Benchmarking of purchasing practices using Kraljic approach

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Abstract

Purpose – The purpose of this paper is to reduce impact on profit and supply risk, for strategic part by defining appropriate purchasing strategies using Kraljic portfolio model (KPM) approach.

Design/methodology/approach – A five-step approach of KPM is used to identify strategic parts. The attributes affecting impact on profit and supply risk are then identified. A structured questionnaire is prepared for each attribute. Likert scale having weights from 1 to 5 is used to select method of measurement for each response. The overall score of attributes for dimensions "supply risk" and "impact on profit" interpret the position of the part, i.e., "strategic part," "leverage part," "bottleneck part" or "non-critical part" in the Kraljic matrix. The part having highest impact on profit and supply risk is to be considered as strategic part for defining the purchasing strategies.

Findings – This paper outlines a practical solution to the problem of designing/defining purchasing strategies for development of supplier. Impact on profit is reduced by cost reduction and quality improvement whereas supply risk reduced by improving delivery time and suppliers profile.

Research limitations/implications – The proposed methodology is applied to a boiler industry to identify the strategic parts and focus on strategic suppliers, which are fewer in number but having larger impact on profit and supply risk. The "Body" part of ball valve assembly of the boiler is considered for the study. However, it can be extended for selecting and evaluating of suppliers strategy for other parts of the boiler. Not only boiler industry sector but also other companies also benefit from the results of this study by implementing the purchasing strategies as formulated in the KPM.

Originality/value – The Kraljic matrix has been largely used in many different industries like automobile, manufacturing, construction, oil and gas, etc., as an efficient tool for developing differentiated purchasing strategies. However, its application on parts procured by boiler industry is unknown, as well as the lack of systematical approach on criteria prioritization which is one of the key issues of the methodology. This work explores the output usefulness and its applicability on ball valve assembly projects.

Keywords Benchmarking, Supply chain management, Buyer-supplier relationships, Kraljic portfolio model

Paper type Research paper

1. Introduction

In recent years, supply chain management (SCM) is gaining higher popularity because of the enhancing challenge from competition, growing pressure from dynamic economic environment and increasing demand from stakeholders. With the growing importance of SCM, the supply side of companies received increasing attentions and assumed more strategic importance. Purchasing has evolved from the traditional clerical function to a strategic imperative. Companies strive to find ways to improve the performance of purchasing in order to strengthen companies competitive advantage. On the issue of how purchasing could be used as a strategic weapon, previous literature noted different solutions. One perspective supports for execution of purchasing exercises, instruments and methods.

Many instruments have been recommended to support purchasing activities. Portfolio model analysis has received enormous attention during the last two decades and it has

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been appreciated by researchers. Nowadays portfolio approach has been widely used in many sectors but has its beginning in the finance sector. Kraljic introduced the first portfolio model for developing purchasing function as an important management instrument, when the strategic importance of purchasing became evident and purchasing was in need of becoming part of SCM. Since then, there have been a growing number of applications of the portfolio approaches and many models were suggested.

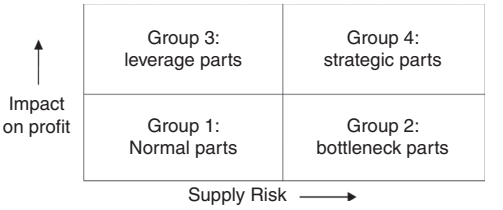
In order to identify differentiated strategies, Kraljic proposed a strategic approach for purchasing function. Kraljic portfolio model (KPM) classifies purchased parts based on impact on profit and supply risk as shown in Figure 1. This model proposed a framework in which the organization must first classify purchased and required parts in terms of impact on profitability and supply complexity and then determine its sourcing strategies based on the position of parts in the Kraljic matrix.

Application of KPM on projects-driven industries like boiler industry is poor and relatively unidentified. Boiler industry does suffer huge losses due to supply interruptions; therefore the selection of the right purchasing strategy is essential. This paper describes the application of Kraljic matrix on major Indian boiler industry to identify the necessary adaptations of the tool. As the application of such methodology on boiler industry is unknown, this research focussed on the applicability and development procedure in order to analyze its usefulness with the real-world industry practitioners.

2. Literature review

SCM is an important function in advancing the competition in an industry (Gunasekaran, 2004). SCM strategy is to blending buyers and suppliers to improve liability and flexibility in firms supply processes (Gunasekaran, 2004). Technological and competitive factors are growing increasingly which makes it difficult and less profit for companies to produce required parts. Alternatively, outsourcing has become a major strategy for corporations. In a meanwhile, increasing worldwide integration and customer satisfaction has led to the sensitivity of logistic issues in planning of supply chain. Such issues form a SCM approach (Gunasekaran *et al.*, 2001). For a long time purchasing is a part of companies supply chain business and has become important with purchasing costs rising to around 50 percent for the whole industry sector and even up to 70-80 percent in some sectors (Gadde *et al.*, 2010).

Nowadays, firms started focussing on minimizing the total cost (Gadde *et al.*, 2010). The focus on essential capability affecting purchasing and buying firms have begun to take benefits of the supplier's capabilities in product development and specialized resources. This has in turn increased the importance of developing strategic relationships with suppliers. To develop relationships larger focus placed on evaluating the firm's supply base and developing strategies for how to manage the supply base structure. Several models have been developed in order to help manage a firm's supply



Source: Kraljic (1983)

Figure 1.
Kraljic matrix for classifying parts

base and some have become widely adopted throughout the industry. Purchasing portfolio models experienced great recognition in the recent literature about strategic purchasing. Numbers of papers are published on the purchasing portfolio models. Some published work related to KPM is reviewed here. Kraljic (1983) introduced the first comprehensive portfolio approach for use in purchasing and supply management. Not every product a company wants to buy can be sourced in the same way. Different strategies need to be implemented in different situations regarding supplier-buyer relationships. Sometimes strategies have to be adjusted due to changes in relationships or the firm's situation. The KPM is one the approach to determine appropriate purchasing strategies. Not only this model useful for understanding the strategies in purchasing but also for the interaction of buyer-supplier relationships.

According to Kraljic a firm's supply strategy depend upon impact on profit and supply risk. Attributes of the impact on profit factor are the percentage of purchased goods and services in relation to total costs and the impact purchased goods and services have on organizational profitability. The thought of the KPM is to reduce complexity in supply market and to strengthen purchasing power of the buyer (Gelderman and Van Weele, 2005). Position of parts in matrix signifies the performance of buyers and suppliers therefore expected attributes of importance in explaining the condition that influences the choice of purchasing strategy within each quadrant.

The leverage parts carry a high impact on profit but a low supply risk. For leverage parts cost of every part is high and many suppliers are available. The procuring strength of buyer is high as various suppliers available in the market. Due to competition between the suppliers is high, competitive auction is the suggested purchasing strategy for leverage parts to achieve the best economical result (Bensaou, 1999).

Strategic parts are having great significance on the economical side of the firm however the supplier risk is high as there is less number of suppliers available in the market. Most of the time strategic parts are supplied on the buyer's request by single supplier only. One possible procuring strategy is to develop a long-term strategic partnership with the supplier. Considering category of strategic parts, buyer controlled or a balanced strategic partnership can be formed.

Bottleneck parts are specified by a low impact on profit but carries great supply risk. For this category available supplier is very less which results in the suggestion to carry out a secure supply and searching for other alternative suppler. Non-critical parts are easy to procure and carry no significant impact on profit. Because of the supplier available in the market used for supplying the non-critical parts are more than the cost of the part, the suggestion is to reduce the number of suppliers and explore competitive purchasing practices (Gelderman and Van Weele, 2002).

Ford (2003) explored the KPM to depict benefiting situations for supplier empowerment. These situations points to bring stability between a buying firm and a supplying firm to make win-win situation for both the sides. Author recommended for strategic and leverage parts that supplier empowerment is highly beneficial solution for high supply risk situations. Supplier empowerment helps to build long-term relationships and makes buyer market power stronger than supplier market power. Author insisted against supplier development for non-critical parts, because long-term relationships pressurize sourcing flexibility.

Kraljic (1983) recommended that for strategic parts purchasing managers should form long-term relationships with their suppliers. Buyers should open out volume of purchases parts between available multiple suppliers for non-critical quadrant by focussing on short-term forecasting and planning. Campbell (1985) studied comparison

between situations favoring competitive and cooperative. The buying firm is larger than the supplying firm in competitive buying. Cooperative buying involves firms of similar size. Portfolio models can be used to improve the position of parts having high supply complexity and impact on profit. A portfolio model offers structure to recognize and to focus on a purchasing strategy which makes the difference between unclear and unproductive purchasing firms and purchasing focussed firms especially firms that have never considered strategic procurement expenses. Portfolio model persuades the effectual function of purchasing in supporting firms earnings and accomplishment (Pedersen and Dubois, 2002).

