

Analysis of Material Project Purchasing Strategy Using Kraljic's Method

Adhitya Nur Rachman

*Faculty of Economics and Business
Universitas Indonesia
Depok, Indonesia
adhitya.nur@gmail.com*

Nofrisel

*Faculty of Economics and Business
Universitas Indonesia
Depok, Indonesia
nofrisel@yahoo.com*

Abstract—The world has seen dramatic changes in the business environment recently. The level of competition between each other is also getting tighter. This competition leads to two factors, which are Customer Relationship Management (CRM) and Supplier Relationship Management (SRM). One of the key components in Supply Chain Management (SCM) is the management of the Supplier Relationship Management (SRM). The construction industry tends to be late in adopting SCM into their management strategies. Contractors are also aware that the key to applying SCM in the construction industry is through proper production planning and purchasing. With these conditions, it is necessary for the company to implement an effective and efficient model of purchasing in order to achieve the expected conditions. A popular purchasing model portfolio used by academics and practitioners is the Kraljic Model, which was found by Peter Kraljic in 1983 and has been used by professionals to analyze purchasing strategies. PT. X is one of the private construction companies in Indonesia that participates in strategic national projects. To limit the quantity of commodity type, spending analysis is performed to discover which commodities give the largest value contribution to the company's total expenditure in 2015-2017. These commodities are mapped on Kraljic's matrix based on the supply risk and profit impact factor of each commodity. Based on the analysis results of using the Kraljic's matrix, PT. X can implement a better purchasing strategy that can maximize the company's performance, while the company's Supply Chain Management Division can perform more effectively and efficiently.

Index Terms—purchasing, Kraljic's matrix, purchasing portfolio matrix

I. INTRODUCTION

The world has seen a dramatically changing business environment recently. The development of technology has also made communication between companies more efficient. These things have been improving competition and gives new opportunities for companies to run their business in new ways. One important factor that plays an important role in improving the level of competition is the relation management of the supply chain. These activities are divided in two parts: back-end concerns, such as supplier sourcing and selection, design and mechanism of the supplier sourcing, are under the banner of supplier relations management (SRM); and front-end concerns, such as distribution, customer service and customer relationship management (CRM) [1]. Back-end concerns are the important points that will be discussed in this paper,

especially in the field of purchasing. Purchasing has long been regarded as a functional activity that goes without any interest in making a strategy [2].

Research conducted by Akintoye, et.al, in the study "Survey of Supply Chain Collaboration and Management in The UK Construction Industry" argued that the construction industry tends to be late in adopting Supply Chain Management (SCM) into their management strategy [3]. Construction projects are closely linked to possible risks due to several unique conditions in construction activities such as long periods of time, extreme processes, extreme conditions and work environment, high financial intensity and dynamic organizational structure in the project [4]. Contractors are also aware that the key to applying SCM in the construction industry is through proper production planning and purchasing [3]. Currently, the company is experiencing difficulties in its purchasing strategy. PT. X makes many purchase orders using the contract scheme in certain minimum quantity to the intended supplier. This is done to ensure the availability of materials needed by the projects of PT. X., however this scheme creates a problem that needs to be dealt with, namely the low commitment realization of the minimum amount of material from the supplier.

With these conditions, it is necessary for the company to formulate an effective and efficient model of purchasing in order to achieve the expected conditions. A popular purchasing model portfolio used by academics and practitioners is the Kraljic Model, which first appeared in the Harvard Business Review in 1983. This modeling is an inspiration for practitioners and researchers to gain an in-depth understanding of the possibilities of other modeling in purchasing [5]. Therefore, several portfolios of this purchasing model were developed from the Kraljic model.

II. LITERATURE REVIEW

A. The Role and Purpose of Purchasing

The role of purchasing has shifted from administrative activities into strategic business functions that contribute to the competitiveness and corporate advantage [6]. Currently, a number of company activities that are supportive or even the core of the company's business processes are transferred to third parties. Outsourced activities can be used both in the procurement of materials and the procurement of services for

specific performance needs. As a result of this outsourcing practice, the costs that companies usually pay to employees turn into the procurement costs of materials and services outsourced to third parties. The costs that arise from these changes cause the purchasing function to be more strategic. Purchasing currently has to deal with third parties in order to get the best deal because these costs have changed from being the company's internal costs to becoming third-party costs. In addition to administrative activities, purchasing must also be able to identify the right strategy in the procurement of materials and services in the most profitable way for the company [7].

