

Supplier Selection Criteria: Study of Automobile Sector in India

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Abstract:—In the supplier selection process, the most important issue is to determine suitable decision making criteria for selecting the right supplier. This research aimed to identify the most important criteria to be used as a baseline for a supplier selection process of automobile sector in India. The results are based on the feedback from automobile sector in India. The common questionnaire was used for data collection/ gathering. The findings can potentially be used as a baseline for an organization to strengthen supplier selection activities and to better understanding with its suppliers. Finally, the main findings about most important criteria are compared with previous studies.

Key words—Supplier Selection, Decision Criteria, Indian Automobile Sector.

I. INTRODUCTION

In today's accelerating world economy, manufacturing companies are facing the market realities of ever more demanding customers, shrinking product lifecycles and steep price erosion. This condition drive to continually cut costs, focus on core competencies (outsource some or all of their production), improving supply chain execution and leveraging the supply base has become more critical than ever in achieving competitive advantage and thus increases the competitive advantage of a manufacturer through supplier selection process. The overall objective of the supplier selection process is to maximize overall value to the manufacturer.

The cost of purchasing raw materials and component parts is significant in most manufacturing companies. Purchased products and services account for more than 60% of an average organization's total costs (Degraeve *et al.* 2000). Accordingly, improvement in the procurement process can help organization to increase their profits and the relationship quality with their supplier can be deemed as one of the significant criteria in the evaluation of organizations' economic performance.

Selection of the suppliers is considered a critical process, cumbersome and lengthy process. England and Leenders (1975) stated that "supplier selection is purchasing's most important responsibility". Later, Weber *et al.* (1991) made the same point by stating, "In today's competitive operating environment it is impossible to successfully produce low cost, high quality products without satisfactory supplier. Thus one of the important purchasing decisions is the selection of suppliers". More recently, with emergence of the concept of supply chain management, more and more scholars and practitioners have realized that supplier selection was a vehicle that can be used to increase the competitiveness of the entire supply chain (Lee *et al.*, 2001).

The selections of suppliers are strategic decisions to be made by an organization with long-term or short term implications. These decisions are highly complex and the most difficult responsibility of the organization and depends on a wide range of criteria such as price, quality, reliability, service, track record, adequate financial resources and ability to comply with the delivery requirements etc. How an organization weigh up the importance of these different criteria will be based on business' priorities, strategy and characteristic of organization.

This research paper is organized as follows: In the next section summarize the literature on supplier selection issues on supplier selection criteria. In the third section, overview about Indian automobile sector is described. In the fourth section methodology adopted to find out the result is discussed. In the fifth section result is discussed. Finally conclusion and future research are drawn.

II. REVIEW OF LITERATURE

Supplier selection has been gaining attention in both academic literature and industrial practice (Panos *et al.*, 2004). Choy *et al.* (2003) stated that in the past decade the role of a manufacturer has evolved from the producer to one that coordinates or manages the supply chain entities. This greatly increases an organization's dependence on suppliers which, in turn, increases the need for effective supplier or partner selection. Supplier selection in such environments can be a complex process and has the potential to have a significant impact on supply chain performance. Braglia and Petroni (2000) stated that supplier selection is the single most important phase in the purchasing process. Liu and Hai (2005) stated that selecting the right supplier is always a difficult task for many purchasing managers. Narasimhan *et al.* (2001) states "supplier evaluation is a complex process that involves the consideration of numerous criterias". Researchers (e.g. Dickson, 1966; Gonza'lez and Quesada, 2004; Teng, 2005; Percin, 2006; Lin, 2009) said that supplier selection criteria are most important in supplier selection process. The studies about supplier selection are based on the years of 1960s. Dickson identified 23 supplier selection criteria, which deeply influenced later researches in this area. In his work, Dickson (1966) conducted a questionnaire survey mailed to 273 commercial organizations, primarily manufacturing firms. The purchasing managers of these firms were asked to identify criterias that were important for selecting suppliers. His findings were divided into two

categories: supplier selection practices by organizations and supplier selection practices by individuals. He showed that quality was perceived to be most important criteria followed by delivery and performance history.

