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SUPPLIER EVALUATION AND SELECTION: CASE OF AN AUTOMOTIVE SPARE-PARTS SUPPLIER

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ABSTRACT

The main aim of this study is to conduct a current state analysis for a leading original and spare parts producer operating in automobile industry. In the focused company, due to having some problems about purchasing process, there was a need for reviewing and restructuring supplier evaluation mechanism. In this perspective, based on the results of qualitative techniques conducted, reasons for poor evaluation systems were found. As a contribution to practice, in line with the needs of company, supplier evaluation and selection criteria were suggested for scorecard assessment. Moreover, detailed rating systems were also formed in order to reach stability and consistency in evaluation. Furthermore, supplier certification classes and possible supplier development strategies were developed.

1. INTRODUCTION

Over years purchasing has evolved and turned into a more strategic function which makes up 50-90 % of total costs in industrial companies (Boer et al., 2001). Thus, with this large share, it is obvious that the effective management of purchasing function may result in cost efficiency and may lead to better profitability. Conducting an effective supplier selection, creating innovative supplier development strategies, and having meaningful supplier performance assessment mechanisms are crucial in supplier relationship management (Kannan and Tan, 2002). Supplier development refers to the efforts of a buying company to increase the performance and capabilities of its suppliers in order to meet the buying company's requirements through evaluation, feedback, training, or direct investment (Krause and Ellram, 1997). Obviously, selecting the right suppliers, evaluating their performance on a consistent basis and conducting supplier development activities have considerable impacts on forming long-term and value creating B2B relationships (Vonderembse and Tracey, 1999). Managing the supply base is an important but complex issue for automotive spare parts manufacturers, especially for the small and medium sized ones. Supplying components to the vehicle industry is a hard task due to the need of compliance to high performance and quality demands.

These high levels of performance and quality can be achieved through an effective supplier management process and constant monitoring of supplier performance even for the low level tiers. XN* Automotive is an original and spare parts manufacturer that provides 360 products in 9 categories (e.g. locks set, starter switches, switches, fuel tank caps, door handles) to vehicle suppliers.

In this paper, the main aim is to conduct a current state analysis for the purchasing process of an automobile spare parts manufacturer and to suggest more comprehensive scorecard criteria for better evaluation and selection via detailed rating schemes. Furthermore, as for constituting supplier development strategy framework, supplier certification classes are also generated.

2. LITERATURE REVIEW

Crucial importance of supplier relationship has been highlighted by many researchers in industrial marketing and purchasing/supply management literatures (e.g. Choi and Hartley, 1996; Olsen and Ellram, 1997, Cannon and Homburg, 2001; Bruno et al., 2012). In order to have an efficient supply base and a long-term relationship, the practitioners should give importance to supplier selection/evaluation and supplier development strategies. In the literature, supplier selection and evaluation based studies are descriptive (as a description of actual practice) or prescriptive which focus on methods (e.g. modeling and other quantitative or qualitative techniques) for selection and evaluation (Ellram, 1990). Regarding to prescriptive ones, various methods have been used in the related literature, ranging from basic ones (e.g. linear weighting and categorical methods) to more advanced methods such as statistical and mathematical methods and artificial intelligence (Boer et al., 2000; Sarkar and Mohapatra, 2006). On the other hand, in the descriptive studies, identification of supplier selection and evaluation criteria is one the areas that the researchers put emphasis on (e.g. Ellram, 1990; Swift, 1995; Vonderembse and Tracey, 1999; Thanaraksakul and Phruksaphanrat, 2009). In supplier assessment, different criteria can be used such as price, delivery, quality, management compatibility, personnel training and development, product reliability, attitude and strategic fit, labor relations record, technical capacity and support, after-sales services, information technology/communication systems, financial status, and innovation (Ellram, 1990; Thanaraksakul and Phruksaphanrat, 2009) which are critical to partnership success and performance development. Besides that area, supplier development issues have also received a considerable attention from the academics (Watts and Hahn, 1993; Krause, 1997; Krause and Ellram, 1997). Industry specific purchasing and supplier management studies are also common in the literature (Choi and Hartley, 1996; Lambert et al., 1997; Chan and Chan, 2004) and more specifically automobile industry has been the focus of some supplier studies (Choi and Hartley, 1996; Schmitz and Platts, 2004; Tang,and Qian, 2008). This study presents a descriptive approach by explaining the practice in automobile industry. Additionally, identification of supplier selection/evaluation criteria (based on the situation, the company may determine on which criterion to use for selection or performance evaluation in on-going relationships), detailed rating systems, certification classes and supplier development strategies are the corner stones of the study.

