed group discussions with ten shop floor leaders in the plant and direct observation of the plant in operation to collect the primary data. In addition, the interviews that are conducted not only deal on the past implementation, but also focus on future plans and development of the company. Secondary data are obtained from company reports, local literature, and local newspapers.

3. Case study

IHM which situated in Pekan, Pahang is selected for the case study. IHM is a branch of Isuzu Motor Ltd (IHL) (Japan), holds a good membership of the Malaysian market shares for commercial vehicle category. Moreover, IHM has undergone a corporate restructuring of Malaysian Truck & Bus Sdn. Bhd. (MTB) shareholders towards IHM market enlargement in Malaysia. By the restructuring of IHM business assembly in Malaysia, this Japanese company has to manage its supplies efficiently in producing good quality vehicles, as well as also efficiently administering other Isuzu factory activities such as outsourcing. IHM assembles the Hicom Perkasa light-duty truck, Isuzu medium and heavy-duty truck, and the D-Max pick up. The principle commitment was to introduce new models which led to a restructuring of the partnership in that year. On 19 June 2007, DRB-HICOM Berhad, through its effectively 100 percent subsidiary, HICOM Holdings Berhad entered into a joint venture agreement with IHL (Isuzu), Japan in respect of equity participation of parties in the MTB.

4. Product and vendor development

The PVD is structured by three main components which includes the localization programme, product development, and vendor monitoring. To ensure that the PVD runs properly, a PVD team was established. Qualified executives with technical knowledge from different departments of IHM, representatives from production planning and control, procurement, and production engineering department were selected as the members of the PVD team. The following sub-sections will explain the details of the PVD.

4.1 Localization programme

The main objective of the localization programme is to plan and monitor the overall localized plan as a part of the product development based on the localization procedure. The localization procedure covers the overall monitoring of the localization programme starting from the localization plan, vendor development, and the development of the part/s to the completion of the plan and approval for mass production. This programme is implemented for coordinating the timing and effective lots for the deleting of the complete knock down (CKD) parts and supply of local parts, as well as to determine qualified vendors who will supply parts or items that can meet to the IHM requirements for quality, costs, and delivery (QCD).

The PVD team is responsible to set up a programme to localize potential parts. The PVD team will identify potential items for localization. The item identification should follow the local material content point and the price of the part/s. All the potential items will be summarized in the localization programme plan book and this will be proposed for approval. The potential items will be reviewed and any necessary changes required in the plan book will be made. If there are items that are rejected by the management committee or there are developments that certain items cannot be continued due to unforeseeable problems or if the IHL does not permit IHM to develop a particular item/s then changes will be also be made.

Upon approval of the management, the PVD team will prepare related drawings and Isuzu engineering documents that would request for further action of the IHL. Besides that, the PVD team would request and purchase the sample parts from IHL and, as well as if there is a requirement for a study on vendor tooling development. With this kind of action, vendors can prepare the related tools to produce the parts as requested by IHM. This can ensure that all vendors will provide services that would satisfy IHM production needs. All vendors that are appointed by IHM are listed in the Approved Vendor List that would be released to the related departments such as the Procurement and Production Planning Department upon request via a memorandum and duly agreed by the head of PVD team. Figure 1 shows the flow chart of the localization programme.

4.1.1 Vendor identification and pre-selection. The PVD team is responsible for identifying potential vendors for the approval of the management for any new localization programmes. The management then pre-selects these candidates for the Vendor Monitoring Activity. New local vendors, who are willing to participate in the localization programme, are registered using vendor profile for the records of the PVD. In order to get a suitable vendor for production, a minimum of three potential vendors (from three companies) will be nominated to participate in this localization programme. (An exception will be made to select two vendors where only two companies are available for the vendor ship.) Selection will be based on vendor profile together with the related documents submitted in the application. The development timing will refer to the master schedule of the localization programme.

