

# USING E-CATALOG SYSTEM TO REDUCE COST IN PROCUREMENT OF DRUGS

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## Abstract

The price of drugs in Indonesia is still relatively expensive in both the government and private sectors. A survey conducted in 2004 showed that the price of patented drugs in Indonesia is 22 to 26 times higher than the International Reference Price (IRP). As for generic drugs, though cheaper than patented drugs, the price is still nine times higher than the IRP. To overcome these problems, the government facilitated the procurement of generic drugs by using the e-Catalog. But not all hospitals can purchase drugs through the e-Catalog, some still use the conventional methods to supply the needs of medicine where the prices are more expensive than the prices of the e-Catalog. The case studies carry out in one of private hospital, and selection of items examined using Kraljic Portfolio Matrix. After doing research, the selected item that is on strategic items is Omeprazole. The price difference is due to different contract system. In the conventional way, the contract made between the Hospital and the main distributor. While, the e-Catalog way, contracts made directly to the pharmaceutical factory through the framework contract with government (LKPP). In the future, the conventional way must be abandoned, because through the e-Catalog, procurement is more efficient, thereby reducing time and costs.

**Keyword:** supply chain; kraljic portofolio matrix; e-catalog; drug price

## Introduction

The largest cost component in healthcare is medicines that can reach up to 70% of the total healthcare cost. Therefore, in choosing medicines, the price factor must be considered whether it is affordable in relation to its benefits (Depkes in Situmorang, 2011). The price of medicines can influence the health level of the people, the people can have the chance to get better healthcare if the price of the medicines is affordable. As a developing country, the price of medicines in Indonesia is still classified as expensive in the government as well as the private sectors. A survey conducted in 2004 shows that the price of medicines in Indonesia is still high. For patented medicines in Indonesia, their prices are 22 to 26 times higher than the International Reference Price (IRP). As for generic medicines, while their prices are still cheaper than patented medicines, they are still nine times the IRP (Anggriandi et al, 2014). To solve this problem, today, the government facilitates the procurement of generic medicines using e-Catalog system. Generic Medicines e-Catalog System is an electronic information system that contains information regarding the medicine names, types, technical specifications, smallest unit prices, and

provider factories. The price listed in e-Catalog is the smallest unit price which already includes the tax and distribution cost. However, not every hospital can afford the purchase of medicines using e-Catalog facility, as some hospitals still use the conventional way to fulfill the needs of medicines so there is a difference between the purchase price using the conventional way and those that use the e-Catalog system.

Table 1 shows the comparison between prices of medicines purchased from hospitals with regular procurement and *e-Catalog* prices. Using the purchasing method used by regular procurement make prices of medicines purchased more expensive than *e-Catalog* prices. For example. the medicine type *Glimepiride* 4 mg whose purchasing price is three times the price listed in *e-Catalog*

**Tabel 1** Purchase Price Comparison

Items	Reguler Procurement	<i>e-Catalog</i>
<i>Seftriaxoneserbukinjeksi</i> 1 g/ vial	Rp 5,000	Rp 3,300
<i>Ondansetroninj</i> 4mg/ 2ml	Rp 3,600	Rp 2,400
<i>Irbesartan</i> 300 mg	Rp 3,200	Rp 2,470
<i>Glimepiride</i> 4 mg	Rp 1,303	Rp 430
<i>Omeprazoleinj</i> 40 mg/10 ml	Rp 40,000	Rp 36,000

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To answer these differences, this study proposed to analyze the structure of the supply chain both the procurement system.

### Literature Review

According to Ballou (2004), supply chain refers to all activities related to the transformation and flow of goods and services, including the flow of information, from sources of raw materials to the end user.

In the healthcare industry, the supply chain related to pharmaceutical products is very important in ensuring high standards of care for patients and provide medical supplies and medical material sufficient consumables for pharmacies. In terms of costs, it is estimated that the cost of the supplies 25-30 percent of the cost of hospital operations (Mustaffa & Potter, 2009). Therefore, it is important to managed effectively to ensure service and cost objectives are met.

This study used Kraljic Portofolio Model to maximize supply security and reduce costs, by making the most of their purchasing power. In doing so, procurement moves from being a transactional activity to a strategic activity (Kraljic,1983). Start by classifying all of the commodities, components, products, and services according to the supply risk and potential profit impact of each.

Supply risk is high when the item is a scarce raw material, when its availability could be affected by government instability or natural disasters, when delivery logistics are difficult and could easily be disrupted, or when there are few suppliers. Profit impact is high when the item adds significant value to the organization's output.