3. METHODOLOGY AND DATA

In this study, 2 stages were pursued for problem definition and score card generation. In the first stage, semi structured interviews and secondary data analysis were conducted by the researchers (project team members) in order to conduct the current state analysis and reveal the problems in the purchasing process.

Additionally, these methods assisted the researchers for the second stage in the determination of the evaluation criteria and developing supplier rating systems. For the second step, a focus group study was employed as an additional technique for forming an interactive environment for criteria and evaluation determination.

Data collection was done between October 2012 and June 2013. For secondary data analysis part, purchasing price list, supplier tracking and evaluation lists, approved and alternative supplier list, purchasing process maps and feasibility forms were examined for conducting current state analysis.

In order to analyze the important aspects in supplier evaluation, nine semi-structured interviews were conducted with different employees/managers from tooling-production, purchasing and import/export departments. Our themes were types/properties of raw materials, purchasing process, supplier evaluation and scorecards. Interviews were recorded and transcribed later by the researchers.

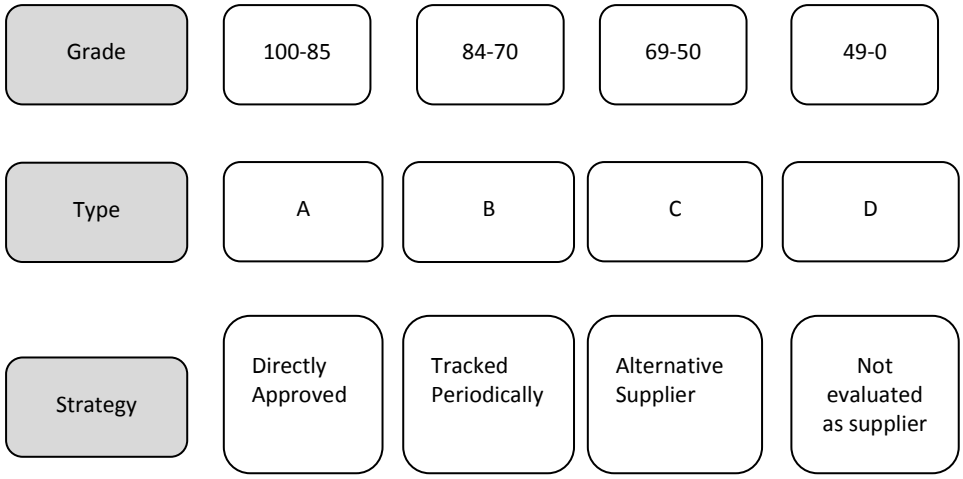
Focus group was composed of Vice Manager, Company's Advisor, Purchasing Department, Import and Export Department, Production Department. Topic was the evaluation criteria (performance indicator), importance rating and detailed measurement of these performance indicators.

3.1. Findings

3.1.1. Problems Defined in Procurement

First problem observed is associated with the supply base. Due to having a limited number of alternative suppliers, XN Company's flexibility is limited. Besides, this situation may create some sourcing risks. As the second problem, this company employs an ineffective supplier evaluation system. Evaluation criteria and grading are causing problems by preventing detailed analysis. "Supplier Performance Monitoring Forms" are being used for recording the names of the firms, prices, order quantities, deadline of orders, and delivery performance. However, supplier evaluation criteria are limited to four classes: quality documents, delivery performance, price, and information flow. These criteria remain narrow also when it comes to detailed evaluation. No sub-categories are evaluated during the process. Additionally, 3 point- grading scale (0-10-15 points) is being utilized in the scoring part. At the end of the evaluation of these criteria, the company categorizes its suppliers. Their classification is shown in Figure 1. Due to having a short list of evaluation criteria, all their suppliers fall in Category A (best category) in performance evaluation. This situation is creating bias in evaluation process.

