

ESUPPLIER APPROVAL PROCESS ON COMPOSITES' PRODUCT-BASED MANUFACTURERS

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ABSTRACT: The supplier is one of the keys to success in an organization and can also be the cause of the collapse of the company in which the supplier is able to introduce a number of problems such as supply of poor raw materials, shipping delays, poor services and failure to comply the requirement. Hence, approved supplier list has been used as a reference and a guide to the purchasing department to sourcing a trusted supplier. Therefore the development of process flow for approved supplier list must be done right for the effectiveness of this system. This paper analyzed supplier approval process on four selected companies specializing in composite product and manufacturing. The data collection consists of a series of semi-structured interview with supply chain personnel, documentation review and observation. These findings indicated that the same concept such as system audit, questionnaire and supplier assessment was used in a process of selecting potential suppliers prior to being inserted in the approved supplier list. Besides, the study identified that different companies (same business nature, but different product) had their distinctive ways in developing the process flow of the approved supplier list. The results can be used as reference to other companies to restructure their process flow for approved supplier list; focusing on their business goal and objective.

KEYWORDS: Approved Supplier List, Composite's Product-Based Manufacturers

1.0 INTRODUCTION

Organizations are increasingly engaged in creating strategic partnerships. Gain a competitive advantage in manufacturer and supplier to work well as an opportunity to add value and reduce costs on both sides of the equation is very large [1]. Therefore this advantage is adopted by companies to find potential suppliers for collaboration between suppliers and the company. Most companies nowadays have adopted the use of approved suppliers list (ASL) as one of the methods for collaboration with suppliers whereby only the list of suppliers that have been approved be used for the purchasing purposes.

ASL is a system or a list of suppliers which has been approved by higher authorities of certain companies as a reference for their purchasing department. ASL is very important for purchasing department; it contains various lists of approved suppliers, including all the details of providers such as names, address and services of companies. ASL system helps companies in minimizing the risk in sourcing and buying, keep providers from interfering departments other than buy for a "foot in the door", authorize the negotiation of better prices for the order to be placed over time and develop buyer-seller relationships [2]. To ensure the selection of quality suppliers in the ASL, supplier approved process should be carried out. The main objective of ASL is to reduce the list of all probable suppliers to a smaller list of approved suppliers [3]. Supplier approved process is a procedure made by the company to ensure each supplier is chosen carefully and effectively. Methods such as the quality system audit, site audit questionnaire analysis, supplier evaluation, and supplier performance can assist the company in determining potential suppliers to work through collaboration between companies and suppliers. Boer et al. [4] state that the ASL can be determined using three methods which is data envelopment analysis (DEA), clustering analysis, and an artificial intelligence (AI) approach called case-based-reasoning method. All three methods are based on the supplier evaluation criteria and supplier performance.

Supplier approved procedures must be complied with by any department in the company, especially the purchasing department to ensure the company benefits in buying. As stated by Gencer and Gurpinar [5], supplier approval process is related to supplier evaluation and supplier performance where this activity is to maintain the list of ASL for the sake of success in purchase.

ASL is one of the factors in the stabilization of the supply chain. The stabilization of the supply chain will collapse if it depends only on one

supplier or unapproved supplier where the risk becomes high if the supplier encounters any difficulties or predicament [6]. Synchronization between a manufacturer and suppliers in the supply chain is usually a complicated and imperative link in the channel of distribution [7].

Composite industry in Malaysia is growing rapidly nowadays. Therefore, a proper ASL process is able to provide benefits to a company and its suppliers. Relevant procedures have been set by a company to ensure that suppliers are able to meet their needs. Good relationships between suppliers and manufacturers through supply chain management have a good impact on an industry. The paper analyzed the supplier approval process by Malaysian composite manufacturing organizations.