Kraljic decisive article started a flow of theoretical and experimental study on the use and potential of a portfolio approach in purchasing function (Gelderman and Van Weele, 2002). Practitioners have established variants of the novel KPM (Lars, 2008) which are providing quite similar results to the KPM. Differentiated purchasing strategies are employed for different parts of different categories. Nellore and Soderquist (2000) explored that the multiple relationships with supplier can be distinguished by specialized procurer with the help of KPM. Purchasing officer can choose differentiated strategies that are suitable for each relationship and can effectively handle multiple suppliers with the help of KPM. KPM has great influence on scholars to start advance research into purchasing portfolio approaches. Caniels and Gelderman (2005) highlighted issues like purchasing strength and supply market reliance. The study about the purchasing portfolio matrix practices and smoothness in purchasing practices was carried out by Gelderman and Van Weele (2005) and author also aimed at continuously varying nature of purchasing strategies in the KPM. Croom (2000) applied KPM approach for web-based procurement of maintenance, repair and operation items. The link to the specification process is explored by Nellore and Soderquist (2000) with the help of portfolio approach. Wynstra and Ten Pierick (2000) argued that portfolio approaches can be implemented for supplier empowerment in development of the product. Nowadays KPM approach became the leading routing practice in purchasing activities and confirmed that KPM remains the basis of differentiated purchasing strategy for many firms.

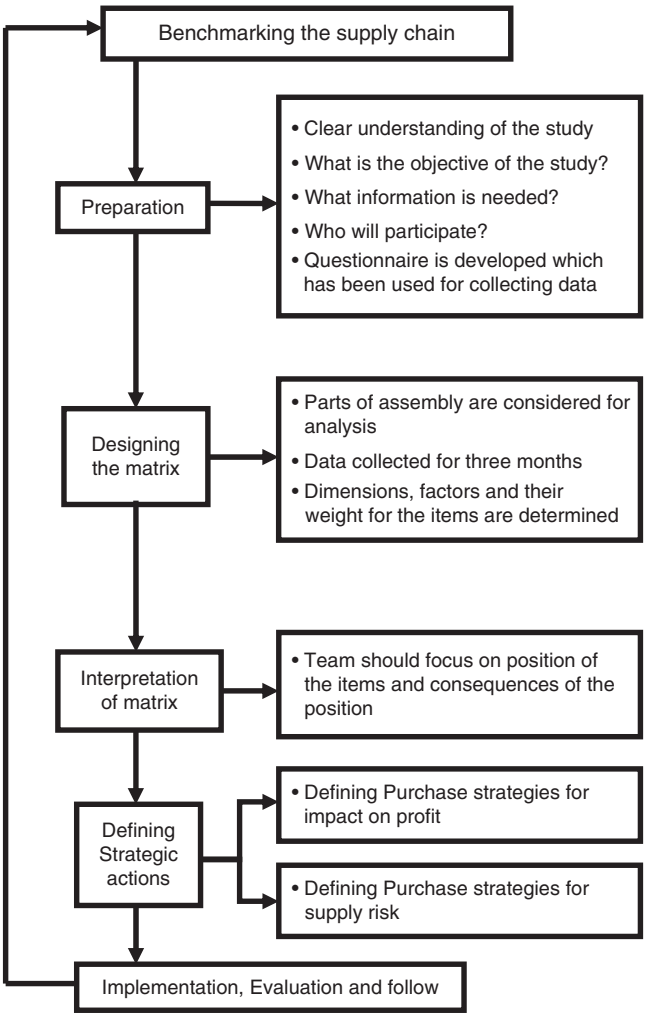
3. Methodology

There are two types of research methods used in the collection of data; quantitative and qualitative methods. A combination of qualitative and quantitative approach will be more suitable in order to fulfill the purpose of this research, since this study is investigating purchasing behavior of an organization which takes into account recognitions, point of views, thoughts and judgments that are difficult to measure only in a quantitative way. A five-step Kraljic approach is used to systematically complete the Kraljic matrix and to identify the strategic recommendations, as shown in Figure 2.

3.1 Phase 1: preparation

During preparation phase clear understanding of the study is given to all the participants and this phase is completed when the following questions are answered:

- What is the objective of the analysis: main objective of this research was to investigate the application of KPM for boiler industry and to validate its use by defining differentiated purchasing strategies to minimize "supply risk" and "impact on profit." Data collection instrument "structured questionnaire" is developed in this phase, which is again tested or evaluated for its reliability through pilot study, which has been used for collecting data.



Source: Gelderman (2003)

Figure 2.
A five-step approach to suppliers evaluation and analysis

- What information is available and/or needed: primary data for our research gathered through semi-structured interviews and secondary data have been collected from academic reports published in well-known business databases.
- Who will participate in the team: a cross-functional team is required for reasons of support and implementation, with representatives and specialist from all relevant departments like purchasing, quality, production and so on. Both the top management and the line management from the various departments of the organization will have to be convinced of the project.

The first step requires the formation of a team and a clear description of its objectives of the study.

3.2 Phase 2: designing the matrix

Different issues considering level of aggregation, the selection of dimensions, attributes, weights and the method of measurement are analyzed and selected in this phase. The dimensions impact on profit elaborates the impact of different attributes on profit, while supply risk elaborates the complexity in supply due to different attributes. The dimensions "impact on profit" and "supply risk" can be interpreted in many different ways.

Kraljic stated the following constituting factors:

- impact on profit: purchase volume, percentage of total purchase value, impact on product quality, impact on market growth; and
- supply risk: availability/scarcity of the product, number of available suppliers, substitution possibilities, possibilities to switch between make or buy, risk of transport and storage.

According to Kraljic, this list is not exhaustive as other factors could be relevant for both dimensions. Within the project team consensus should be found concerning the used attributes and the way these attributes are measured.

3.3 Phase 3: interpretation of the matrix

The resulting KPM gives four positions for the purchased parts as strategic, leverage, bottleneck and non-critical parts:

(1) First group of parts (strategic parts) have the highest prospective for providing competitive advantage. In this category the majority of buyer's efforts and its resources should be spent on the goods.

(2) Second group of parts (bottleneck parts) have high supply risk with little benefit.

(3) Third group of parts (leverage parts) provide a high profit for the organization and also a large number of suppliers in relation to supply these parts are available.

(4) Fourth group of parts (non-critical parts) have low value and rather little risk.

The team is probably to benefit from a critical comparison between prior, sometimes implicit, expectations and the actual found positions in the matrix. There might be some flustering discoveries which challenge the team to develop a more profound understanding of the state of affairs. The team should want to know reasons for such findings; the team should take into account detailed information on the overall business strategy, the situation on the supply market and the capacity and intentions of individual suppliers.

3.4 Phase 4: defining strategic actions

The fourth phase is dedicated to the selection of strategic responses to the position in the portfolio matrix for each of the products under consideration. One should always be aware of the fact that there are various options to consider for each product category in the matrix. The leading question is which improvements are desirable, necessary and feasible. As a rough guideline one should recognize that there are strategies for holding a position and strategies for moving to another position. Obviously, changing positions will not always be possible. Whenever specific conditions are met, it might be possible to switch to other, more favorable positions. The most common switches within the matrix and the conditions that allow for these movements are identified during this study.

3.5 Phase 5: evaluation and follow up

The selected strategies could be interpreted into routine actions. The current situation of the part and their supplier performance is reflected by the positions of part in Kraljic matrix. Buyer benefits more if compared the matrix with the matrix from previous period. Evaluation of the positions of the parts after reasonable time allows additional intervention if needed. Company might benefit from portfolio analysis, which is based on the observations and interviews. It elaborates on the possibilities to formulate differentiated purchasing strategies and focusses on moving items to better positions in this matrix.

4. Kraljic five-step approach

Proposed KPM approach consists of five steps is tested and evaluated to develop appropriate purchasing strategies in boiler industry for ball valve assembly of boiler. All five steps are implemented during case study and discussed below in detail.