Figure 1: Current supplier classification scheme



3.1.2. Supplier Selection and Evaluation Scorecard Generation for the Selected Raw Materials

Scorecards are being used in various industries for evaluation and selection of suppliers. Besides, monitoring the performance via scorecards enables taking corrective action on the suppliers' side. Scorecards can show the performance evaluation for a certain period of time like a year or a month. Based on the trends and arising needs, it can be updated and new criteria can be added. New suppliers and if needed current suppliers have to provide the product related information to the buyer company when it is needed. This can be demanded in the form of Request for Information (RFI).

In scorecards, importance weighting and performance scores are multiplied and evaluated together. While the performance ratings are done with 5-point scales (0-very bad, 4-very good), importance weights for the criteria given by the managers and purchasing staff range from 0 to 1. As the total rating, a supplier could get a grade between 0 and 4.

As a result of the focus group studies, the category importance weights were determined. The most important category for the company was found to be Quality (with the weight of 0.30). Price and Logistics Capabilities received the same weights (0.20) while the other categories get lower importance ratings (Trustability- 0.10, Information Sharing- 0.05, Contract Terms- 0.05 and Social- Environmental Responsibility- 0.10).

The suggested criteria for evaluation and selection are explained in detail as below:

Category 1: Quality

- **Quality Certificates:** ISO 9001: 2008 Quality Management Systems and ISO / TS 16949 Automotive - Quality Management Systems and Certification (certificate for being a car manufacturer (OEM) with standard parts supplier) are among the most significant certificates in automotive industry. XN Company has the mentioned certificates. Moreover, they have the Ford Q1: 2002 Preferred Quality Situation Certificate. Thus, during their supplier selection process, the company evaluates the certificates owned by the supplier. The most important certificate is ISO 16949 as for being a component supplier in the Company.
- **Rejected parts per million (RPPM):** It measures defective product rate in a shipment. The PPM value is defined as the number of rejected parts divided by the total quantity delivered multiplied by 1 000 000. PPM is calculated on a monthly basis and is one of the important key quality indicators.
- **PPAP Reports:** Production Part Approval Process (PPAP) is a standard process generated by AIAG (Automotive Industry Action Group) which is required from component suppliers for quality planning in automobile industry. PPAP documents involve design records (if the supplier is responsible of drawing), engineering approval for the part, process flow charts for parts' production, sample reports, quality certificates for testing laboratory, Design Failure Mode and Effect Analysis Report (DFMEA), Process Failure Mode and Effect Analysis Report (PFMEA), specification reports, statistical process control reports. Besides, PPAP encompasses Records of Material for all tests performed, appearance approval and measurement system analysis records (for critical part characteristics) and Part Submission Warrant (PSW) as a summarizing form of all PPAP records.

  Record of Material becomes more important when the semi-finished materials are being purchased. When it comes to raw material manufacturers, technical data sharing remains limited. For instance, UV rays can change door handle's color. This is a case of non-conformance and record of material should be submitted to the buyer company. Besides, for Finland markets, door handles should be resistant to freezing and this semi-finished door handles should exposed to -40 C degrees durability test and the results should be written in the material report.

  These sample and process related documents are essential for understanding the level of conformance to the required quality and design specifications and suppliers' production capability. Suppliers are graded based on the documents availability and their level of PPAP application.
- **Corrective action response:** This refers to the correction responsiveness in case of failures. In case of non-conformance XN gives importance to accessibility. Quick response and providing a detailed feedback with 8D report for non-conformance is essential. 8D is the corrective action process that serves as a problem solving tool by involving root analysis of failure, definition of the problem and corrective actions.