Firms must find a new set of comparative advantages by shoring up their current weaknesses. The purchasing function, along with supplier organizations, holds the greatest potential for effecting the needed improvements. The traditional view of the supplier relationship has placed too much emphasis on current cost and quality competition at the supplier level. In fact, it can be argued that the current weakness in material quality and cost is a result of weak supplier industries. Strengthening supplier capabilities in terms of advanced technology, quality, delivery, costs, and flexibility can improve their productivity and, in turn, will contribute significantly to the competitiveness of the buying organization. If automation can bring about a significant productivity improvement, the firm should also investigate the impact of automation at the supplier level [8].

B. Commodity Grouping Strategies

When developing a supply strategy, companies typically perform a process called categorization or grouping. This categorization is used to group similar products to be purchased into one particular category. This categorization is performed by the purchasing team alongside internal users who will use the materials and services [9]. One of the tools that can be used to group the commodities for the company is the spend analysis. Spend analysis is an overall review of purchases made by the company on an annual basis [9]. Spend analysis will help purchasing to determine specifically which parts need to be addressed when there is an improvisation plan.

The stages for analyzing the expenditure can be divided into three stages: sorting of purchase data, determining total expenditure used for commodity purchasing and determining the top ten commodities in terms of financing that contribute to total corporate expenses. The first step is the collection and sorting of historical data based on purchased commodities. This stage will yield information on total expenditures based on commodities purchased by the company [9].

C. Purchasing Portfolio Matrix (Kraljic Matrix)

The Kraljic matrix has largely been used in many different industries as an efficient tool for developing differentiated purchasing strategies. However, its application in the construction industry is unknown, as well as the lack of systematical approach on criteria prioritization which is one of the key issues of the methodology [10]. The purchasing portfolio

matrix was first introduced by Peter Kraljic in 1983. In his article, "Purchasing Must Become Supply Management", Kraljic mentioned that the purchasing department in a company must be able to change its role from the clerical/administrative function into a more strategic function in the company [11]. To obtain the right strategy, Kraljic designed a matrix known as the Purchasing Portfolio matrix that classifies products into 4 different quadrants based on the supply risk and how large the commodity affects the company's profit value. The four categories of the purchasing portfolio matrix are: leverage, strategic, non critical and bottleneck items [12].

Leverage items are products that have a low supply risk but have a significant financial impact for the company. Typically, the products or services in this quadrant have a large market capacity, availability of alternative products and services in the market, a number of sources of quality supply, and high price and market sensitivity. Strategic items are products that have a high supply risk and also have a high financial impact for the company. Usually the products or services in this quadrant have few suppliers, large expenditures, design and quality that are critical and have rigid and complex specifications. Non critical items are products that have a low supply risk and also have a low financial impact. Usually, the products and services in this quadrant have an abundance of suppliers, low product prices, uncompleted goods and can be bought by many people. Bottleneck items are products that have a high supply risk but have a low financial impact for the company. Typically, the products and services in this quadrant have few suppliers, have complex specifications and have a major impact on operating activities or maintenance activities [13].

Strategic direction can be interpreted as a strategic measurement organizations can make to move commodities from one quadrant to another or retain commodity positions in a particular quadrant [13]. The most favorable quadrant on the purchasing portfolio matrix lies in the leverage and non-critical quadrants. By moving commodities into these two quadrants, the firm can minimize risks and ensure the continuity of supply of the commodities.