Dickson's pioneering work was re-visited by Weber *et al.* (1991). Weber *et al.* (1991) examined the 74 articles which were published between 1966 (year of Dickson's study) and 1990. Weber *et al.* (1991) categorized these articles based on Dickson's 23 supplier selection criteria. Weber *et al.* (1991) pointed that supplier selection decisions were complicated by the fact that various criteria must be considered. He found out significant changes in relative importance of such criteria as Repair Service and Geographical Location for supplier selection can easily be noted. Similar research work was performed by Zhang *et al.* (2004). In his study, researchers collected 49 articles from 1992 to 2003 and made a review according to Weber *et al.*'s (1991) method. Supplier selection criteria both in Dickson's 23 criteria and new developed ones are reviewed and compared with Weber *et al.*'s (1991) study. The literatures show heavy emphasis on price as significant criteria in the early 1980s. In the early 1990s, time management and customer responsiveness were added to cost. In late 1990s and early 2000s, researchers and practitioners realized the importance of a flexibility criterion as key criteria (Beamon, 1999). Vonderembse and Tracey (1999) indicated managers needed to focus on a set of supplier-selection criteria that could evaluate across multiple aspects including product quality, product performance, and delivery reliability. Chan (2003) stated that apart from the common criteria such as cost and quality, additional aspects had to be given some attention such as flexibility and innovation. Finally, the quality consideration has become strategically important when a manufacturer starts focusing on volume flexibility (Ndubishi *et al.*, 2005). These researches shows that supplier selection criteria are changing over the time period and these change is affected by political, economic, social, environments, characteristics of business. These criteria are a key issue in the supplier selection process since it measures the performance of the suppliers also. The researcher found out 85 criteria (shown in table 1) from the expletory literature review and discussion with industrial professionals of Indian automobile manufacturer.

Table 1: Supplier selection criteria

S.No	Supplier Selection Criteria	S.No	Supplier Selection Criteria
a1	Quality	a44	Product Volume Changes
a2	Delivery	a45	Certificates Of Compliance
a3	Performance History	a46	Housing And Facilities
a4	Warrantees and Claim Policies	a47	Manufacturing Capabilities
a5	Production Facilities and Capacity	a48	Supply Lots
a6	Price	a49	Capacity to Meet The Demand
a7	Technical Capability	a50	Problem Solving Capability.
a8	Financial Position	a51	R&D And Engineering Capabilities
a9	Procedural Compliance	a52	Production Capacity
a10	Communication System	a53	Technological Capability
a11	Reputation and Position In Industry	a54	Response To Customer Request
a12	Desire For Business	a55	E-Commerce Capability
a13	Management and Organisation	a56	Ease-Of-Use
a14	Operating Controls	a57	Environmentally Friendly Products
a15	Repair Service	a58	Product Appearance
a16	Attitude	a59	Catalog Technology
a17	Impression	a60	Freight Terms
a18	Packaging Ability	a61	Trade Restrictions
a19	Labour Relations Record	a62	Information Sharing
a20	Geographical Location	a63	Negotiability
a21	Amount Of Past Business	a64	Customization
a22	Training Aids	a65	Certifications
a23	Reciprocal Arrangement	a66	Country's Political Situation
a24	Maintainability	a67	Currency Exchange Situation
a25	Reliability	a68	Trust
a26	Flexibility	a69	Responsiveness
a27	Consistency	a70	Discipline
a28	Long-Term Relationship	a71	ISO 9000 / ISO 14000 certified
a29	Product Development (Ability to Innovation and Co-Design)	a72	Waste management
a30	Logistic Cost	a73	Product range
a31	Inventory Management (Inventory Costs)	a74	Infrastructure
a32	Willingness to Disclose Cost/Other Information	a75	Layout
a33	JIT	a76	Product line
a34	Quality Standards	a77	Management skills
a35	Quality System Adequate	a78	Calibration control
a36	Professionalism	a79	Non-conforming material control system
a37	Physical Proximity	a80	Corrective and preventive action system
a38	Legal/Contractual Terms	a81	Audit mechanism

a39	Superior Customer Service	a82	Patent
a40	Social Policies	a83	Management Commitment
a41	Organizational Culture	a84	Number of Employees
a42	Supplier Purchasing Strategies, Policies, And Techniques	a85	Number of Technical Staff
a43	Cost Reduction Activities		

Further research is focused to identify the supplier selection criteria, analyzed and testified based on an industry's characteristics. Toward this, a study is undertaken by the researcher in Automobile Industry in India.

III. OVERVIEW OF THE AUTOMOBILE INDUSTRY IN INDIA

While the automobile industry in India started developing in 1940s, distinct growth rates started only in 1970s. After economic reforms took place in India in 1991 that the automobile industry started opening up. Thus, the mid-1990s are characterized by the entry of global automobile manufacturers through joint ventures in India. After the year 2000, further policy changes were introduced and the focus on exports in the industry started increasing. Following that, the Core Group on Automotive Research and Development (CAR) was set up in the year 2003 to identify priority areas for Research and Development (R&D) in India. After year 2003, there was a change in automobile market which where due to -

- ✓ The government has reduced regulation on the industry and more foreign players were looking to invest in Indian automobile sector.
- ✓ Banks and other financing companies started providing car loans at reasonable interest rate.