4.1 Phase 1: preparation

In this phase clear understanding of the objective of this study is given within the company. Main objective of the study is to investigate and validate the application of KPM to reduce "impact on profit," and "supply risk," for strategic part by defining appropriate purchasing strategies. This will be done according to the methodology explained in the previous section. To make adequate preparations of a study a cross-functional team is formed which consists of representatives from all relevant departments like purchasing, production, quality, design, logistics and marketing. Different attributes which are important to define supplier's strategies like quality, delivery, past performance, production facilities and capacity, net price, technical capabilities, criteria of price, in time delivery, geographical location, product, performance criteria, service performance criteria, cost criteria were discussed in cross-functional team. The discussions revealed that there is no any common knowledge of the factors which guide the decision making process. Therefore the evaluation criteria's are classified into four main categories, i.e., benefits, opportunities, cost and risk. On the basis of these categories, questionnaire is developed which has been used for collecting data. To select suppliers strategies and to satisfy the organization needs different sets of attributes have been proposed for supplier's evaluation in the preparation phase.

4.2 Phase 2: designing and filling in the matrix

Total 35 parts of ball valve assembly (Figure 3) are considered for analysis. For both dimensions of KPM, the criteria's and their weight for the 35 selected parts are determined.

The dimensions "impact on profit" and "supply risk" interpreted in following different ways:

- impact on profit: quality, supplier's technology, joint growth, relationship building, cost of product, cost of relationship; and
- supply risk: flexibility, delivery, supply constraint, buyer-supplier constraint, supplier's profile.

Finding the values for both the dimensions of KPM is time consuming as there are many attributes determining these dimensions. Consensus method is used until consensus is reached. Likert scale of 1 to 5 is used for reply of each question. Each reply having range from "very good" to "unsatisfactory" and that can be selected according to impact of all attributes on profit of the organization and level complexity in supply of the parts.

No.	Part	No.	Part	No.	Part	No.	Part	No.	Part
1	Body	8	Trunnion Pad	15	Springs	22	Stem "O" Ring	29	Stuffing Box
2	Drain Washer	9	Ball	16	Stud	23	Bracket	30	Stuffing Box Bolt
3	Drain Plug	10	Ball Seat	17	Nut	24	Coupler	31	Top Mounting Bolt
4	Trunnion	11	Soft Seat	18	Adaptor	25	Gear Box Bolt	32	Gear Box
5	Trunnion Bolt	12	Seal O Ring	19	Sealant Injection	26	Gland Seal Ring	33	Stem Sealant Injection
6	Trunnion Gasket	13	Back Up Ring	20	Stem Thrust Washer	27	Gland O Ring	34	Name Plate
7	Trunnion "O" Ring	14	Seat Retainer	21	Stem	28	Circlip	35	End Cap

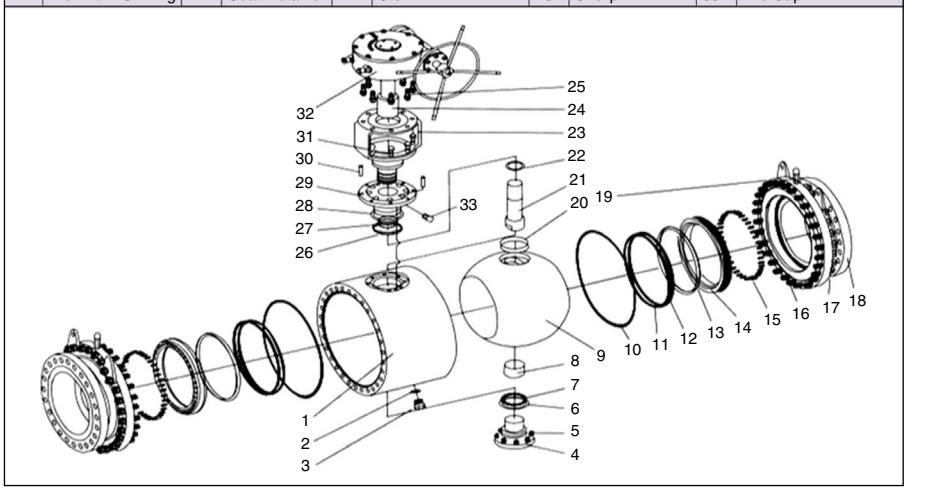


Figure 3.
Ball valve assembly

4.3 Phase 3: interpretation of the Kraljic matrix

The detailed data required for case study is collected by using structured questionnaire. Questionnaire consists of total 38 questions which are used for critical assessment of "supply risk" as well as for "impact on profit." KPM consist of 19 questions for "impact on profit" and 19 questions for "supply risk." Likert scale is applied to reply of each question to reach consensus in the team. As per Likert scale, for reply of each question highest weight is 5 and lowest weight is 1 as described in phase 2. The lowest strategic index is 19 while highest strategic index is 95 is coming out for both dimensions of KPM. It is considered that the matrix is equally divided on 50 percent for each dimension axis, e.g., Strategic parts are the ones that score more than 50 percent both strategic impact and supply risk dimension while non-critical parts are the ones that score less than 50 percent both strategic impact and supply risk dimension as presented in Figure 4, exhibits the relative positioning of diverse parts using the KPM.

Initial analysis indicates that only seven parts, i.e., 20 percent of total parts categorized as strategic parts, which actually compromise 80.34 percent of total procurement budget for the project. In the same way percentage total cost of bottleneck parts, leverage parts and non-critical parts has been calculated and presented in Table I. This table explains the reason why strategic parts and their suppliers require special selection, treatment and empowerment. The other 80 percent of total parts add up to 19.66 percent in purchasing value, and are obviously of less critical and with strategic importance.

4.4 Phase 4: defining strategic actions

Kraljic defined a set of strategies and on the basis of these strategies this study is elaborated. Different purchasing strategies and circumstances are taken into consideration to arrive at an appropriate set of larger number of strategies. During case study two

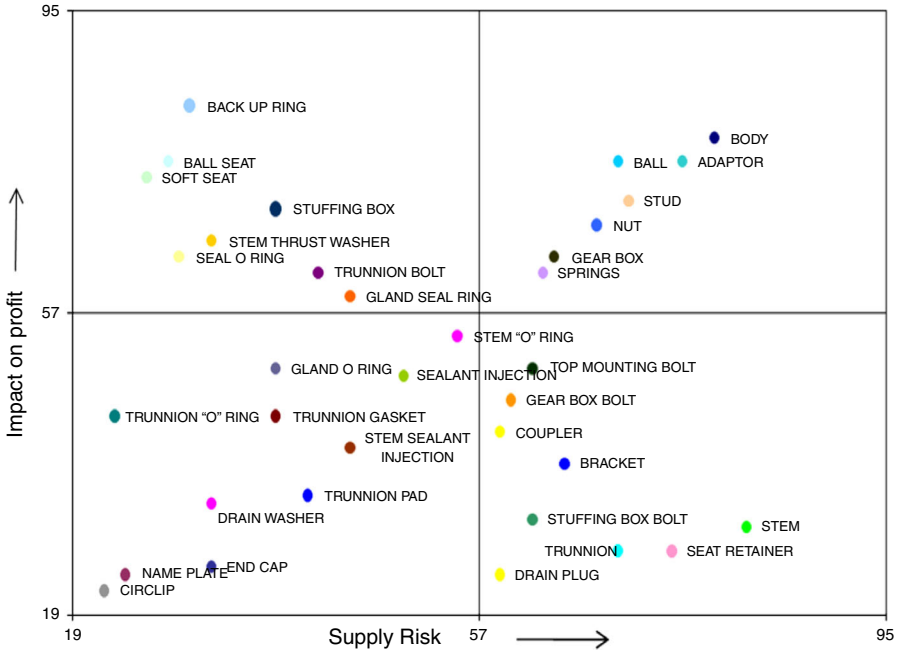


Figure 4.
Interpretation of Kraljic's matrix

Categories	Strategic	Bottleneck	Leverage	Non-critical
Number of parts	7	9	8	11
No. of parts (out of 35) (%)	20	25	23	32
Percentage of total amount purchased	80.34	13.18	4.75	1.73

Table I.
Categories of parts

categories of strategies are selected. First category of strategies aimed at switching to another position, i.e., strategic to leverage, bottleneck to non-critical. Second category strategies aimed at staying in the same category, i.e., in the same quadrant of Kraljic matrix as changing positions from one quadrant to another quadrant is not always possible. In assessing the positions in the matrix and defining the strategic actions, attention should be paid to the sector in which company operates, i.e., the boiler industry sector and the volatility of the market for some materials in this sector. Strategies are defined in such a way that the main focus is to reducing the supply risk which will lead to lower dependency on the supplier. This strategy is therefore not for a specific quadrants but applicable to all directly purchased parts in the matrix. To improve positions in the KPM the next overall assessment was done:

- analysis of the design of part or purchasing process to find out whether improving the position of strategic part is feasible;
- define the strategic actions like long-term relationships when strategic parts hold their position deliberately or when improvement is not possible;
- analyze if non-critical parts can be pooled and placed in supply agreements to improve the efficiency of the purchasing process;

- determine if standardization can be applied to non-critical parts, which could result in reducing the number of suppliers;
- analyze the impact on use of purchasing agents and integrated logistic management system;
- for bottleneck parts, it is advisable to have an agreement with the supplier to secure deliveries; and
- the overall strategy for leverage parts is to bargain the best deal and switch between suppliers if a better deal can be achieved.