III. RESEARCH METHODOLOGY

This research began with the identification of the problem. In identifying the problem, exploration of data and information was done to find the constraints or dilemmas faced by management related to the scientific concentration taken, and then worded as research questions. The next stage was data collection. The data collected for the research consisted of primary and secondary data. Primary data was obtained by two methods: through questionnaires and interviews. Questionnaires were distributed to respondents within the company, have expertise in the supply chain and purchasing and came from various departments. Data collected through questionnaires and interviews were processed through editing and tabulation. This was followed by analysis and discussion through two methods in sequence, first by performing analysis to determine which commodities had the largest amount of transaction in the company (which made up 80% of the company's total

purchases) and contributed the largest percentage of total purchases of commodity procurement by the company. This was proceeded by carrying out an analysis using the Kraljic method by entering the commodities into the purchasing portfolio matrix.

A. Data Collection and Processing

The foundation of the problem, the basic thinking and theoretical framework for the implementation of this research was built through the data collection of both primary and secondary data. For the primary data, questionnaires were distributed to several employees of PT. X, a total of 20 people were asked to respond to the research questionnaire and were interviewed for additional information. These people were involved in both purchasing and supply chains within the company. The questionnaire was distributed to them to determine the dimension value of profit impact and supply risk for each commodity purchased/held by the company.

There are roughly 14,000 kinds of materials used by PT. X. In order to analyze the problem stated in the introduction, this research used the methods of spend analysis and Kraljic's purchasing portfolio model to answer the problems that exist in this study. Spending analysis is an overall review of purchases made by the company on an annual basis [9]. The stages of performing expenditure analysis can be divided into three stages: sorting of purchase data, determining the total expenditure used for commodity purchasing and determining the top ten commodities in terms of financing that contribute to total corporate expenses. Each product was grouped in the process of the spending analysis, and was re-analysed with a formula to include a number of variables to fill them in the quadrants of the Kraljic matrix model/purchasing portfolio matrix.

IV. RESULTS

A. Company Profile

PT. X is one of the private construction contractor companies in Jakarta. In 2017, PT. X had contracts for over 17 projects on the islands of Java and Sumatra. The purchasing process that was previously managed in each project (decentralized) became centralized in the head office to ensure that materials and transactions can be monitored maximally. The procurement process/purchasing that is implemented in PT. X is under the control of the supply chain management division. The supply chain management division itself consists of 6 departments. The departments that are directly related to negotiated transactions and the execution of purchase orders (POs) are the Vendor Management (VM) and Purchasing departments. Currently there is no clear strategy in the procurement/purchasing strategy in PT. X. The procurement process of materials or commodities required by the projects use a contract system. To handle this problem, the purchasing portfolio matrix (PPM) will be utilized to determine what strategy is appropriate in handling the certain commodities the company needs based on two main aspects, ie supply risk and profitability to company profit.

B. Spending Analysis

Before entering into the purchasing portfolio matrix, it is necessary to determine which commodities need to be analyzed and mapped into the purchasing portfolio matrix (PPM). This is because not all of the commodities need to be mapped into the PPM. In addition, this spend analysis can also be used as material when conducting interviews and distributing questionnaires to experts in the field of purchasing at PT. X. The spend analysis was based on historical data from the year 2016-2017 where the top 20 commodities that have the largest contribution in the value of purchases made by the company in the last two years was obtained. Details of these commodities can be seen in Table I.

Based on the spending analysis of the suppliers in Figure 1, it is found that commodities of the "others" category have the largest number of suppliers, which was 98 suppliers. This commodity category include the supporting materials of operations both in the projects and in the head office such as gallons of drinking water, box containers, spray paint and so forth. The "spare parts" category is also available in terms of the largest number of suppliers, which was 70 suppliers. In addition to leasing, PT. X also owns and manages heavy equipment and vehicles, such as excavators, power generators, vibrators, to even operational vehicles. Spare parts are also very important for the company in supporting these equipment.

In relation to previous data on value-based commodities, the number of readymix and iron suppliers (at 15 and 47 suppliers respectively) only occupies the 32nd and 6th positions on the overall rank of the commodities required by suppliers. This indicates that there is still room to source suppliers capable of supplying these commodities to PT. X. It is expected that increasing the number of suppliers will increase the bargaining power of PT. X and reduce the risk of short supply.