2.0 LITERATURE REVIEW

Developing a system for approved suppliers must be done properly. Several methods have been identified previously to facilitate the manufacturers in selecting potential suppliers. An effective ASL system needs a good performance, and a good relationship between the supplier and the manufacturer. A strong competition in industry has led to a new kind of buyer-supplier relationship, which focuses on an importance of working together that can help both parties in order to remain competitive in the industry. For example, the innovative buyer-supplier relationship that has been practiced by British and European producers, is able to gain more cost savings and control [8]. Buyer-supplier relationship can be defined as operational relationship which includes three attributes; buying firm's commitment, cooperation and operational linkages. It also shows the perception of the buying firm's behavior [9]. Buying firm's commitment can be defined as the extent to which suppliers' perception of the importance of a buying firm's or continuing business with a particular supplier [10]. Commitment can be divided by three mechanisms; investments in trading partners, affective commitment and expectations of future relationships [11]. Loyalty between supplier and buyers, willingness to make investments in the supplier's business and confidence in the stability of a long-term relationship can be demonstrated by the effectiveness of commitment. Cooperation can be defined as move together between two trading partners in order to solve problems, establish strategic directions and achieve their goals together [12]. While the operational linkage is defined as supplier's perceptions in coordinate systems, procedures and routine between buying and selling firms to facilitate operations [13]. There are two major models in buyer-supplier relationships that can be categorized as adversarial and collaborative [14]. Adversarial

model can be characterized as tough negotiation, focus on price, short term contracts and multiple sourcing. It can also be referred as an antagonistic model [15]. Collaborative model (cooperative model) is based on cooperation, mutual benefit, trust, and relation exchange. In the collaborative model, it considers not only on preferred supplier based on price or cost, but also the factors that contribute more on cooperation on supplier competence in production, distribution, and after purchase service. Hence, supplier will get an access to business skills and expertise of their buyer partners. Examples of collaborative models are cross-functional team decision making and supply base rationalization.

An effectiveness of supplier performance outcomes in the functioning of the purchasing department can be measured through a better supplier management; management of the quality of the items delivered by the supplier, delivery schedule, lead-time and the total cost of acquisition [16]. The performance of every supplier can be measured through the supplier performance evaluation. To keep maintaining the supplier performance, many firms use the supplier development program as a tool to improve their supplier performance. Supplier development can be defined as activities undertaken by the buying firms in their efforts to measure and improve the products or services they receive from their suppliers. Supplier development program is set up with suppliers that are no longer able to meet the objectives of the business for the short term and long term. The main key of the objectives in a supplier development program is to increase the competitive advantage of the buyer in the marketplace and increase the buyer-supplier relationships [17]. According to Humphreys [18], the supplier performance outcomes can be divided to three dimensions; a supplier performance improvement, buyer competitive advantage and buyer-supplier relationship improvement. Supplier performance improvement is to improve the existing supplier ability and performance has been acknowledged as one of the initiatives in supplier development to meet the requirement in changing competitive [19]. The supplier performance focuses more on the supplier improvement criteria such as quality, delivery, cost, lead time, inventory and the rate of new product. Buyer competitive advantage improvement is the main key to link the purchasing strategy with a buying firm that depends on the supplier development for overall corporate competitive strategy [20]. It will be one indicator of effectiveness of supplier development. Stuart [21] determines that the advantages of buyer competitive include the quality improvement, market share gains, cost reduction and faster product development. The advantages of buyer competitive play the important role in developing the operational strategy for an organization. Buyer and supplier are

involved in activities of supplier development. Joint action between both parties is the key toward success in supplier improvement. Supplier development program improves the scope of joint activities and leads to a long lasting relationship between buyer and supplier and effectively turns the supplier into business partner [22].

3.0 RESEARCH METHOD

The main purpose of the paper was to review more on the process of ASL based on composites manufacturing companies. The process of flow diagram has been applied in this study to review the actual concept that has been applied for every composite manufacturing company in Malaysia. The case study was conducted in June 2014 at four composites manufacturers in Malaysia. Data were collected through the semi-structured interviews, documentation review and observation. The semi-structured interview was focusing on supply chain personnel. Interview questions revolved on the purchasing process and ASL process related to green supplier development in manufacturing operation. The documentation review was focusing on ISO 9001. On-site data gathering and observation were used and information which focused on process flow in ASL including the requirement, emphasis and implementation were collected.

4.0 CASE STUDY

The aim of the study was to extend existing concepts and comprehension within the field of procedure on ASL process. Four companies were investigated. The companies are addressed as 'Company A', 'Company B', 'Company C' and 'Company D' for privacy and confidentiality purposes. Table 1 illustrates the companies under study and their process and procedure for supplier approval.