A summary of the overall strategic recommendations found in Figure 5.

From Figure 4, it is understood that "Body" is a strategic part as it holds the highest impact on profit and supply risk. To conduct this case study, "Body" has been selected for analysis to explore purchasing strategies.

5. Purchasing strategic implementation

Appropriate purchasing strategies are formed and implemented to reduce impact on profit and complexity in supplying "Body" part. While implementing strategies, priority is given to reduce the supply risk and improve its negotiating position against the suppliers. Because of improved negotiating position, industry may reduce the purchasing cost that will finally reduce its impact on profit.

5.1 Defining strategic actions for "Body" to reduce impact on profit

Attributes like "quality," "supplier's technology," "joint growth," "relationship building," "cost of product," "cost of relationship" are having direct impact on the profit of the organization and for each attribute differentiated purchasing strategies are formed and implemented.

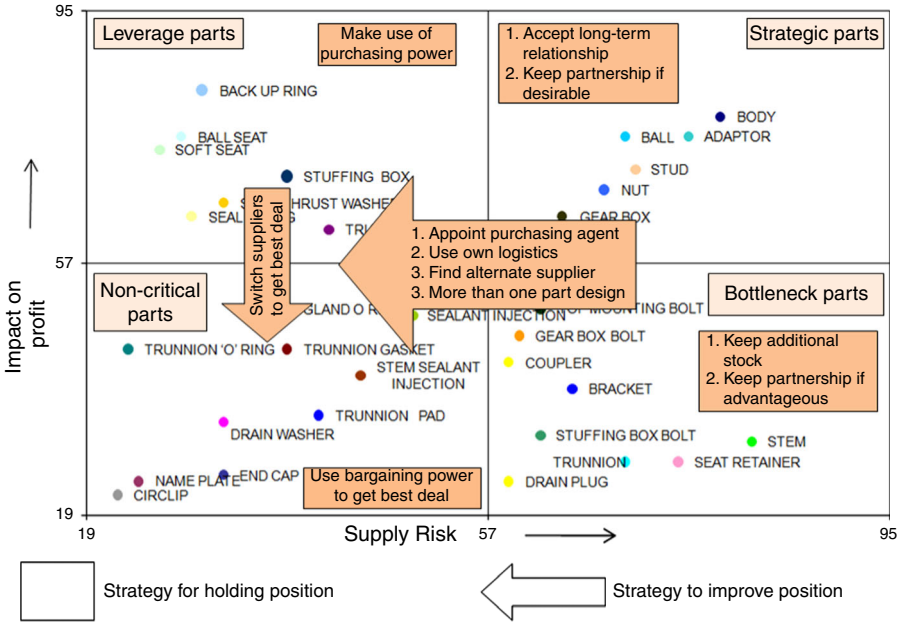


Figure 5.
Kraljic's portfolio matrix with overall differentiated purchasing strategies

5.1.1 Quality. Quality in engineering has a realistic understanding as the superiority of something and defined as fitness for function. Quality is a biased attribute and often misinterpreted. In this study quality is defined with the help of following detailed criteria's:

(1) the capability to provide quality products;

(2) the consistent conformance to specifications;

(3) the quality in providing support services; and

(4) the presence of good quality systems and continuous improvement program.

In order to fulfill above defined criteria's following strategies are implemented while conducting case study:

- selecting ISO 9000 certified suppliers to meet quality standards;
- selecting ISO14001 certified suppliers to ensure environmental standard specifications, safety and health record performance;
- part certification with ISO 17025;
- testing of raw material to adhere quality standards;
- providing sample of part before first ordering;
- proper record on complaints and follow up;
- special packaging by proper marking and labeling of materials;
- meeting shipping requirements by suppliers own transportation; and
- reliability in supply quality by using MRP.

Due to implementation of appropriate purchasing strategies 20 percent improvement has been observed in "quality" attribute, as shown in Table III.

5.1.2 Suppliers technology. Suppliers should deal with new technology to be in competition. Companies are approving those suppliers which respond quickly to new technology. In order to get best possible result supplier should use the correct mix of technologies. The supplier technology must meet the requirement of the purpose by fulfilling the customer satisfaction.

Supplier technology is defined with the help of following detailed criteria's:

(1) existence of an admirable technological structure that can make easy production as well as development of supplying parts;

(2) future technological development as well as the development in manufacturing capability as per the development in supplying parts; and

(3) use of correct mix of technology to reduce cost of the part.

Following strategies been implemented to improve the supplier's technology:

- Suppliers are connected with company using electronic data interchange, web forms and ecommerce tool, i.e., ERP and PLM software's. The benefits include reduced supply chain costs, reduced procurement cost, improved invoice tracking and eliminating non-value added or manual processes.

- Company decided to use traditional machines for machining operations instead of higher end CNC machines. The minimum required quality standards are achieved with the help of traditional machines. The benefit of using traditional machine is reduced cost of the product.
- Supplier is having their own R&D department with testing laboratory which makes supplier capable of testing and calibration of raw material as well as finished parts.

Due to implementation of appropriate purchasing strategies 31 percent improvement has been observed in "supplier technology" attribute as shown in Table III.

5.1.3 Joint growth. A joint growth is a contract between two parties, i.e., buyer and supplier, in which the buyer and supplier agree to develop a new material goods or asset or any concept for a predetermined time by contributing equal shares with honesty, integrity and successful communication.

In this study, different criteria's are considered to understand the impact of joint growth attribute on profit and supply complexity:

(1) buyer's ability to acquire and secure significant knowledge and technologies from the supplier;

(2) the ability of the buyer and the supplier to complement each other's capabilities; and

(3) the ability to jointly develop product and technology by both the buyer and the supplier.

Following strategies implemented to get more benefit from joint growth:

- set up an atmosphere by defining smooth communication channels in which knowledge or critical information can be transferred;
- arranging side by side training activities in service;
- solving the problems of customers by regular meetings and brain storming sessions of buyer and supplier with customer;
- buyer supplier should establish organizational knowledge leveraging meetings with the customer where organization can manage, learn and develop the organizational knowledge;
- customers should get an access of knowledge warehouses where knowledge is developed, accumulated, structured, developed and dispersed; and
- carrying out activities concerning possible future needs of customers.

Due to implementation of appropriate purchasing strategies 25 percent improvement has been observed in "joint growth" attribute as shown in Table III.

5.1.4 Relationship building. Company wants to form a stable and long-term relationship with supplier of "Body" part. Company under the case study is a large-scale manufacturing buyer; hence its role becomes vital in building relationship with supplier whereas the newly selected Indian supplier is belonging to small scale industries. It has been observed that company should have clarity between expectations and available offerings to make effective relationship with supplier. The objective of the case study is to understand the impact of buyer-supplier relationship attribute on profit and supply complexity. Questionnaire is prepared to

understand the level of relationship between buyer and supplier. Following factors are considered while preparing questionnaire:

(1) the capability to sustain a long run steady relationship between the buyer and the supplier;

(2) the situation of existing association and projected imminence between the buyer and the supplier; and

(3) the capacity to preserve a fine communication control and bargain with the supplier.

On the basis of data collected through questionnaire following strategies are formed to build strong buyer-supplier relationship:

- trust building by giving assurance to the suppliers about work by making flexible contracts;
- relationship continuity with those suppliers who are cooperative in problems solving;
- making communication more effective by understanding requirement of each other with same level of thinking;
- supplier's management by investing in supplier qualification and technology developments;
- improvement in service performance of supplier by organizing special skill set improvement plan to improve the skill of the supplier's manpower; and
- in order to have reliability in relationships company made clear and transparent documentation process and ask supplier for any document like right shipment and payment document.

Due to implementation of appropriate purchasing strategies 50 percent improvement has been observed in "relationship building" attribute as shown in Table III.

5.1.5 Cost of product. The need for cost reduction is raising as more companies struggling with global rivalry and the uncertain financial system. While defining these attribute different cost are considered. Product cost includes cost of purchased material. Freight cost includes transportation cost, inventory cost, handling and package cost, damages during transportation and insurance costs. Extra cost includes extra processing cost, maintenance cost, warranty cost, and other costs related to the manufacturing of the product when using the material provided by the supplier.