4.1.2 QCD evaluation. Nominated vendors would have to undergo the QCD evaluation in order to evaluate their performance for IHM. The technical assistant of the PVD will release a sample drawing and related Isuzu Engineering Documents to nominate vendors using “request for quotation” that is approved by the PVD team. Then, the nominated vendor would have to submit a quotation by using a local parts price estimation within three weeks and any delay duration required for the quotation by any of the companies should be agreed by the PVD technical assistant. If no feedback

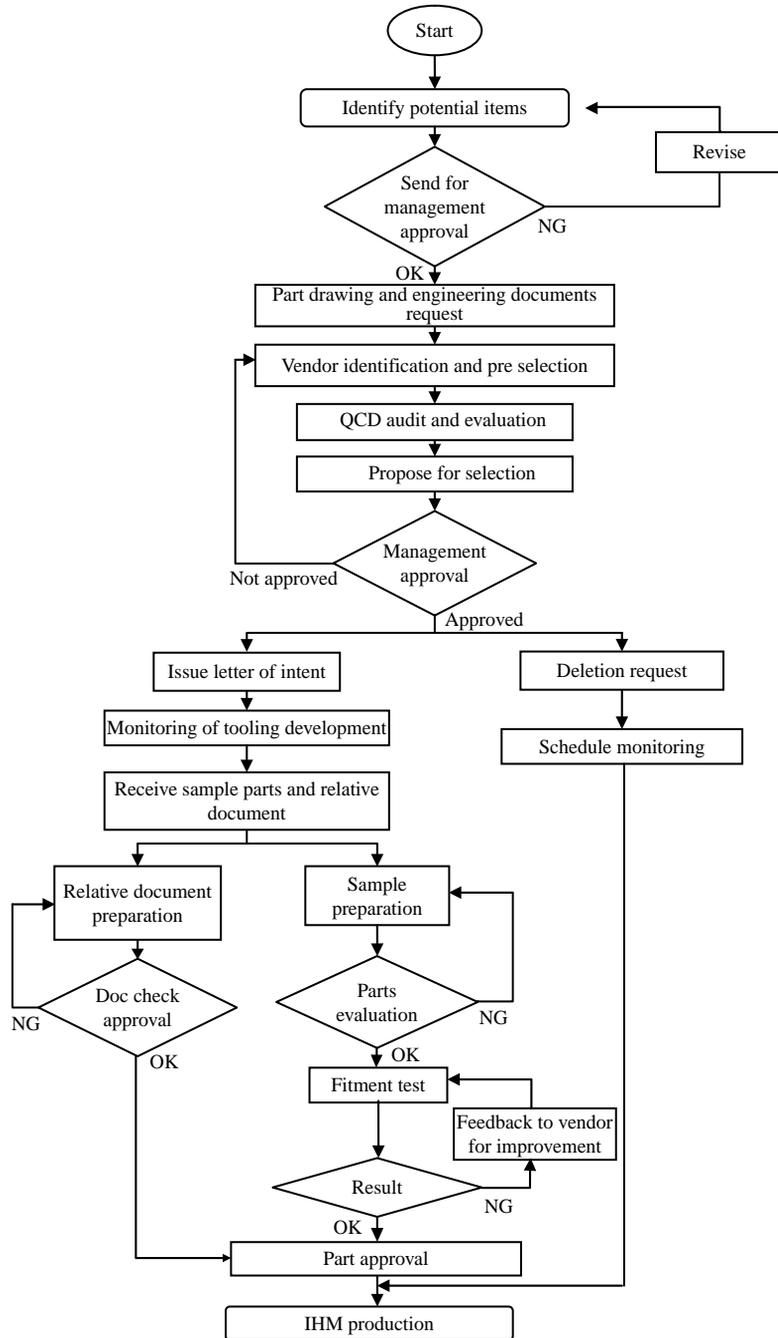


Figure 1.
Localization programme

is received within the specified time, the PVD team would consider the nominated vendor as an uninterested party.