4.1 ASL Process Flow in Company A

Company A focuses on supplier approval process by forming the vendor pre-qualification committee. This committee makes up of Purchasing, Facilities and Finance unit. The committee is responsible for evaluating Pre-Q application of engineering and service providers. It also focuses on issues such as classification of vendor according to capabilities and expertise, re-organization and re-classification of the job type based on new capabilities and expertise, company registration form for private limited company. Every vendor that is interested to be a supplier to company A must fill the Pre-Q application form and submit to the

purchasing department. The evaluation will be made by the committee every two months or at least three applications in hand whichever comes first. If the qualification engineering and services provided, the vendor pre-qualification committee will evaluate the application using supplier Pre-Q form or periodical evaluation form. If qualification for non-deliverable products and tools vendor, purchasing executive will evaluate the application using supplier Pre-Q form or periodical evaluation form. The results of the evaluation will be summarized and a recommendation for approval will be made to purchasing manager and operations support manager. If necessary, the committee will conduct a site visit which covers either previous project or vendor facilities. Once the application is approved, the purchasing manager will update the approved vendor list according to their specialization or abilities in the system based on a coding system. Re-evaluation of engineering contractors will be made once a year to measure their performance in accomplished tasks, service rendered, and others. This re-evaluation will be done by procurement. Any rejected supplier will be advised to re-apply.

Table 1: Floating-point operations necessary to classify a sample

Company	Description
A	<ul style="list-style-type: none"> • Located in Kedah, Malaysia. • Formed in 1998 as a Joint Venture (JV) company between the Boeing Company and Hexcel Corporation for composite fabrication and minor parts assembly. • Have about 950 employees with factory footprint of 440,000 ft². • Manufacturer of flat and contoured primary (Aileron Skins, Spoilers & Spars) and secondary (Flat Panels, Leading Edges, Trailing Edges & MISC: Components) structure composite bond assemblies and sub-assemblies for aerospace industries
B	<ul style="list-style-type: none"> • Established in 1997. • Located in Batu Berendam Airport, Malacca, Malaysia is a JV company between Germany and Malaysia. • Manufacturer of dome, racing yachts and power boats also involves in the aircraft and automotive industry, environmental industry, and the use of composites in architecture and building construction
C	<ul style="list-style-type: none"> • Established in 2013 • Situated in Krubong Industrial Park Malacca, Malaysia. • JV Company with RPC Company (Australia). • Have 25 employees with factory footprint 68,000 ft². • Expert in manufacturing structural composite product, ballistic protection products and fire protection products
D	<ul style="list-style-type: none"> • Incorporated on 20 November 1990. • Located at Composites Technology City in Batu Berendam, Melaka, Malaysia. • This company runs the manufacturing of composites aero structures and is also providing other services such as engineering design, composites assemblies and R&D, automotive composites structures and for military defense related equipment. • The number of employees exceeds 1200.

The supplier development program starts by searching the potential suppliers starting from local supplier to undertake the manufacturing of these parts locally. If local suppliers cannot meet the need of company,

the purchasing clerk will search for foreign potential suppliers. They must meet the requirement such as price, quality, quantity and delivery.

4.2 ASL Process Flow in Company B

The company B, will undergo a process of supplier approval before being added to the ASL system. Firstly, suppliers need to answer a questionnaire. The questionnaire is divided into six sections A to F. Sections A is about the financial system and then is followed by section B, company personnel questions such as the total number of employees. Section C is on quality. Then, section D is on purchasing system for supplier companies. Section E is for environmental issues and then section F is for open ended questions, i.e., who are your major customers? This first process of supplier approval is important to know the supplier details. After supplier qualification form is filled up, material manager will evaluate and give approval to the qualified suppliers. All suppliers who pass the evaluation will be monitored through the delivery response and compliance with the requirements. The second step in supplier development is supplier history in which all the history of previous data on the goods received note (GRN) and non-conforming report (NCR) will be revised. The material manager will evaluate the supplier performance through these data and an assessment is done on a continuous basis. The third step is site survey or supplier quality audit. The project or material manager will survey the supplier site to determine the supplier's ability to comply with contracts meet needs. The supplier's organization and quality system will be reviewed. The results of the survey will determine the approval of the supplier into the ASL.