To analyze the structure of the supply chain of disposable medical devices, this studi used pharmaceutical supply chain conducted by Mustamu (2007). He stated that distribution chain of pharmaceutical consisted of raw material, factory, wholesalers, subdistributor, retailers and consumen.

### Research Model

#### Supply Chain

Supply chain is a network of facilities and distribution options that carry out the functions of procurement of raw materials into semi-finished goods and finished goods, and distribution of finished goods to customers (Ganeshan & Horison in Hugos, 2003, 3). A supply chain includes all the parts involved either directly or indirectly, in the process of fulfilling customer demand.

#### Supply Risk and Profit Impact

Supply chain risk can formally be defined as the potential loss resulting from a variation in an expected supply chain outcome.

Seifbarghy (2009) stated that supply risk are all factors in the supply procurement items that quality or quantity affect the size of the risk in the company's

supply. They are number of existing supplier, number of potential supplier, political risk, availability to supplier, lead time, financial condition, quality and technology level. While Knight, Tu dan Preston (2014) stated that supply risk are supply scarcity and logistic cost. While profit impact are all factors that affect the profits of the company included purchased volume and impact on business growth. They are purchased volume and impact on business growth (Knight, Tu dan Preston, 2014); impact on profitability and importance of purchase (Padhi, Wagner and Anggarwal, 2012).

The analysis model in this study is based on a model research by Mustamu (2007). The purpose of this study is to shorten the supply chain of medical consumables material to make it more efficient.

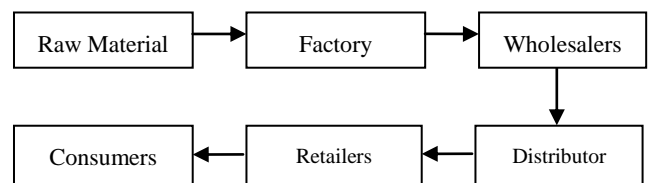


Figure 1. Supply Chain of Pharmaceutical

By direct observation, interviews and discussions with the parties directly involved, the conventional drug supply chain in Indonesia are described by Figure 2 as follows :

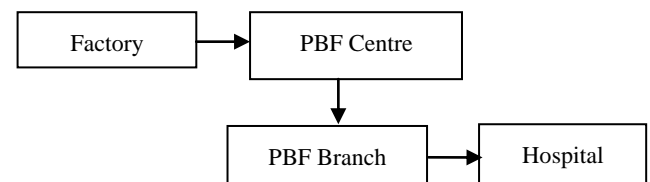


Figure 2. Conventional Drug Supply Chain

Based on observation, there are any differences of distribution structure between conventional drug supply chain and e-catalog drug supply chain. Figure 3 describes e-catalog drug supply chain as follows :

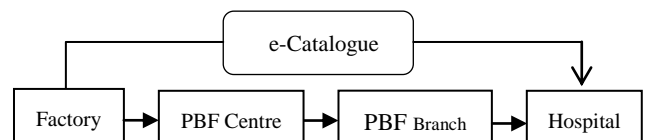


Figure 3. E-Catalog Drug Supply Chain

This research focused to analyse the supply chain's process flow on both the procurement system. The result is to find value in each plot and shorten the flow of the supply chain to be more efficient.

**Research Method**

This study was conducted by direct observation on the object of research, as well as interviews and discussions with the parties involved directly. The aim of observation is to select of the main medical consumables such as seftriaxone serbuk injeksi 1 g/ vial, ondansetron inj 4mg/ 2ml, irbesartan 300 mg, glimepiride 4 mg and omeprasole inj 40mg/10 ml applied at Puri Asih Hospital.

The main medical consumables (seftriaxone injection 1 g/ vial, ondansetron inj 4mg/ 2ml, irbesartan 300 mg, glimepiride 4 mg and omeprasole inj 40mg/10 ml) are selected based on the consideration of the item cost ratio compared with the overall cost of purchase within one year.

The next stage is to use the model portfolio's matrix Kraljick to classifies the products based on two dimensions, profit impact and supply risk ('low' and 'high'). The result is a 2x2 matrix and classified into four categories, namely bottleneck, non-critical, leverage and strategic items.