Table 1. Detailed assessment rating for quality category

Quality		
Quality Certificates	4	Supplier has ISO 9001: 2008 and ISO / TS 16949
	3	-
	2	Supplier has ISO 9001: 2008
	1	-
	0	Supplier has no certificates
PPAP	4	Part Submission Warrant (PSW) with product samples and complete supporting other PPAP documents available for review
	3	PSW with product samples and most of the supporting other PPAP documents are available
	2	PSW with product samples and limited supporting other PPAP documents are available
	1	Only PSW and limited supporting other PPAP documents are available
	0	if only PSW is submitted
Rejected Parts Per Million (RPPM)	4	0 PPM
	3	1 - 499 PPM
	2	500 - 999 PPM
	1	1000 - 2500 PPM
	0	> 2500 PPM
Corrective action response	4	Immediate response
	3	Response in 24 hours
	2	Response in 48 hours
	1	Response in 72 hours
	0	> 3 day Response

Category 2: Price

- **Discounts:** If the suppliers provide more than 20 percentage discount to XN Company with the same quality level as the other suppliers provide, that supplier can get the maximum grade. Sometimes the suppliers agree to make price stability agreements for minimum of 3 years rather than providing any discount. In that case, the suppliers get 1 point. Getting discount is important for the company.
- **Relative price:** This is the relative price criterion. Based on the average market price, rating is done for the first prices given by the suppliers (before discounts).

Table 2. Detailed assessment rating for price category

Price		
Relative Market Price	4	>20% lower than the average market price
	3	10 - 20% lower than the average market price
	2	1 - 9% lower than the average market price
	1	No discount, price stability agreement for minimum 3 years
	0	No cost advantage
Discount Rate (% of price)	4	10 or more discount rates
	3	9 - 6 discount rate
	2	5 - 3 discount rates
	1	2 - 1 discount rate
	0	No discount

Category 3: Logistics capabilities

- **On time delivery**: On-time delivery is calculated based on the tolerance limits. Each shipment can have a tolerance limit (e.g. -2, +2 days) for delivery dates which is decided by the buyer company. Receiving the materials in tolerance zone is crucial due to the prevention of any possible breakdowns deriving from late delivery or additional inventory costs originated from early arrivals.
- **Order accuracy:** Although the company works on arranged cumulative party quantities with its suppliers, incorrect quantities (especially more than the required) can cause extra storage costs for the buyer. Again for the quantities, a tolerance limit is determined.

Category 4: Information sharing

- **Open book policy:** In the scope of cost breakdown analysis, suppliers are expected to share their cost accounts with the buyer company. Open book policy implies the transparency of operations regarding to costs. This can help the players in building trust oriented relationships in B2B environment and better supplier development activities.

Table 3. Detailed assessment rating for logistics capability category

Logistics Capability		
On-time Delivery	4	All shipments on time
	3	1 Time Delay (outside tolerance limits)
	2	2 Times Delay (outside tolerance limits)
	1	3 Times Delay (outside tolerance limits)
	0	> 3 Times Delay (outside tolerance limits)
Order Accuracy	4	All correct quantities (within tolerance)
	3	< 5 % shipments with incorrect quantities (within tolerance)
	2	5-10 % shipments with incorrect quantities (within tolerance)
	1	11-20 % shipments with incorrect quantities (within tolerance)
	0	> 20 % of shipments with incorrect quantities (within tolerance)

Table 4. Detailed assessment rating for logistics capability category

Information sharing		
Open book policy acceptance	4	Transparency in all financial records
	3	-
	2	Conditional acceptance of open book policy
	1	-
	0	No acceptance

Category 5: Trustability

- **References:** References are critical for understanding the reputation and trustability of the supplier company.

- **Financial check:** This involves the data collection from banks, tax offices or chamber of commerce (if the supplier is registered in one of them) on the suppliers' credibility.
- **Business experience:** Experience in the field is a major concern for assessment. This provides evidence for stability of the company and its strength.
- **Duration of relation:** The duration of relationships is vital for trust building. Informal relations can emerge over time and enable extra concessions in relations such as more discounts, and expedited shipments. Hence, the length of the relation should be taken into account.