Different methods are used to reduce the cost of the product like cost reduction by:

(1) design;

(2) lean production;

(3) reducing overhead cost;

(4) standardization cost reduction;

(5) product line rationalization cost reduction;

(6) cost reduction by benchmarking Supply chain; and

(7) quality cost reduction.

In this work, the main focus was on the cost reduction by benchmarking the supply chain. In the first step company gathered data of local suppliers. Organization selected two ISO

certified suppliers which will supply product with desired quality and in low cost. Selection of more than one supplier reduces supply risk of the product. Previous supplier for "Body" part was from china. Company had to pay in dollars as supplier was at international level, which causes fluctuations in cost of the product. Since last two years fluctuations resulted into increased cost of the product. Selection of local supplier also helps to reduce transportation cost which ultimately reduces product cost. Previously product was shipped from china which was collected at Cochin and from Cochin it is transported to Pune via local transport. It causes huge transportation cost to the buyer. Buyer reduced major amount of transportation cost by selecting local supplier. While conducting case study, it was observed that the minimum required quality standards of machining can be achieved with the help of traditional machines. Use of traditional machines instead of CNC lower the cost of machining and finally reduces cost of the product. In the final step company made an agreement with supplier to maintain minimum required inventory at suppliers end only which reduces inventory carrying cost to company. With the proper implementation of appropriate purchasing strategies cost of "Body" is reduced by 21.25 percent, i.e., Rs. 4,250/-. All the steps carried out to reduce the cost of "Body" of boll valve assembly are shown in the Table II.

Due to implementation of appropriate purchasing strategies 42 percent improvement has been observed in "cost of product" attribute as shown in Table III.

5.1.6 Cost of relationship. Buyer-supplier relationship must be continuously nurtured. Establishing a strong relationship with suppliers could potentially lead to improved deals, quicker services and development in reliability and trust. "Cost of relationship" attribute is defined with the help of cost and time to form relationship with supplier. It includes the cost to form a satisfactory buyer-supplier relationship, including financial cost, human resources and coordinating and controlling costs. Following strategies are formed to reduce cost of relationship:

- On time payment: company can negotiate for favorable payment terms before placing an order, but once the order is placed company cannot change the payment terms. In case if company not in position to follow the specified terms,

Table II.
Steps carried out to reduce the cost of "Body"

BODY				
Costing Component	Cost per piece (Rs)	Remark	Proposed per piece cost (Rs)	Remark
Body casting	11,000	Only one supplier	9,750	Alternate vendor with cost competitive
Transportation	1,000	Vendor is from outside of Maharashtra	500	Vendor will be within Maharashtra
Local tax	500	LBT/Octroi	500	LBT/Octroi
Inventory carrying cost	1,000	To maintain minimum inventory because of transportation time	0	Vendor will maintain min. inventory with him and able to supply within two days
Body machining	6,000	CNC Lathe and VMC	4,500	Traditional Lathe and VMC
Inventory carrying cost	500	To maintain minimum inventory	500	To maintain minimum inventory
Total cost	20,000		15,750	
Per piece saving in rupees			4,250	Saving = 21.25%

Scale	Attribute	Question for "Body" part	Q. no	Implementation of strategies		Percentage of improvement
				Before	After	
				1	2	
Impact on profit	Quality	How does the supplier demonstrates product quality?	1	Good	Good	20
		To what degree does the component impact the total cost of the car?	2	Good	Good	
		How does the supplier have quality in providing support services, such as purchasing, technology support, etc.	3	Satisfactory	Good	
		How does the supplier define quality and performance objectives that promote continuous improvement?	4	Satisfactory	Good	
				10	8	
	Supplier's technology	How does the supplier comply with technical requirements?	5	Marginal	Satisfactory	31
		How does the supplier respond toward product development participation by employing future technology?	6	Marginal	Satisfactory	
		How does the supplier respond toward development of manufacturing capabilities participation by employing future technical support?	7	Marginal	Satisfactory	
		How does the supplier engage in cost reduction efforts?	8	Marginal	Good	
				16	11	
	Joint growth	How does supplier provides assistance to buyer to acquire and secure critical knowledge and technologies?	9	Marginal	Satisfactory	25
		How does supplier and buyer complementing each others capabilities?	10	Marginal	Satisfactory	
		How does the supplier try and promote joint product/technology development?	11	Marginal	Satisfactory	
				12	9	
	Relationship building	How does the buyer and the supplier demonstrates stabilized relationship between them?	12	Marginal	Good	50
		How does company's relationship with supplier met original expectations?	13	Marginal	Good	
		How does supplier fair with respect to the effective communication inside their organization?	14	Marginal	Good	

(*continued*)

Table III.
Score of attributes of "Body" for impact on profit before and after implementation of purchasing strategies

Table III.

Scale	Attribute	Question for "Body" part	Q. no	Implementation of strategies		Percentage of improvement
				Before	After	
				12	6	
	Cost of product	What is the price of the product? (comparing with competitor)	15	Marginal	Good	42
		What is the freight cost of the product? (comparing with competitor)	16	Marginal	Satisfactory	
		What is the extra cost of the product? (comparing with competitor)	17	Marginal	Good	
				12	7	
	Cost of relationship	Whether supplier costs heavily to form a satisfactory buyer-supplier relationship?	18	Unsatisfactory	Satisfactory	40
		Whether supplier takes too much time to establish buyer-supplier relationship?	19	Unsatisfactory	Satisfactory	
				10	6	
		Total		72	47	40

inform suppliers about why and when company will pay. Following this simple strategy buyer will be benefited by the cooperative attitude from the supplier.

- Provide sufficient lead times: try to give suppliers as much lead time as possible on orders. Exchange information with supplier an honest projection of needs and keep supplier side by side of any significant changes in estimation. Developing lead times helps to be knowledgeable about suppliers' production methods and needs.
- Devoted association in the relationship: routine calls and visit to the supplier's workplace include supplier in some of strategy meetings and Invite suppliers to office parties and tours.
- Exchange information: keep the good suppliers aware about current affairs in company. Inform suppliers about changes in key management employees, new parts and special marketing schemes. Sometimes it has been observed that efficient suppliers cooperate to company to search consumer. Developing good relationships with suppliers is not a complicated process. Transparent communication with supplier, respectful behavior, faithful claims and payments on defined dates can develop good relationship.

Due to implementation of appropriate purchasing strategies 40 percent improvement has been observed in "cost of relationship" attribute as shown in Table III. The summary of all the defined purchasing strategies to reduce impact on profit are summarized in Figure 6.

5.2 Defining strategic actions for "Body" part to reduce "supply risk"

Attributes like flexibility, delivery, supply constraint, buyer-supplier constraint, supplier's profile are having direct impact on the complexity of supply market and for each attribute differentiated purchasing strategies are formed and implemented.

5.2.1 Flexibility. Flexibility is defined as making a system that can alter and react to internal or external disruptions affecting its effectiveness. In this study, while defining flexibility following criteria's are considered:

(1) flexibility in quality via good quality systems and continuous improvement programs;

(2) flexibility in volume by making adjustments as per the buyers demands;

(3) flexibility in producing different parts as per buyer guidelines;

(4) flexibility in customization of the part;

(5) flexibility in processes by adjusting manufacturing processes; and

(6) flexibility in processing urgent orders.

In order to fulfill above defined criteria's of flexibility following strategies are discovered:

- company selected two local suppliers to reduce the supply cost risk and buyer can bargain with supplier for competitive bid;
- company made a flexible supply contracts with suppliers which allows buyer to make changes in predefined orders at short notice but with limited number of quantity;