Now the automobile industry in India produces a wide range of vehicles like passenger cars, utility vehicles, commercial vehicles, two-wheelers, three-wheelers and tractors. Currently, there are approximately 15 manufacturers of passenger cars and utility vehicles, approximately 9 manufacturers of commercial vehicles, approximately 16 manufacturers of two-wheelers and three-wheelers and approximately 14 manufacturers of tractors. The Indian automobile industry is one of the world's fastest growing automobile industries growing at a Compounded Annual Growth Rate (CAGR) of approximately 17 per cent over the last five years.

The largest Indian passenger car manufacturers include Tata Motors, Maruti Suzuki, Mahindra and Mahindra and Hindustan Motors. Presence of foreign players such as Fiat, General Motors, Toyota, BMW, Audi, Volkswagen and Volvo is also growing in this segment. Major Indian manufacturers of commercial vehicles are Tata Motors, Ashok Leyland, Eicher Motors, Mahindra and Mahindra and Force Motors. Like the passenger car segment, this segment has also seen foreign companies such as MAN, ITEC, Mercedes-Benz, Scania and Hyundai entering the market. Two-wheeler manufacturing is dominated by Indian companies like Hero Honda, Bajaj Auto and TVS. Foreign players in this segment include Honda, Yamaha and Piaggio. Three-wheeler manufacturing is also led by Indian companies that include Bajaj Auto, Force Motors and Mahindra and Mahindra.

In India, the automobile industry provides direct and indirect employment to about 17 million persons. According to the Automotive Mission Plan 2006–2016 (AMP), the automobile industry is expected to provide additional employment to nearly 25 million by 2016. It contributes 4.7 per cent to India's GDP and 19 per cent to India's indirect tax revenue. The Indian automobile component manufacturing sector consists of 500 firms in the organised sector and around 5000 enterprises in the unorganised sector. The following are the major automobile clusters:

Western India: Mumbai - Pune - Nasik - Aurangabad

Southern India: Chennai – Bangalore -Hosur

Northern India: Delhi-Gurgaon – Faridabad

The major characteristics of Indian automobile sector are:

- ✓ Indian automobile is the second largest two-wheeler market in the world
- ✓ Indian automobile is the fourth largest commercial vehicle market in the world
- ✓ Indian automobile is the 11th largest passenger car market in the world

Turnover of the automobile industry in the year 1998–1999 was Rs. 360 billion which was US\$ 18 billion in the year 2008-09. The high GDP growth rate of India of 8–9 per cent over the last five years, combined with the development of a large domestic market due to increase in prosperity and incomes in the country and a large pool of a skilled workforce at lower costs has attracted several major global automobile manufacturers to India. According to the AMP, increasing competition between manufacturing companies has led to improvement in productivity by 20 per cent each year in the automobile industry which is one of the highest in the manufacturing sector.

In the automobile industry, raw material purchasing has become a critical business component. Purchased goods account for about 80% of the cost of vehicle goods sold, and together, the large automobile companies spend hundreds of billions of dollars a year with suppliers. Thus purchasing processes can have a big impact on a company's bottom line. In fact, some experts estimate that a 1%- 4% reduction in purchase costs can add as much to profits as an 8%- 10% increase in sales (Varshney and Gupta, 2002). Hence supplier selection becomes most critical issue for Indian automobile manufacturer.

IV. RESEARCH METHODOLOGY

The current research is both qualitative and quantitative in nature. The review of the related literature was done to identify the different variables, probable contemporary issues, and clarity of concepts. This was followed by primary survey. Self-structured questionnaire was formulated, pre-tested and then applied to gather information with the aid to solve the

considered problems. Respondents were Assistant Manager, Manager, Assistant General Manager, and General Manager of the automobile manufacturing companies. The collected secondary data were used for empirical research. In the questionnaire rating scales were used. For the purpose of collection of qualitative and quantitative data and to avoid ambiguities and non-response, appropriate sample size was taken. In Indian automobile approximate 35 companies are in operating and out of which 15 companies have been responded the questionnaire. The researcher collected the data with the help of questionnaire, personal interview and personally visiting these companies to get a rich insight in supplier selection process. The collected data were processed with the aid of the computer. Softwares viz., SPSS and MS-Office were used for tabulation, calculation, statistical testing and graphical representation. Hypotheses were tested by the use of t-test at 0.0001 level of significance and 95% confidence interval of the difference. The ratings of criteria that can be expressed in grey numbers.