4.3 ASL Process Flow in Company C

Company C starts its process when there is a need for new customers for a new product or the existing suppliers are unable to continue supplying raw materials. Purchasing executive will be responsible to search for a new potential supplier, using trade book, yellow pages or other sources as a medium. Based on the obtained information such as product data sheet, brochures, catalogue and prices, the potential supplier will be short listed for evaluation. These potential suppliers need to fill up the 'new supplier evaluation form' and submit to purchasing department. This form is divided to two sections. The first section contains information on potential suppliers' information such as company name, address, phone number and number of workers. The second section contains information on the company operation such as ISO implementation, quality and service. The purchasing executive will

evaluate using criteria such as product quality, attitude, service, price and delivery schedule. Where necessary, samples will be requested for test or subject to site audit. Upon completing the evaluation, the purchasing executive will submit this form to the managing director. This form will be reviewed by managing director and successful supplier will be listed as approved supplier. If the potential supplier cannot meet the requirements based on 'new supplier evaluation form', the purchasing executive must search for new suppliers. New approved suppliers will be updated in the ASL by the purchasing executive. Managing director will review and approve this ASL.

4.4 ASL Process Flow in Company D

Company D set up the Supplier Quality Assurance (SQA) as a department that is responsible for the overall process in supplier development and controlled ASL. For any new parts, material, tools and services that are related to the manufacturing process, the purchaser or requestor shall fill up the "request for supplier approval" form and complete all company information to be reviewed by SQA. If a new supplier caters for CAD/CAM design, supplier must complete the CAD/CAM capability questionnaire provided by purchaser or requestor. The Engineering CAD Center (ECC) or Information Technology (IT) will assist the SQA team in reviewing the questionnaire. The supplier must gain and maintain the appropriate Quality Management System (QMS) with minimum ISO 9002 or ISO 17025 and/or national regulation along with the customer specific quality requirement prior to company approval. The results of review will determine if an audit is required for either site or desktop audit. In site audit, the SQA will perform an audit of the potential supplier facility. For CAD/CAM supplier site audit or assessment, the SQA must be assisted by ECC or IT personnel.

SQA can accept a recent audit report that is less than 6 months from a supplier third party, in lieu of audit. The following certificate may be accepted; International Organization for Standardization (ISO) certificate, National Aviation Authorities (DCA, FAA, CASA, CAA others) and established aerospace company (Airbus, BAE Systems, Spirit Aero System, Boeing, Bombardier, others). Any auditor that involve in auditing tasks shall use the "Audit Assessment Report" to record all findings and supplier corrective action request (SCAR) must be implemented by the potential supplier based on the audit's findings. The result of an audit or assessment will determine supplier to be registered in the ASL based on their category and classification. All updated ASL must be done by SQA. The request for supplier approval form shall be completed by SQA along with overall relevant

documents and file for future reference. SQA will inform the purchaser or requestor on the results of audit and advice the quality manager on decision whether the supplier is approved or rejected.

5.0 DISCUSSION

In order to establish a proof of concept for implementing ASL in industry, four companies which have the same nature of business (composite product and manufacturing) were selected for data collection through semi structured interviews and documentation review. A simple case study is provided and summarized in Figure 1. There are six basic processes in ASL that can be simplified from data collection; which is the need of new product or new supplier, registration for potential supplier, supplier evaluation, supplier audit, approval process and supplier performance.

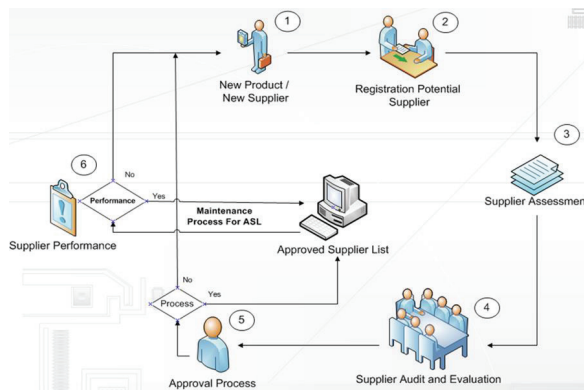


Figure 1: Basic conceptual design for a process of ASL

The processes of ASL occur when the need of a new supplier for a new product or project or existing supplier cannot meet the requirement of the company. Early involvement of supplier in new product development is a key coordinating for three process designs namely supply chain design, product design and process design [23]. The first stage in ASL process is a new product or a new supplier. In this stage, purchase department will outline the requirement of new product/new supplier in details such as supplier location characteristics of supplier, internal or external supplier, and quantity of supplier needed. The supplier location is important when the industrial purchaser selects a supplier. It affects the cost in terms of distance. The high-risk locations must also be taken into account, to avoid any loss due to natural disasters such as floods that can affect the supply chain management.