For late local parts price estimates received from nominated vendors, a PVD technical assistant is still responsible to review the quotation received against part number and specification requirement. If in case a vendor submits a quotation without using the local parts price estimates, the PVD technical assistant will convert the quotations received into a required form and attach the original quotation to the original IHM format.

After all quotations have been received from the nominated vendors, the PVD executive will continue with negotiations on prices, specifications, terms and conditions, and appropriate delivery timing to ensure that all nominated vendors can provide services in accordance to the IHM production process. The appointed evaluation team will conduct the QCD evaluation using the vendor selection audit form at the vendor's premises. In that way, the team would have to visit the nominated vendor's premises in order to check their production process. The evaluation team consists of an executive or someone higher in authority than the PVD department. A related department will only be invited if there is a necessity for it. An appointed evaluation team from another department will be invited via a memorandum.

4.1.3 Final selection. The PVD team prepares and submits the management's proposal of the list of the most qualified vendor/s to the chief executive officer (CEO). The CEO has the final authority to approve or reject the proposal made by PVD team. If the CEO decides to reject the proposal, the whole process will be repeated in order to identify other qualified vendor/s. If, however the CEO approves of the proposal made, the PVD team will be responsible in issuing the "letter of intent" to the appointed vendor/s but signed by the CEO.

4.1.4 Part development. Localization activities are applicable for the development of new or existing local parts. After appointing a vendor, the development of the tooling will be executed. During the tooling development, the PVD team is responsible in monitoring the progress. For the multi-sourcing out of parts, there will be no monitoring and development of the tooling, but the PVD team will immediately conduct evaluation on the parts after receiving the samples from the vendor/s or supplier/s.

There are trim and final assembly lines which involves in the production of local parts and CKD items. An executive from a chassis group is responsible for only parts of the chassis items such as hub and drum, tires, leaf springs, absorbers, surge tanks, fuel tanks, axles, propeller shafts, brake pipes, exhaust alternators, starters, batteries, air-conditioners, etc. An executive from the trim group is responsible for trim items of the body and trim parts such as the instrument panels, doors, meter clusters, center clusters, oil tank lids, glove boxes, ornaments, window regulators, check arm doors, brake pedals, front and rear combi lamps, head lamps, relays, flashers, antennas, radios, etc.

Upon completion of the tooling development, the first of the tool samples will be submitted to the PVD team for evaluation. The evaluation would consist of actual sample part evaluation and documents for approval such as reports to be submitted by vendor. The evaluation will be on a part produced by volume production facilities and volume production processes, and upon the completion of the evaluation, the PVD team will give a statement as to whether a vendor can satisfy and ensure the required quality. This is to confirm all documentation pertaining to the specification for part development as a requirement by IHM.

4.1.5 Drawing. The drawing of a part must follow the IHL requirement and the IHL drawing can be used as a reference. If there are modifications on sample parts, the vendors will come out with their own drawings. A design change request is important to ensure that the design change operation is conducted efficiently which covers only the local part supply design change information from IHL, local vendors and from the IHM internal department which is the production engineering department. In this design of changes, the PVD team is responsible in making a detailed study and translating it into a comparison part report and has to be approved by the head of the PVD team. This is to ensure whether a design change is suitable or unsuitable for the IHM production. In addition, inspection standards are important to ensure that all parts to be examined and evaluated are based on the IHM standards. After all terms and conditions are met and approved by the head of PVD, the item will proceed for IHM production.

4.2 Product development

Product development is the process that requires the PVD team to study the viability of a product development. The procedures and steps in product development will be the responsibility of the PVD team in order to plan and monitor the execution of the product development which involves the Malaysian National Commercial Vehicle (MNCV) products. The study, planning and monitoring are to ensure that the specification of a product developed complies with the requirement of the government regulations. Like other vehicle manufacturing organizations, it is realized that by fulfilling terms and conditions according to the regulation requirements, the safety and comfort of the customers can be ensured.