Criteria Category 6: Contract Terms

- **Term acceptance level**: XN Company's purchasing agreement includes 50 clauses. Thus, supplier's term acceptance level should also be assessed in evaluation. Acceptance of the clauses is graded with 4 points**.**

Table 5. Detailed assessment rating for trustability category.

Trustability		
References	4	10 and more acceptable and well-known customers
	3	7 - 9 acceptable and well-known customers
	2	4 - 6 acceptable and well-known customers
	1	1 - 3 acceptable and well-known customers
	0	No references
Duration of Relation	4	10 years and more
	3	7 - 9 years
	2	4 - 6 years
	1	1 - 3 years
	0	New Relationship
Business experience	4	More than 30 years
	3	20 - 30 years
	2	10 - 19 years
	1	1 - 9 years
	0	Newly established company
Financial Check	4	High Credibility
	3	-
	2	Average Credibility
	1	-
	0	No Credibility

Table 6. Detailed assessment rating for contract terms category

Contract terms		
Term Acceptance Level in Purchasing Agreement	4	Acceptance
	3	-
	2	Conditional Acceptance
	1	-
	0	No Acceptance

Table 7. Detailed assessment rating for social and environmental responsibility category

Social and Environmental responsibility		
Occupational health and safety	4	if the supplier has OHSAS 18001 - Occupational Health and Safety Management System
	3	-
	2	-
	1	-
	0	if the supplier does not have OHSAS 18001 - Occupational Health and Safety Management System
Environmental certificate	4	if the supplier has ISO 14001 - Environmental Management Systems and Certification
	3	-
	2	-
	1	-
	0	if the supplier does not have ISO 14001 - Environmental Management Systems and Certification

3.1.3. Supplier Classification and Strategy Development

Based on the total ratings gathered by suppliers in scorecards and by considering the lowest and highest possible ratings, the proposed supplier certification classes can be defined as follows:

Table 8. Proposed supplier certification classes

Total rating	**Certification classes**
4 - 3,5	Platinum
3,49 - 2,99	Gold
2,98 - 2,48	Silver
2,47 - 1,97	Bronze
< 1,97	Not working with those suppliers

Apart from the easiness of monitoring and classifying suppliers, this proposed classification also enables determining supplier development strategies for classes. For platinum group suppliers, who are the best performing suppliers, reward systems can be utilized through providing priority in contracts, forming strategic alliances or supporting supplier investments in various areas such as R&D. The aim is to create long-term relationships with the suppliers that fall into this group.

For gold group suppliers, lacking points should be identified from their scorecards and based on the review, trainings can be given on the selected areas for improvement. Gold suppliers commonly stated as good class suppliers that needs improvement in certain areas.

Silver and bronze groups are the ones that involve low performing suppliers. Rather than making any kind of investment, improve or else approach can be implemented. Setting specific goals such as initiating corrective action in a specific time period would be utilized. As improve or else approach suggests, in case of failure, the contracts can be terminated. Through auditing and feedback mechanisms improvements can be achieved in those groups.

4. CONCLUSION

This study is developed from a part of a senior project which was guided by industry advisors and the author as the academic advisor. By presenting both industry specific criteria in addition to the more commonly used ones, and the detailed rating systems, this study will serve as a guideline for developing better supplier evaluation systems in automobile industry. Besides, this study establishes a bridge between industry and university by forming collaboration.

Supplier classification classes are the tools for understanding and grouping the suppliers. Depending on the classes generic supplier development strategies can be generated. Through development, better buyer-supplier relations can be built and long-term relations in B2B environment can be achieved. Certification classes are being used by most of the companies working with several suppliers. Moreover, if the buyer is a global and powerful brand, the suppliers can take benefit of this certification class system. Suppliers may use their classes (if it is a good one) for reputation and assurance to other companies with the aim of enlarging their business volumes.

As the limitation, semi-finished parts' supplier assessment was set as out of scope and just evaluation of raw material suppliers were taken into account. Some additional criteria such as innovativeness should be assessed for supplier selection and evaluation when semi-finished parts are being evaluated. In the further studies semi-finished material suppliers' evaluation can be taken as the basis. Moreover, different quantitative techniques can be utilized for company's evaluation system.

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