In general, a model portfolio begins by classifying the product or the relationship between the seller-buyer by considering the dependency factor between the two. This portfolio then becomes the basis of the company's strategic planning. Based on the classification of commodities performed during spend analysis, 20 commodities were obtained to be studied more in depth by using the Kraljic Matrix. Questionnaires were distributed to 20 purchasing experts at PT. X, as well as managers and staff from the Supply Chain Management division.

V. DISCUSSION

Based on the gathered and processed data, 20 commodities were chosen based on the spend analysis. The top twenty chosen contributed to the highest purchasing value from 2016 until 2017.

A. Purchasing Portfolio Matrix (Kraljic Matrix)

The purchasing portfolio matrix (Kraljic's Method) classifies commodities based on two factors: supply risk and profit impact. For both of these factors, we used a weighted method of measurement on a scale of 1-10 to get an objective result. The questionnaire was used to determine the preference

TABLE I
RESULTS OF SPEND ANALYSIS BY VALUE

No.	Detail	Total (in Rupiah)
1	READYMIX	466.248.844.546
2	STEEL	458.320.519.478
3	HEAVY EQUIPMENT	284.168.464.805
4	PRECAST	142.165.006.230
5	SUPPORT EQUIPMENT(BUCKET COR, ANGKUR TC, CLAMP)	72.054.162.910
6	CEMENT	59.322.478.520
7	ELECTRICAL	41.319.390.634
8	SPARE PARTS	21.705.182.442
9	MECHANICAL	20.201.952.307
10	IT	19.740.757.361
11	DIESEL	18.971.806.465
12	OTHERS	18.044.070.031
13	READY MORTAR	16.875.049.953
14	CERAMICS	14.920.371.665
15	WALL COVERINGS	14.016.837.646
16	APD	13.004.003.362
17	NATURAL STONE	10.253.195.520
18	LIGHT TOOLS (EX: BAR BENDER, CUTTER)	7.895.336.019
19	NATURAL MATERIALS	7.471.309.501
20	OFFICE SUPPLIES	7.425.573.345



Fig. 1. Number of suppliers of PT. X.

TABLE II
RESULTS OF THE EXPERTS' PREFERENCES

On a scale of 1-10 (1: Very Low, 10: Very High) How do you assess the factors below?					
Supply Risk			Profit Impact		
Market Risk	Performance Risk	Complexity Risk	Impact on Profitability	Criticality of Purchase	Cost/Value of Purchase
32.3%	48.3%	19.4%	17.7%	28.6%	53.7%

assessment of purchasing experts on the factors measured at PT. X. The results of this questionnaire concerning the preferences of the experts can be seen on Table II.

It can be seen on Table II that generally the experts agree that the supply risk factors that have the highest risk are performance risk, market risk and the risk of complexity. While for the factor of profit impact, the greatest impact is the cost or value of the purchase, the critical level of purchase and the impact on corporate profits. After obtaining a preference for each factor, the experts were given back the questionnaires to give an assessment on each selected commodity obtained on the spend analysis. The results can be seen on Table 2.

Euclidian distance was calculated based on the calculation

in the previous section. The Euclidian distance is calculated as input for multidimensional scaling (MDS) calculation later conducted on SPSS. Based on the coordinates mentioned on the table above, the purchasing portfolio matrix can be created for all 20 commodities in the spend analysis. The matrix results can be viewed on Figure 3.

A commodity's position in a particular quadrant may be preferred because the company believes that it is the best position for the commodity. Another matter to be taken into consideration is that there is no possibility of a realistic change in the condition of a commodity in Kraljic's Matrix [13]. Based on the research, it can be concluded that it is possible for a commodity to be moved from its existing quadrant in