At the beginning of a product development, the PVD team will identify a new product for development through the marketing strategy meeting with the distributors. In IHM situation, Hicom Holdings Berhad is one of the prime movers on IHM marketing orientation that is involved in the manufacturing, assembling, and distribution and sales of a commercial vehicle. The partnership with Automotive Corporation Malaysia Sdn. Bhd. (ACM) is important in order to develop the marketing strategy because Hicom Holdings which is contracted for distribution activities for the MNCV product around Malaysia. The product meeting with ACM is based on the requirement and principal for Hicom Perkasa products from IHL. In order to get the high quality of the product and to fulfill customer satisfactions, the product development team will study the market requirements and gather information pertaining to the product. Figure 2 shows the flow chart of product development.

4.3 Vendor monitoring

Vendor monitoring procedure is established to ensure all vendors supply the parts continuously and consistently with quality products. After selected companies have been approved by IHM, these companies must be monitored every month. This covers for vendor performance evaluation through vendor rating system and to countermeasure any problems related to quality, delivery, and cost. The procedure of vendor monitoring is to maintain their performance continuously and avoid any problems that can affect the production. The scope of this procedure is applicable only in IHM for continuous vendor performance monitoring for Hicom Perkasa parts based on quality and delivery. Figure 3 shows the flow chart of vendor monitoring.