The characteristics of the supplier must be considered by purchasing in sourcing process such as supplier responsibility and reliability. It can turn into benefit when the supplier has good characteristics to enhance buyer-supplier relationships [24]. The internal and external suppliers need to be considered as they relate to the cost and time in term of delivery. Quantity of the suppliers must be considered whether using single or multiple suppliers. The buyer's firm has big advantages in dealing with multiple suppliers because of price differentials, quality, delivery performance and service among suppliers. It gives the choice for buyer's firm to select the potential supplier. Empirical studies show, that the current situation in most business areas is still dominated by dual or multiple sourcing [25]. The second stage in ASL process is registration of potential suppliers. All selected suppliers in stage one must fill up the supplier information where the company details such as supplier name, address, phone number and type of supplier are included. If any invalid or confusion occur in receiving information from the potential supplier, the management cannot make any informed decisions, leading to a wasted effort [26]. General questionnaire must be added during a registration of the potential supplier which includes basic things on quality, i.e., quality implementation on supplier firm. This is important to know the supplier quality level.

The third stage is a supplier assessment. Supplier assessment is one of the methods that is used to evaluate the potential supplier as mentioned by Krause and Scannell [27]; it is a method to company for selecting the potential supplier. Four main criteria of the supplier assessment are "delivery", "quality", "cost", and "services" [28]. There are two decision methods that are usually used to form a supplier assessment; interpretive structural modeling and expert system [4]. The interpretive structural modelling was designed by Mandal and Deshmukh [29], divided to two criteria; dependent and independent. This model separates dependent and independent criteria in supplier selection process. A dependent criterion was used in level screening the potential supplier, while the independent criteria were used for the final step in supplier selection. The expert system is designed by Vokurka et al. [30], where to capture knowledge based on previous supplier selection process is important to be used for future development. Several methods have been proposed starting from 1960 until now. The most popular method by Tahriri et al. [31] is analytical hierarchical process (AHP), combining both qualitative and quantitative criteria. In this case study on four composite industries, the linear weighting has been chosen as the method in selecting the potential supplier because it is least costly, simple and easy.

Quality system audit is the next stage after supplier assessment in ASL process. The quality system audit is practiced in the effort to improve overall performance in business. In industries, quality system audit has been used as a management tool that is prominent and proven for assessing effectiveness and compliance of the quality system. The development of the quality audit system must be done effectively using the concepts of audit reliability, availability and suitability [32]. In order to achieve the continuous improvement, the companies can set up the groundwork by developing an ISO 9000 quality system and onwards to enhance performance by using an excellence model, thereby efficiently applying both evaluation methodologies [33]. The management of quality audit system should be carried out effectively with potential suppliers to ensure the ability of suppliers to fulfill the quality requirements of the company.

The fourth stage in ASL process is supplier approval. De Boer et al. [4] state that supplier approval is a final stage in supplier selection. At this stage, all data report from stage two until four will be analysed by the manager. While, successful suppliers will be added to the ASL system along with an overall analysis by the manager, the rejected ones need to reapply. The final stage in ASL is supplier performance. Every listed supplier in ASL system will be monitored through the supplier performance evaluation. Supplier performance evaluation is commonly used in industry to monitor and retain approved supplier so that it can fulfill the company requirement in terms of several performance criteria [34]. There are several different methods for evaluating supplier performance such as the weighted point method, cost ratio method, categorical method, a weighted point method using a performance matrix and AHP [35]. The strategic evaluation of supplier performance is able to boost their operation across a variety of dimensions, specifically in process of supplier improvement and a company's performance. The advantage of effective supplier performance evaluation in supplier development is able to allow for optimal allocation of resources and assist the managers in maintaining the ASL based on current performance of supplier [36]. Every supplier that cannot meet the requirement or fails in supplier performance evaluation will be given the corrective action report. The improvement must be done or else will be rejected from the ASL system.

6.0 CONCLUSION

In conclusion, the ASL is able to improve company's profits with good cooperation among approved suppliers. Besides, in protecting

the supply chain, most companies should adopt the effective resource through an implementation of the approved supplier list. System audit, questionnaire and supplier assessment task has been used to make sure suppliers are able to meet contract requirements. ASL must be updated to make sure the effectiveness in sourcing and buying process.

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