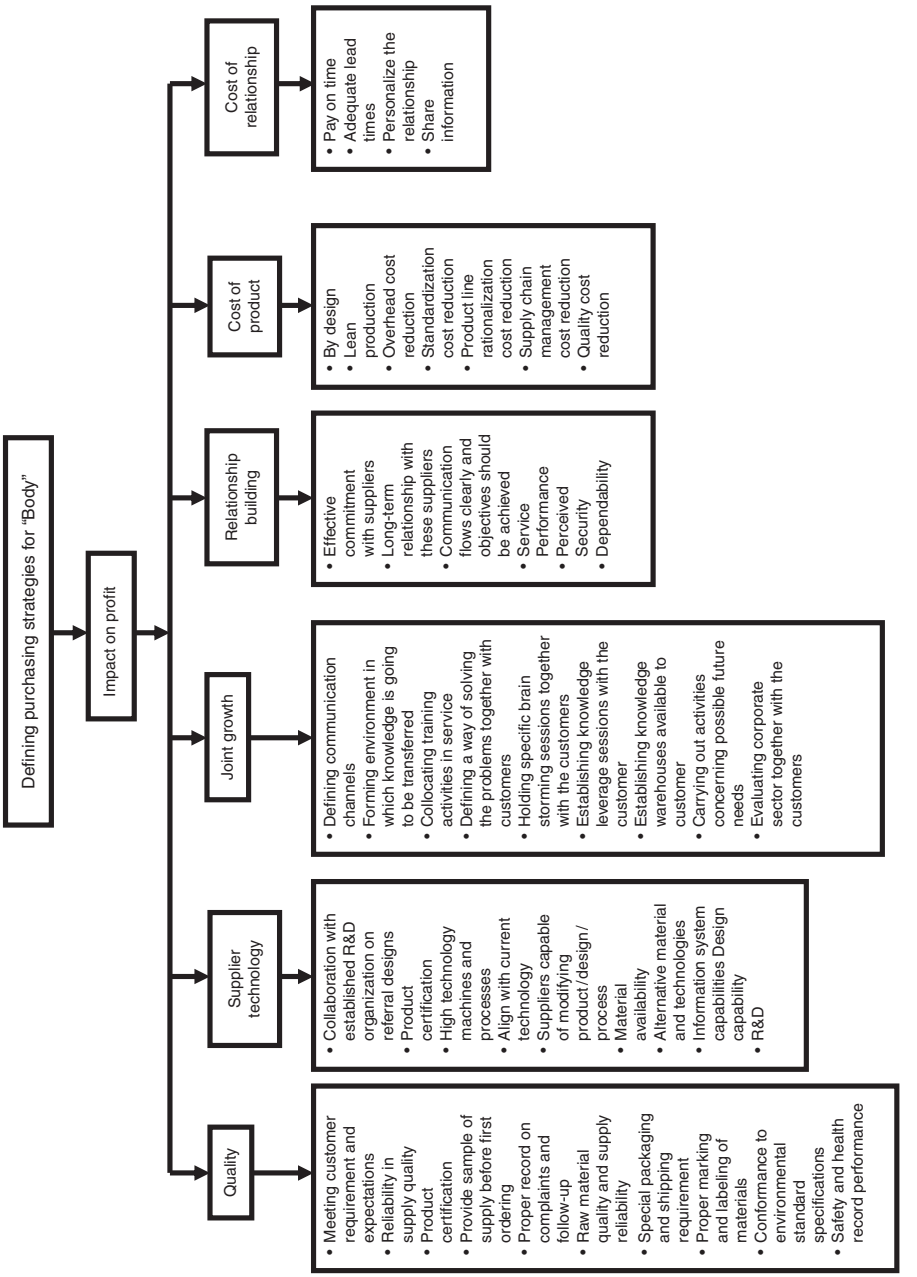


Figure 6.
Summary of purchasing strategies to reduce "impact on profit" of "Body"

- selected supplier has two different plants in Maharashtra only which provides flexibility in operation and production to meet buyer demand in terms of volume and product mix;
- company decided to allot specialize engineer at suppliers end to meet required product design changes;
- company decided to practice product postponement strategy which reduces risk by delaying further investments in part or service until the last possible moment of production; and
- company implemented flexibility responsive pricing where company can postpone the pricing decision for the selling reason.

Due to implementation of appropriate purchasing strategies score of "flexibility" attribute improved from 26 to 14, i.e., 46 percent improvement has been observed as shown in Table IV.

5.2.2 Delivery. Suppliers on time delivery of the required parts is very crucial form buyer's points of view to meet customers' demands. While defining delivery attribute following criteria's are considered:

(1) the duration of time from putting an order to the receiving of the order;

(2) the ability to follow the predefined delivery schedule;

(3) the consistency in meeting delivery deadlines; and

(4) the quality and service of delivering products.

To overcome these shortfalls following steps were taken during the case study:

- Late delivery should be considered as a defect and buyer should inform to the respective supplier for corrective action.
- Strategic vision meetings should be periodically held with senior management and middle management representation from the buyer and supplier organizations.
- Valid measurement systems should be established for supplier on-time delivery. The system should be based on purchased part and automatically driven by material receipts.
- Provide delivery performance record to supplier on a regular basis and arrange evaluation meetings about supplier's performance.
- Completely abolish supplier's acknowledgment to confirm the buyer's required delivery dates.

Company selected local supplier from Pune, Maharashtra only. Selected supplier fulfills all quality policies as explained in the quality section. As supplier is from Maharashtra only, it reduces major shipping time from china to Pune which helps to improve delivery time. Previously major portion of time was utilized in transportation from china to the Pune, i.e., 37 days. Comparison between China and Indian supplier is depicted in Figures 7 and 8. Earlier part was shipped to Cochin port from china, and then it was transported to Pune via local transport. The whole process was time consuming and increases cost of the

Table IV.
Score of attributes of "Body" for "supply risk" before and after implementation of purchasing strategies

Scale	Attribute	Question for "Body" part	Q. no.	Implementation of strategies: Before	Implementation of strategies: After	Percentage of improvement
				1	2	
Supply risk	Flexibility	How does supplier demonstrate volume flexibility demanded by the buyer over time?	1	Unsatisfactory	Good	46
		How does supplier demonstrate product mix flexibility over time?	2	Unsatisfactory	Good	
		How does supplier customize product as demanded by the buyer?	3	Marginal	Good	
		How does supplier adjust manufacturing process as demanded by the buyer?	4	Marginal	Good	
		How does supplier fill emergency orders with required amount in a required time?	5	Marginal	Satisfactory	
		How does supplier provide flexible services other than the above items?	6	Marginal	Satisfactory	
				26	14	
	Delivery	How is the frequency of the delivery of good or services?	7	Marginal	Satisfactory	32
		How does the supplier follow the predefined delivery schedule?	8	Marginal	Good	
		How reliable the supplier is in meeting delivery deadlines?	9	Marginal	Satisfactory	
		How does the supplier have a distribution network quality to meet schedule effort?	10	Marginal	Satisfactory	
				16	11	
	Supply constraint	How does the supplier have production facility and capacity constraint?	11	Marginal	Satisfactory	36
		How does the supplier demonstrates capability to develop and produce new product by introducing various technologies?	12	Satisfactory	Good	
		How does supplier face difficulties in acquisition of material from its supplier?	13	Marginal	Good	
				11	7	
	Buyer-supplier constraint	Rate the price increase index	14	Satisfactory	Good	46
		How does the supplier have the degree of bargaining power in the market?	15	Unsatisfactory	Good	
		Define the level of compatibility between buyer and supplier?	16	Unsatisfactory	Satisfactory	
				13	7	
	Supplier's profile	How does supplier possess stable financial status, Involved in any other risky business?	17	Unsatisfactory	Good	54
		How supplier does demonstrate history of any bad performance in the past?	18	Marginal	Good	
		How does supplier company comply with all applicable environmental local laws and regulations?	19	Marginal	Good	
				13	6	
		Total		79	45	43

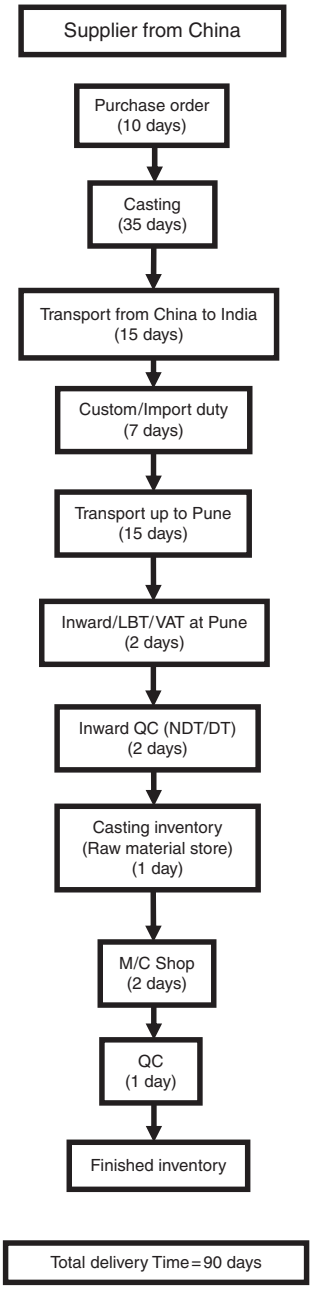


Figure 7.
Delivery time for China supplier to supply "Body" part

product also there are chances of late shipment because of external constraints like geographical, political, legal, etc. Because of selection of local supplier process becomes smoother and buyer get product delivery earlier than it was with previous supplier.