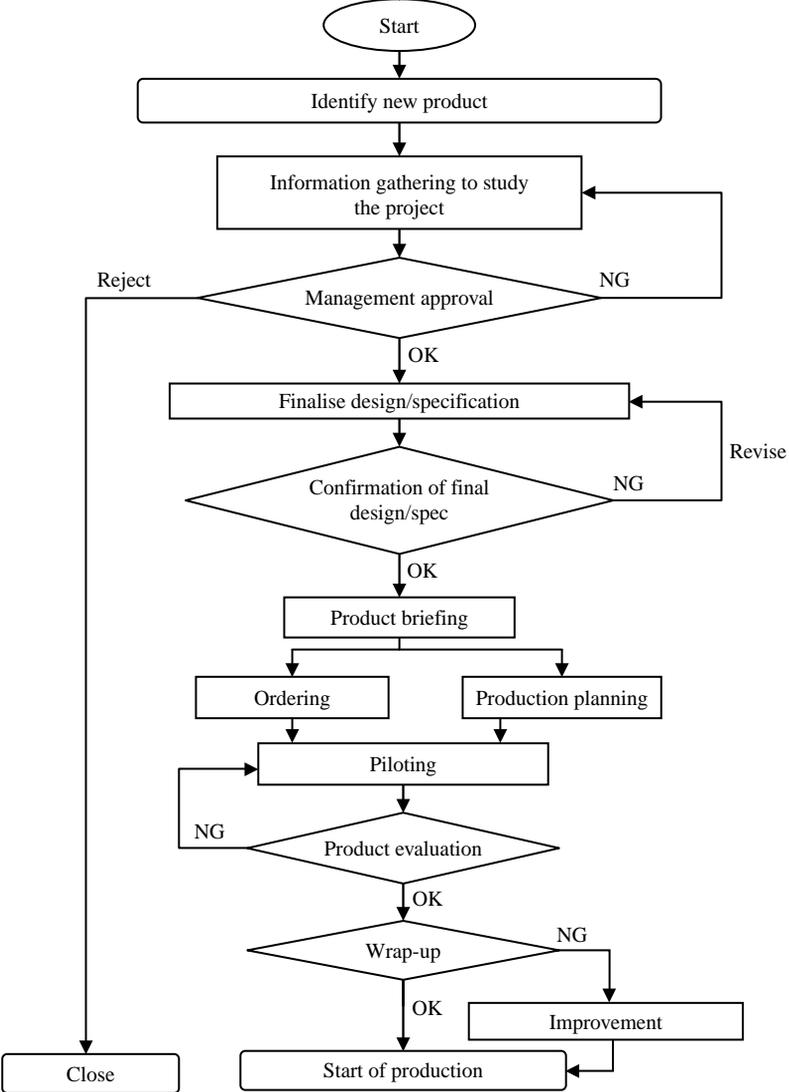


Figure 2. Product development

4.3.1 Vendor performance. Upon receiving the reports or documents from the related department, the PVD team will compile and clarify the report based on quality and delivery. The PVD team will prepare the monthly quality summary and monthly delivery summary based on recorded problem/s submitted by the related department. Based on the monthly summary for quality and delivery, the PVD team will evaluate vendor performance through the vendor performance sheet for that particular month. Vendor performance is evaluated based on their delivery and quality performance every month. It based on delivery instruction (DI), the date that is stated in the purchase order (PO) which was earlier submitted to the vendor and the actual date

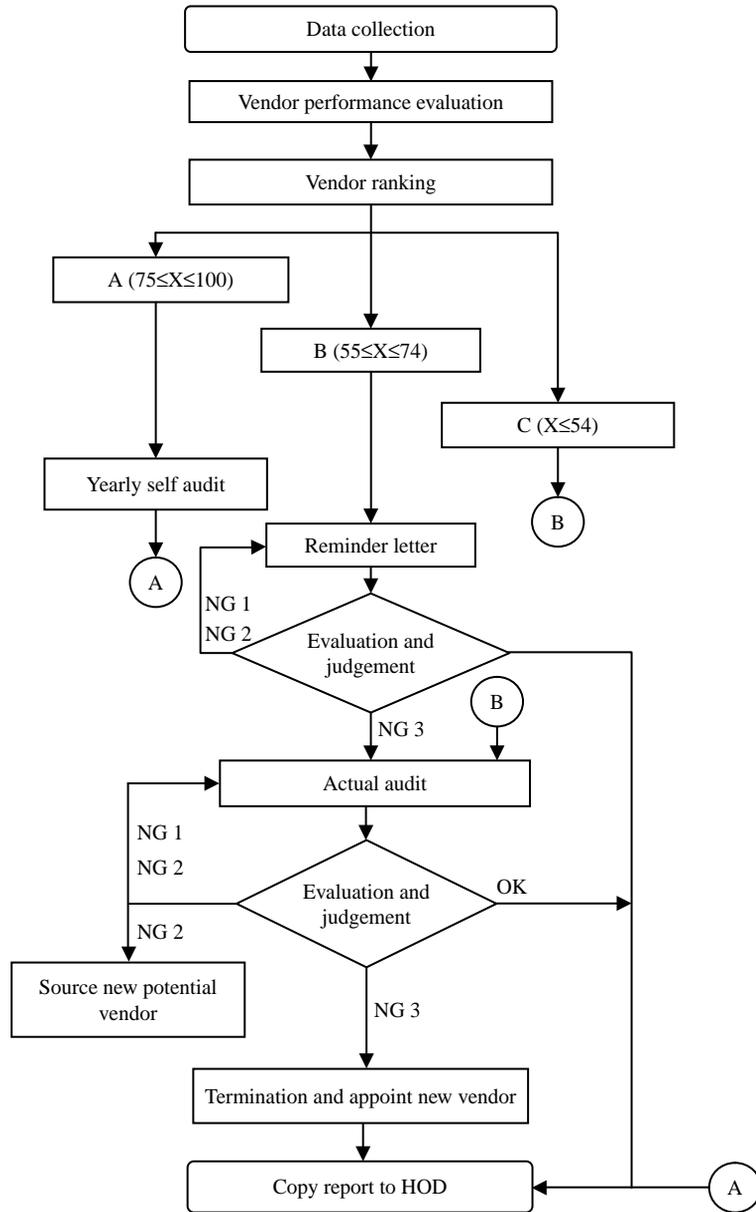


Figure 3.
Vendor monitoring

of receiving the part is recorded based on the name of the part and quantity. The steps are followed by the monthly vendor performance check sheet which includes quality, delivery, and service evaluation descriptions. For quality description, rejection rates must be identified along with the conformation to the specification and zero return to the defect. Data collection from DI is used to compare actual delivery with requested

delivery (quantity) and quoted delivery (punctuality). Table I represents the items for vendor performance evaluation in IHM.