Dalam skala 1-10 (1 : Sangat Rendah , 10 : Sangat Tinggi) Bagaimana anda memberikan penilaian atas faktor-faktor dibawah ini	Supply Risk					Profit Impact				
	Market Risk	Performance Risk	Complexity Risk	Weighted Average	Global Average	Impact on Profitability	Criticality of Purchase	Cost/Value of Purchase	Weighted Average	Global Average
READYMIX	3,4	8,8	4,7	6,26	3,13	9,5	9,3	9,5	9,44	4,72
BESI BAJA	7,3	9,2	8,3	8,41	4,21	9,6	9,5	9,6	9,57	4,79
ALAT BERAT	6,4	7,7	7,4	7,22	3,61	6,3	7,6	6,5	6,78	3,39
PRECAST	6,8	7,2	7,3	7,09	3,55	6,7	8,3	8,3	8,02	4,01
ALAT SUPPORT (BUCKET COR, ANGKUR TC, CLAMP)	5,4	6,6	6,3	6,15	3,08	5,7	8,2	7,5	7,38	3,69
SEMEN	2,6	7,8	5,3	5,64	2,82	6,8	8,7	7,6	7,77	3,89
ELECTRICAL	2,4	6,7	5,1	5,00	2,50	3,5	7,4	6,5	6,23	3,11
SPARE PARTS	4,3	7,2	7,5	6,32	3,16	2,3	6,4	3,2	3,96	1,98
MECHANICAL	3,4	5,4	4,2	4,52	2,26	3,6	5,2	3,5	4,00	2,00
IT	2,3	5,8	3,3	4,18	2,09	4,2	5,1	3,5	4,08	2,04
SOLAR	6,5	7,9	5,3	6,94	3,47	6,3	8,3	6,8	7,14	3,57
OTHERS	1,4	4,3	2,3	2,98	1,49	2,5	2,4	2,1	2,26	1,13
READY MORTAR	4,3	5,8	4,9	5,14	2,57	3,7	5,8	4,2	4,57	2,28
KERAMIK	6,2	5,4	4,8	5,54	2,77	3,4	5,5	3,7	4,16	2,08
PENUTUP DINDING	4,5	4,8	3,5	4,45	2,23	2,8	3,7	3,2	3,27	1,64
APD	3,3	3,7	4,7	3,76	1,88	1,6	4	2,3	2,66	1,33
BATU ALAM	4,2	4,9	2,6	4,23	2,11	4,5	3,6	5,7	4,89	2,44
ALAT RINGAN (MIS : BAR BENDER, CUTTER)	5,7	5,8	4,6	5,53	2,77	3,7	5,8	5,2	5,11	2,55
MATERIAL ALAM	7,4	6,2	6,1	6,57	3,28	5,7	6,6	7,3	6,82	3,41
ALAT-ALAT KANTOR	1,8	3,2	2,2	2,55	1,28	1,6	2,7	2,2	2,24	1,12

Fig. 2. Questionnaire results.

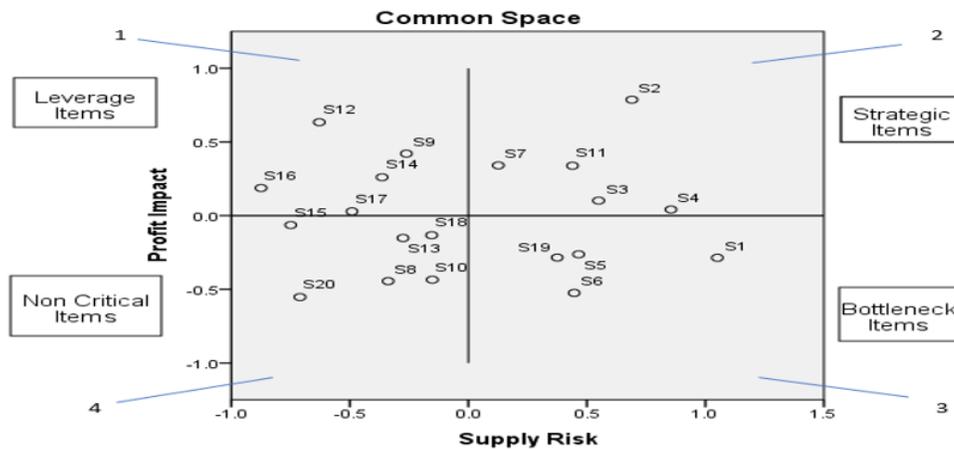


Fig. 3. Mapping results of the Kraljic matrix.

the Purchasing Portfolio Matrix/Kraljic’s matrix (figure 4).