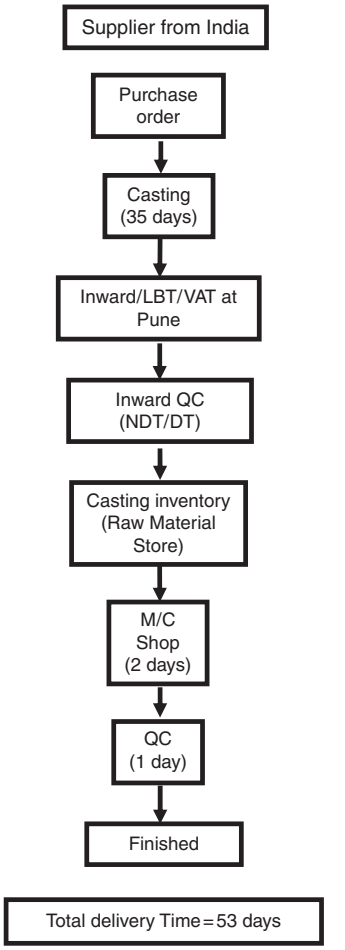


Figure 8.
Delivery time for Indian supplier to supply "Body" part

Due to implementation of appropriate purchasing strategies score of "delivery" attribute improved from 16 to 11, i.e., 32 percent improvement has been observed as shown in Table IV.

5.2.3 Supply constraint. Constraints can be internal or external to the system. If the market requirements are more from the system than it can deliver then it is referred as internal constraints. When the system can generate more than the market requirements then it referred as an external constraint. While defining constraints following criteria's are considered:

(1) the production capacity constraint;

(2) the technology and production capability constraint in developing and producing a new product; and

(3) the difficulties of the supplier in obtaining required raw materials from its suppliers in the right quantity at the right time.

To overcome these constraints following strategies are implemented during the case study:

- company selected two suppliers for high production capacity;
- maintain workforce by allowing suppliers to work in shifts;
- enhancing competence of workers through training sessions;
- reliable production facilities by ISO certification;
- reliable maintenance program; and
- apply overall equipment effectiveness concept to measure efficiency of a machine.

Due to implementation of appropriate purchasing strategies score of "supply constraint" attribute improved from 11 to 07, i.e., 36 percent improvement has been observed as shown in Table IV.

5.2.4 Buyer-supplier constraint. Buyer always wants to keep supplier in control in terms of price of the part and bargaining power. It leads to formation of buyer-supplier constraints. In this study, Buyer-supplier constraint attribute is defined with the help of following criteria's having great impact on development of buyer-supplier relationship:

(1) uncertain changes in price;

(2) negotiating power of supplier; and

(3) buyer-supplier incompatibility.

Following strategies are implemented to overcome these constraints:

(1) Continuous revision of price: the possibility of having an unbalanced or a general direction of increasing price of the part in compared with other suppliers in the future. Company decided to have quarterly revision of cost.

(2) Demotivating bargaining power of the supplier: the level of bargaining power of the supplier that may have an unfavorable impact on the buyer in terms of price and specification of product in the future. Company implemented following strategies to overcome this strategy:

   - alternate vendor method;
   - competition for vendors; and
   - agreement renewal after every year.

(3) Stop different management styles and work cultures: different management styles and work cultures between the buyer and the supplier create constraints. In order to have smooth relationship between buyer and supplier both must understand each other's work culture and management styles.

Due to implementation of appropriate purchasing strategies score of "buyer-supplier constraint" attribute improved from 13 to 07, i.e., 46 percent improvement has been observed as shown in Table IV.

5.2.5 Suppliers profile. Supplier risk attribute plays vital role in purchasing operations for companies where the organization is highly dependent on suppliers to achieve objectives. A questionnaire is prepared to get all the details of supplier to avoid any kind of risk. This questionnaire exposes the company to the risk of a supplier

suddenly going liquidate, shut down of operations or being seized. While preparing questionnaire following points are considered:

(1) risk related to supplier's financial conditions and financial stability;

(2) risk related to the past unsatisfactory performance of the supplier; and

(3) risk related to environmental controls and programs that may lead to unacceptable products for exporting to certain countries.

In order to get more benefit while defining strategies following points are analyzed to minimize the risk:

- supplier's knowledge particularly about related manufacturing process;
- strategic geographical location;
- topographical situations such as labor cost and traffic congestion;
- flexibility in freight via having own transportation;
- suppliers position in the industry and reputation and Performance history; and
- manning by having sufficient workers.

Following strategies are defined to reduce risk related to supplier profile:

(1) establishment of a centralized supplier registration portal;

(2) synthesis of supplier's performance record, supplier's financial data and foretelling indicators into the supplier profile;

(3) gather data of Criminal records of supplier if any from its previous buyer or CRB; and

(4) special attention and solutions to disruptions caused due to geographical location.

Due to implementation of appropriate purchasing strategies score of "supplier profile" attribute improved from 13 to 06, i.e., 54 percent improvement has been observed as shown in Table IV. Summary of purchasing strategies to reduce "supply risk" of "Body" part is shown in Figure 9.

6. Result

In this case study the purchasing portfolio analysis was carried out for a total of 35 parts of ball valve assembly. The positioning of parts in the Kraljic matrix resulted in four major clusters in, respectively, the "non-critical," "leverage," "bottleneck" and the "strategic quadrant." The "Body" was the strategic part identified for defining/designing purchasing strategies as it holds the highest "impact on profit," i.e., 79 and "supply risk," i.e., 79 as shown in Figure 4. The focus of the methodology of case study was to reduce the "supply risk" and the cost affecting "impact on profit" of the product, i.e., "Body." After implementing the methodology and adopting appropriate purchasing strategies in the case study, position of "Body" is shifted from "strategic quadrant" to "non-critical quadrant." The improved position of "Body" after implementation of purchasing strategies for the "Body" is shown in Figure 10.

6.1 Results for "impact on profit"

The ratings for the factors of "impact on profit" are improved from 79 to 47, i.e., by 40 percent. Figure 11 shows the changes in score of each factor of "impact on profit" for "before" and "after" implementation of strategies.

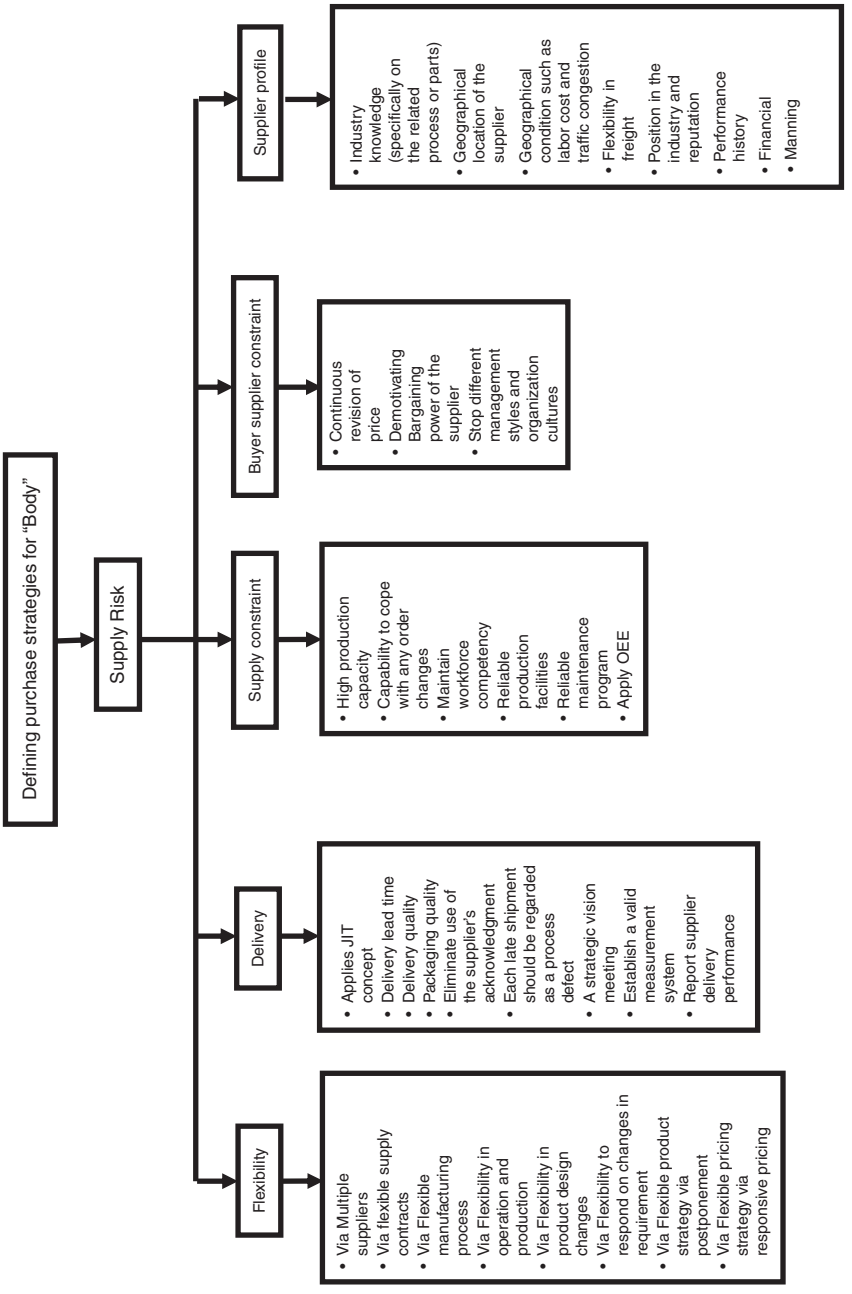


Figure 9.
Summary of purchasing strategies to reduce "supply risk" of "Body"