The last evaluation is on services which describe the communication, responsiveness to problems, availability for field assistance, and regular conversation with IHM. From this document, the PVD team will recognize the score ranking of the vendor. Table II shows the vendor ranking list used for evaluation. The vendor ranking information will be transferred to the vendor performance chart based on a monthly basis. Subsequent monthly percentages of conformance will be compared to the previous month's percentage. If the vendor's performance deteriorates and the ranking drops, a brief description of the underlying deficiency has to be recorded.

When a significant change occurs, such as a major decrease on the vendor's rating score, the PVD team has to review the details of the weakness with the vendor

Items	List	Description	Score (%)
Quality	1	Conformance to specification (material should meet all IHM's specification)	25.0
	2	Zero returns due to defects (to achieve the best rating, a supplier must have NO record of returns due to defects since the last evaluation. Any rework history or line problems on the supplier's product will decrease the rating accordingly. This area requires the appropriate documentation (APR, SCAR, etc.))	20.0
Delivery	3	Actual delivery to request delivery (quantity) (this rating is based on actual delivery history of promises, quantities compared to receipt quantities, with data pulled from the PO and DI system for the item in question)	15.0
	4	Actual delivery compared to quoted delivery (punctuality) (this rating is based on actual delivery history of promised dates as compared to received dates, with data pulled from the DI for the item requested. The allowable window period is two days late or five days earlier from the scheduled delivery date)	30.0
	5	Adequate packaging to avoid damage in shipment, manageable in quantities, and form (to be rated by storeroom personnel or the project manager, this category is to encourage improvements in these areas where needed)	5.0
Service	6	Communication, responsiveness to problem, availability for field assistance (ratings should be a collaboration of all employees in a department who have contacts with suppliers. This includes such activities as calls regarding incoming shipments and/or services, availability for raining, direct involvement in problem solving, etc.)	2.5
	7	Service regularity of conversation with buyer (frequency of conversation which involves both parties)	2.5
Grand total			100

Table I.
Vendor performance
evaluation items

Categories	Score	Action	Remark
A	$75 \leq x \leq 100$	Self-auditing	Yearly
B	$55 \leq x \leq 74$	Reminder letter	Three months in a row
C	$x \leq 54$	Actual auditing	Immediately

Table II.
Vendor ranking list

to determine if there are problems to produce the part for IHM production. Furthermore, based on the rating for vendor performance, the PVD team will take the necessary action for improvement to ensure the target date of production is achieved.

4.3.2 *A reminder letter and actual auditing.* In order to implement the action of improvement, the PVD must identify the vendor performance measure. Based on Table II, if the vendor maintains in the category of B which is " $55 \leq x \leq 74$ " for more than three months in any of the performance elements, the PVD will issue the first reminder letter to the related vendor for improvement. If the performance is still deteriorating and weak, the PVD team will issue the second and third reminder letters for further action. After that, a process auditing will be conducted if the vendor fails to improve his performance to the expectation of IHM.

The PVD team will prepare and submit related documents and inform the vendor/s involved on the auditing schedule at least two weeks before the auditing process. The PVD team will remind related vendor/s for auditing confirmation and acceptance. The PVD team will appoint the auditor through head of department related department such as the procurement and production planning department within one week before the auditing process and hold discussions related to the auditing process before the actual auditing takes place. If the appointed auditor is unable to join the auditing process, he is responsible in sending an official letter to inform that he is unavailable. The auditing process is then conducted based on standard operation procedure audit process for vendor monitoring.