V. RESULT AND DISCUSSION:

The data collected was tabulated and subjected to Grey analysis and t-test is performed. In below the result is shown in fig 2. Researcher took the 21 most important criteria out of 85 criteria based on survey. These criteria are Price, Quality, Quality Standards, Reputation and Position in Industry, Delivery, Financial Position, Quality System Adequate, Technical Capability, Production Facilities and Capacity, Long-Term Relationship, Trust, Procedural Compliance, Responsiveness, Impression, Communication System, Warrantees and Claim Policies, ISO 9000 / ISO 14000 certified, Attitude , Management and Organisation, Packaging Ability, and Performance History are mostly being used in the automobile sector.

H10: There is no significance of price of the product in supplier selection process.

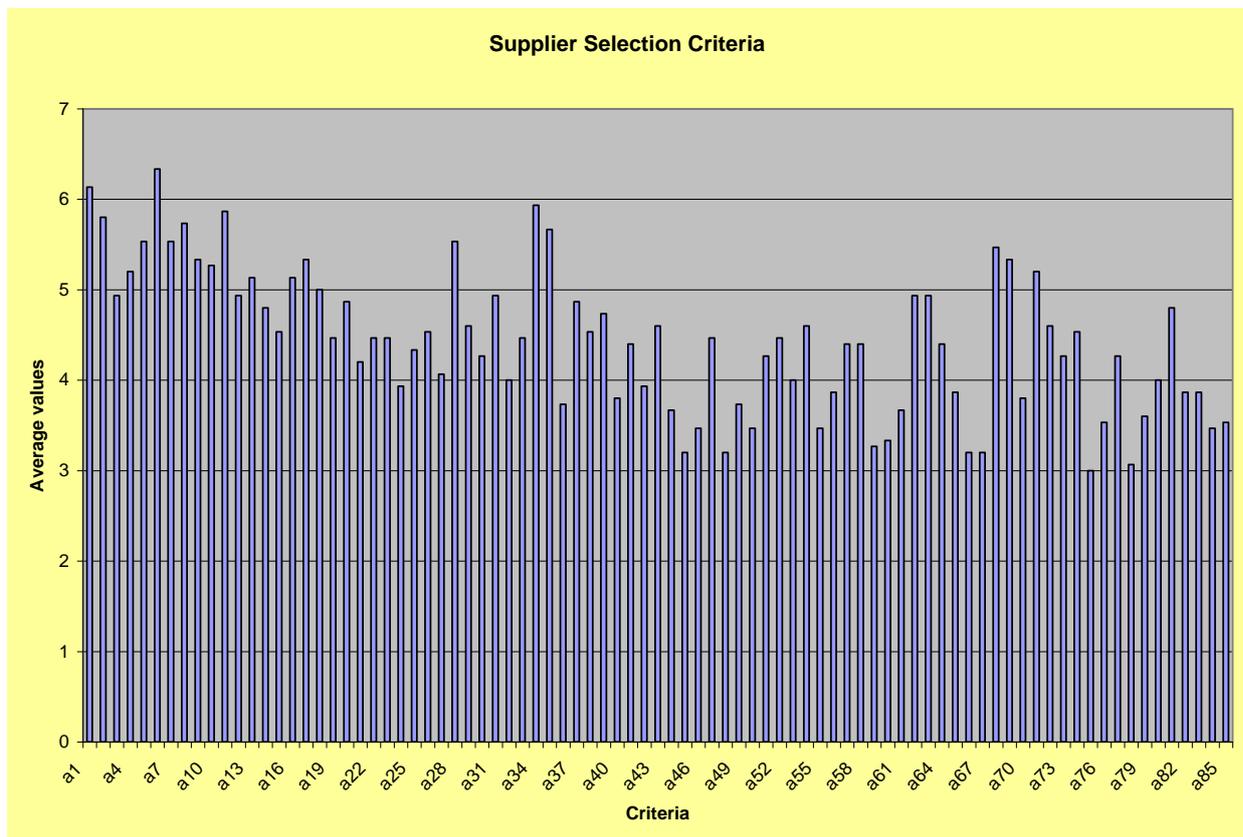


Figure 1: Supplier Selection Criteria

Researcher compared these supplier selection criteria (concern with Indian automobile industry) with other researcher’s findings (these researches are based on manufacturing industry in other countries) following results were reached at:

Table 2: Rank of the supplier selection criteria

Rank	Supplier Selection Criteria	Mean	t- Value	Gray No. (Γ_i)	Dickson 1966	Weber et al. 1991	Zhang et al. 2004
1.	Price	6.333	23.438	0.862	6	1	1
2.	Quality	6.133	17.521	0.845	1	3	2
3.	Quality Standards	5.933	32.654	0.760	---	---	---
4.	Reputation and Position in	5.867	27.250	0.757	11	8	12

	Industry						
5.	Delivery	5.800	23.869	0.747	2	2	3
6.	Financial Position	5.733	21.500	0.743	8	9	6
7.	Quality System Adequate	5.667	30.324	0.713	----	---	---
8.	Technical Capability	5.533	17.200	0.722	7	6	5
9.	Production Facilities and Capacity	5.533	25.702	0.697	5	4	4
10.	Long-Term Relationship	5.533	28.835	0.690	---	---	----
11.	Trust	5.467	23.127	0.690	---	---	---
12.	Procedural Compliance	5.333	16.733	0.689	9	15	13
13.	Responsiveness	5.333	21.166	0.673	---	---	---
14.	Impression	5.333	22.958	0.667	17	15	21
15.	Communication System	5.267	17.540	0.672	10	15	7
16.	Warrantees and Claim Policies	5.200	15.255	0.674	4	23	13
17.	ISO 9000 / ISO 14000 Certified	5.200	17.567	0.667	---	---	---
18.	Attitude	5.133	15.957	0.662	16	12	19
19.	Management and Organisation	5.133	15.957	0.657	13	7	7
20.	Performance History	4.933	12.458	0.642	3	9	7
21.	Packaging Ability	5.000	16.202	0.639	18	13	13

Thus, conclusively it can be said that the supplier selection criteria used in Indian automobile sector is different from the said literature of supplier selection.

Dickson (1966) ranked the importance placed on 23 criteria of supplier selection. Quality is the most important criteria cited followed by delivery and performance history. Weber *et al.* (1991) reviewed 74 articles from 1966 to 1991 concerning supplier selection criteria and methods. In his study price is seen as most important criteria followed by delivery and quality. As Weber *et al.* works, Zhang *et al.* (2004) is also collected 49 articles from 1992 to 2003 and made a review using similar methodology. In this work, price is having top rank followed by quality and delivery. Production facilities and capacity, technical capability and financial position, which were categorized as having ‘considerable importance’ by Dickson, were discussed in large proportion of the articles Zhang *et al.* reviewed. Financial position and communication system as supplier selection criteria got more attention from the literature reviewed in this study than that in Weber *et al.*’s (1991) study, while the reverse happened to geographical location. Other criteria, such as packing ability, training aids, procedural compliance, labor relation record, warranties and claims policies, attitude, reciprocal arrangement, impression, desire of business and amount of past business were much less mentioned in the articles reviewed in both studies.

Since 2003, new criteria have been presented in the supplier selection articles. Some of them are extensions of Dickson’s original criteria; some are generated with the development of management philosophy. While delivery and quality remain much the same, cost seems to be substituting net price. In this research work 21 most important criteria is identified, in which price is most important and some newly developed criteria i.e. Quality Standards, Quality System Adequate, Long-Term Relationship, Trust, Responsiveness and ISO 9000 / ISO 14000 Certified is developed along with the development of supply chain management (SCM).

VI. CONCLUSION AND FUTURE RESEARCH:

The biggest challenge the most of the automobile industries is change of mindset of the purchasing and traditional business approach. Supplier selection starts with setting of the strategic goal or strategic decision about the single sourcing and multiple sourcing (Demirtas and Ustun, 2008). After deciding the strategic goal, organization has to decide the various selection criteria based on organization’s requirement. The researcher found out 21 criteria (Out of 85 criteria from the review of the exploratory literature) which are selected for supplier selection purpose in Indian automobile industry which is based on the survey results.

For future research, these two aspects, supplier selection criteria and methods, will continue to be the focus. For supplier selection criteria, combining supply chain performance measurement and supplier selection seems to be an important area. Although some articles are on SCM environment, little attention has been paid on the influences on the whole supply chain if a certain supplier is selected. Some new criteria to reflect the whole supply chain performance should be developed in the process of supplier selection. The methods mentioned in this study have shortcomings in dealing with the selection problem. New methods to simulate the process of human decision making, such as neural network, seems to be promising, and the computer programming for supplier selection should also be developed.

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