These movements can be triggered by external factors such as the increasing number of suppliers that can supply products, new technologies that reduce cost, or government regulations that cause commodities to become scarce. Apart from external factors, companies can also force commodities to move to new quadrants. The internal factor that can force movement between quadrants is when companies are able to take advantage of their ability to reach economies of scale when ordering commodities and when companies are able to standardize the commodities they want to buy.

B. Strategic Directions

Commodities located in the strategic quadrant typically have several strategies related to it. The first strategy is accuracy in demand forecasting. Commodities located in the bottleneck

quadrant typically have several generic strategies that can be used. The first generic strategy is volume insurance. Due to the commodities located in this quadrant having a high supply risk, it is important to have assurance that the commodity is readily available. Commodities located in the leverage quadrant typically have several generic strategies that can be utilized, such as the exploitation of purchasing power. This can be achieved through competitive bidding. Commodities located in the non-critical quadrant typically have several generic strategies that can be used. One such strategy is order optimization. The order can also be done using spot purchasing because the commodity is readily available in the market and can be easily found. Under current conditions, it is not possible to move other commodities from their existing quadrants except the S7 and S19 commodities because the others are too far

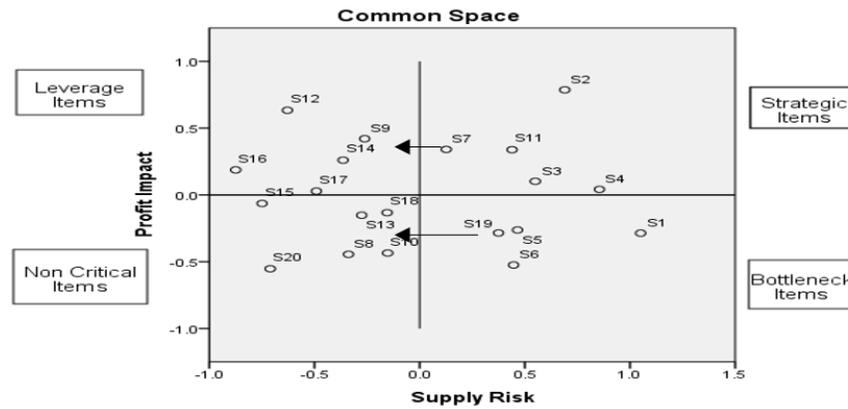


Fig. 4. Changes to the Kraljic's matrix quadrant for commodities of PT. X.

from the quadrant limit. To shift other commodities to a more profitable quadrant, they must wait for changes in the market that change the conditions for these commodities. In addition to changes in market conditions, the changes in technology and the emergence of new suppliers of these commodities are some of the factors that allow a shift in commodities in the Kraljic's matrix.

VI. CONCLUSION

Based on the research, the research problem is solved by using the purchasing portfolio matrix theory. The commodities can now be segregated into four quadrants in which each commodity will have more specific strategies. It is possible to move between quadrants. These movements can be triggered by the market or by the company. What the company can do, however, is limited. What the company can do is either find a new supplier base to move the commodity to a more favorable quadrant or utilize economics of scale, if possible. Movement can be triggered by the market when the supplier number is growing, new technology is introduced and regulation changes.

Depending on where the commodity is located, the strategy implemented will differ. For commodities located in the leverage quadrant, the strategy that will be used is the exploitation of purchasing power through competitive bidding and finding commodities that can be used to substitute existing commodities. Commodities located in the strategic quadrant can use demand forecasting to minimize the chances of commodity outage. Another strategy that can be used is developing long term supply relationships through long term contracts or strategic partnerships. The next strategy that needs to be implemented is contingency planning to solve outage when it happens. Commodities that are located in the bottleneck quadrant must have volume insurance to ensure the commodity is well supplied. As for commodities located in the non-critical quadrant, the strategy that can be used is order optimization and inventory optimization. Order optimization can be achieved through scheduled ordering processes and spot purchasing.

Based on this research, the company could make an adjustment to their procurement strategy. The company could also save up to 7% of total transactions for materials that are included in S7 and S19. This research was limited to only the construction industry and the materials and services used will also be different depending on the transactions performed by the company.

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