After that, the PVD team will follow up and monitor the improvement plan and the schedule for every month. If the vendor/s cannot meet with IHM requirement on the improvement schedule date line, the PVD team will proceed with the second auditing process. At this juncture, the PVD team will start sourcing out new potential vendor/s to replace the problematic vendor/s potential for business termination. If the vendor/s still cannot comply to meet the IHM requirement on the improvement after the second auditing process, the PVD team will propose for a third auditing process. After all, if the vendor/s fails to improve to the required level, the PVD will propose for the vendor/s termination and will appoint new vendor/s to supply the parts. After the auditing process, the summary report will be submitted to the head of the PVD team.

If there is no suitable vendor for replacement, the PVD team will study a potential company's background to check whether it has any delivery, quality and services problems with its customers. As a result, the defaulting vendor will be eliminated, and the PVD team will appoint a new vendor based on the results of the potential company. Thus, the process is complex and sometimes requires a long time. The PVD team will try to identify multiple suppliers rather than a single or sole supplier to avoid supplier constraints.

4.3.3 *Price increase or price decrease.* Price is an important issue in selecting the vendors in order to implement the cost-reduction strategy at IHM. Vendors always request for price increase continuously because they want to get better profits from their customers in order to cover up the cost of the entire production. In vendor monitoring at IHM, upon receiving the proposal for price increase or price decrease from the vendor, the PVD team will study on the vendor's proposal.

Specifically for a price increase, the PVD team will negotiate to get an agreeable price between IHM and the vendor/s. If the general manager or someone of higher authority does not agree with the price increase, the PVD team will re-negotiate

with the vendor/s to get a comparative price. At this juncture, the PVD team will also seek for the new potential vendor/s as referred by the localization programme procedure as mentioned earlier. After finalizing the agreeable price, the PVD team will fulfill the price summary by parts or price summary models and will submit the list to the head of the PVD team and to a senior manager or a higher authority for approval. Once approved, the agreeable price will be implemented in the new PO when ordering parts from the vendor/s. Finally, a copy of the price summary is submitted to the accounts and procurement department for further action. Regardless of the SCM strategy adopted at IHM, negotiations regarding the critical elements of the contractual relationship must take place. These negotiations often focus on quality, delivery, payment, and costs.

5. Discussion and conclusion

The findings show that to have a qualified supplier (or vendor), it requires an organized procedure. The description of the responsibility of all parties that are involved in the PVD is a key success factor to avoid misunderstanding and delay in decision-making process especially by the PVD team. The step-by-step methodology in the PVD explains that a new supplier or an existing supplier cannot be ignored from the performance evaluation procedure to ensure that supply is prepared based on the IHM standard. The authors agree that the current practice of the PVD is practical for the current operational needs at IHM. Furthermore, based on our observation, there seem to be three issues faced by the IHM in achieving effective and efficient supplier involvement which is similar to Wynstra *et al.* (2001):

- (1) identifying specific processes and tasks that need to be carried out, aimed at the integration of product development and out sourcing processes;
- (2) forming an organization that supports the execution of such tasks; and
- (3) staffing the organization with people who have the right commercial, technical, and social skills.

In a nutshell, involving suppliers in product development can result in major benefits in terms of money and time. But, it requires a great deal of thinking and effort. Primarily, it requires an active management support on behalf of the manufacturer, both in the short term and in the long term, supported by adequate organizational and human resources for the success of the PVD. Therefore, in order to develop future research in this area, it is suggested that the following research questions should be evaluated:

- RQ1. Is there any technology that can be used to improve the PVD?
- RQ2. What are the risks that may influence the result/s of PVD?
- RQ3. What are the constraints for IHM to sustain the PVD?
- RQ4. What kind of action should be taken by IHM to enhance the PVD and to encourage its staff to contribute (in terms of knowledge) in improving or updating the SCM system?
- RQ5. Besides the PVD, what kind of activities could be developed to enhance the SCM in IHM?

The authors of this paper intend to provide details of such research questions in future publications. They believe that the above suggested research solution/s may prove useful in helping to redesign the PVD as an effective method towards the success of SCM.

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