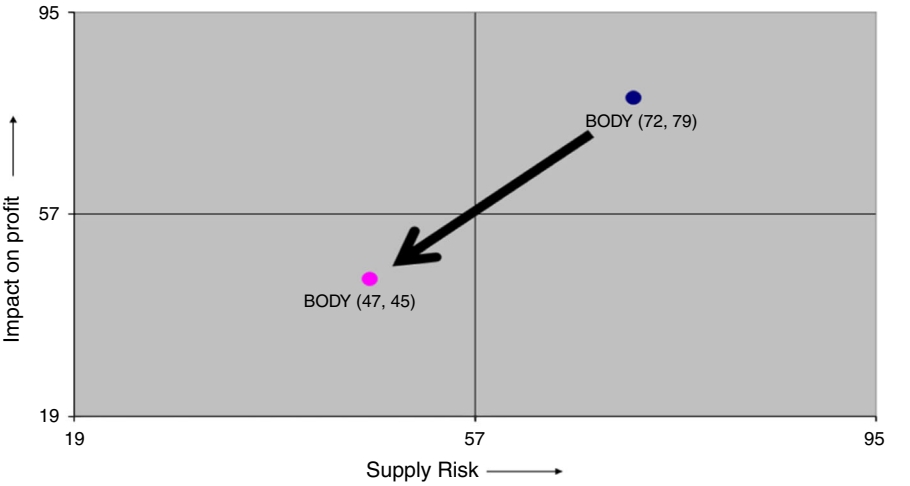


Figure 10.
Improved position of "Body" in Kraljic matrix

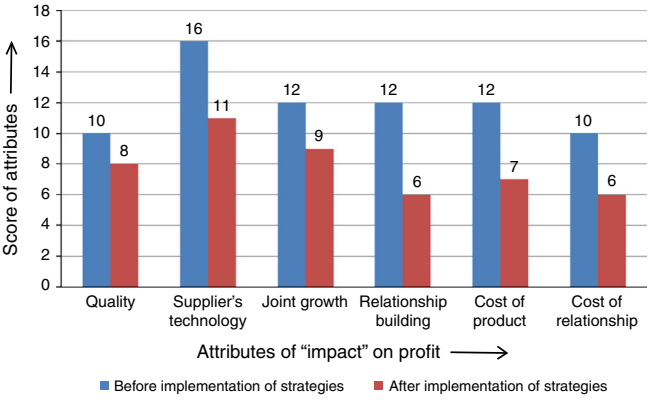


Figure 11.
Score of different attributes of "impact on profit" before and after implementation of strategies

Following changes are observed after the implementation of strategic purchasing:

- Score of "quality" attribute changed from 10 to 8, i.e., 20 percent improvement is observed.
- Score of "cost of product" attribute changed from 12 to 7, i.e., 42 percent improvement is observed. With the proper implementation of purchasing strategies cost of "Body" is reduced by 21.25 percent, i.e., Rs. 4250/-.
- Score of "supplier technology" attribute changed from 16 to 11, i.e., 31 percent improvement is observed.
- Score of "joint growth" attribute changed from 12 to 9, i.e., 25 percent improvement is observed.
- Score of "relationship building" attribute changed from 12 to 6, i.e., 50 percent improvement is observed.
- Score of "cost of relationship" attribute changed from 10 to 6, i.e., 40 percent improvement is observed.

Due to implementation of appropriate strategies, changes are observed significantly in "relationship building" and "cost of the product" attributes while satisfactory changes are observed in score of attribute of "supplier technology," "cost of relationship" and "supply constraint." Marginal changes observed in other factors like "quality ratings," and "joint growth."

6.2 Results for "supply risk"

The ratings for the factors of "supply risk" are improved from 79 to 45, i.e., by 43 percent. Figure 12 shows the changes in score of each factor of "supply risk" for "before" and "after" implementation of strategies.

Following changes in score of each attribute are observed after the implementation of strategic purchasing:

- Score of "flexibility" changed from 26 to 14, i.e., 46 percent improvement is observed.
- Score of "delivery" attribute changed from 16 to 11, i.e., 32 percent improvement is observed. Delivery time is reduced from 90 day to 53 days, i.e., by 37 days.
- Score of "supply constraint" attribute changed from 11 to 7, i.e., 36 percent improvement is observed.
- Score of "buyer-supplier constraint" attribute changed from 13 to 7, i.e., 46 percent improvement is observed.
- Score of "supplier profile" attribute changed from 13 to 6, i.e., 54 percent improvement is observed.

Due to implementation of appropriate strategies, changes are observed significantly in "flexibility," "delivery," "buyer-supplier constraint" and "supplier's profile" attributes. Satisfactory changes, i.e., more than 30 percent are observed in score of the attributes of "supply constraint."

7. Conclusion

Supplier strategy selection and empowerment can become a competitive advantage in portfolio of projects. A model is developed as a supplier management framework for project-based companies, with similar type of requirements for multiple projects. The proposed model is applied to an actual case of boiler industry, helped to identify the strategic parts and focus on strategic suppliers, which are fewer in number but having larger impact on profit and supply risk. The model will be extended for evaluating and selecting of suppliers strategy for each part of this group.

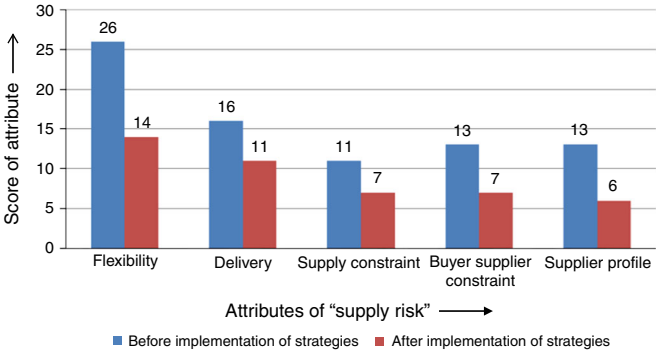


Figure 12.
Score of attributes of "Supply risk" before and after implementation of strategies

In this case study, industry was facing an extreme supply risk and impact on profit with a large part of its strategic parts. It is essential to develop purchasing strategies for the ball valve assembly. One possible risk mitigation strategy was the approval of more than one "Body" supplier in the beginning of the project allowed some flexibility. Establish strategic partnerships with "Body" suppliers reduced the supply risk as well as cost of the product. By applying differentiating purchasing strategies industries reduced the supply risk for "Body" part and improve its negotiating position against the suppliers. Because of improved negotiating position for "Body" part, industry can reduce the purchasing cost of the part and that will result into low impact on profit.

Implementing the differentiated purchasing strategies for an organization will significantly improve its purchasing portfolio. The main conclusions of this research work are listed below:

- By implementing the desired strategies for the strategic parts, some of these parts will shift from the strategic to the leverage quadrant, which will improve buyer's negotiating position, will reduce the supply risk and the dependency on suppliers.
- An increased volume of parts in the leverage quadrant will result in more buying power for buyer. With more buying power better agreements can be made, resulting in a lower cost of the part.
- Reduced risk in supply market complexity helps buyer against upsetting supply interruptions and accidental shutdowns of its operations.
- As the parts moved toward the leverage quadrant, negotiating position of buyer is improved which will help to reduce the purchasing costs and can have insisting bids that will finally reduce its impact on profit.
- Using KPM, both dimensions "supply risk" and "impact on profit" is minimized. Hence the use of KPM approach diminishes reliance of decision makers and makes decisions more balanced.

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