The following are the criteria that influence whether there is a risk that occurred in the procurement process . Where these criteria are divided into two dimensions, namely profit impact and supply risk. Supply risks are : (1) number of existing supplier, (2) political risk, (3) availability to supplier, (4) lead time, (5) financial condition, (6) quality, (7) technology level, (8) competitive demand, (9) storage possibility, (10) possibility of replacement, (11) quantitative flexibility, (12) qualitative flexibility, (13) exclusiveness, (14) supply scarcity, and (15) logistic cost. Meanwhile, profit impact are : (1) purchased volume, (2) impact on business growth, (3) impact on profitability and (4) importance of purchase

Produc items included in the category of strategic goods, will be analyzed on the structure of the supply chain to see the added value that occurs along the supply chain. Then, this study will compare the supply chain cost structure of conventional procurement system and e-catalog procurement system.

**Results And Discussion**

Based on Padhi, Wagner and Aggarwal (2012), the Kraljic Portfolio Matrix approach consist of the following steps:

Step 1: Design a linguistic scale for collecting importance and performance scores on the chosen attributes, and assign a Triangular Fuzzy Number to each point in the linguistic scale.

Step 2: Collect scores of domain-experts on the attributes and convert into fuzzy number. In this research we use 10-point linguistic scale (Table 2).

Step 3: Compute the average of the attribute importance scores. To compute the average preference score for each attribute use formula as follows:

$$\bar{\theta}_m = \frac{\sum_{e=1}^E \theta_{em}}{E}, \forall m = 1, 2, .. M \dots\dots\dots(2)$$

where e is the index for the expert, where e=1, 2,..., E (here E=3) and m is the index for the purchasing portfolio attribute, where m=1, 2, ..., M (here M=16 for supply risk and 4 for profit impact attributes).

We denote the vector of average preference scores as AG<sub>SR</sub> and AG<sub>PI</sub> for supply risk and profit impact attributes.

$$AG_{SR} = \begin{bmatrix} 7.667 & 8.667 & 9.667 \\ 7.333 & 8.333 & 9.333 \\ 4.667 & 5.667 & 6.667 \\ 6 & 7 & 8 \\ 8.222 & 9.222 & 10.222 \\ 6 & 7 & 8 \\ 7.667 & 8.667 & 9.667 \\ 4 & 5 & 6 \\ 7.333 & 8.333 & 9.333 \\ 3.778 & 4.778 & 5.778 \\ 7.333 & 8.333 & 9.333 \\ 3.333 & 4.333 & 5.333 \\ 6.333 & 7.333 & 8.333 \\ 7.222 & 8.222 & 9.222 \\ 8.444 & 9.444 & 10.444 \\ 4.667 & 5.667 & 6.667 \\ 6.667 & 7.667 & 8.667 \end{bmatrix}$$

$$AG_{PI} = \begin{bmatrix} 6.889 & 7.889 & 8.889 \\ 8.222 & 9.222 & 10.222 \\ 8.222 & 9.222 & 10.222 \end{bmatrix}$$

Step 4: Obtain the normalized supply risk and profit impact importance scores of the attributes by following Steps 4a through 4c.

Step 4a: Carry out a pair-wise comparison of the average importance scores to construct a fuzzy judgment matrix AG':

$$AG' = \begin{bmatrix} (1, 1, 1) \lambda_{12} & \dots & \lambda_{1M} \\ \lambda_{21} (1, 1, 1) & \dots & \lambda_{2M} \\ \vdots & \vdots & \dots \\ \lambda_{M1} \lambda_{M2} & \dots & (1, 1, 1) \end{bmatrix}$$

AG is an (MxM) matrix. The ratio-based approach is followed to make the pair-wise comparisons. The fuzzy weight vectors are given by :

$$\hat{\lambda}_{11} = \frac{\bar{\theta}_1}{\bar{\theta}_1}; \hat{\lambda}_{12} = \frac{\bar{\theta}_1}{\bar{\theta}_2}; \dots\dots\dots \hat{\lambda}_{(M-1)M} = \frac{\bar{\theta}_{M-1}}{\bar{\theta}_M}; \hat{\lambda}_{MM} = \frac{\bar{\theta}_M}{\bar{\theta}_M} \quad (3)$$

Step 4b: Use Deng's (1999) approach to determine the fuzzy attribute weights (β<sub>m</sub>) from the elements of AG' as

$$\beta_m = \frac{\sum_{u=1}^M \lambda_{mu}}{\sum_{u=1}^M \sum_{u=1}^M \lambda_{uu}} \dots\dots\dots(4)$$

Step 4c: Defuzzify the fuzzy attribute weights using centroid method:

$$df_M = \frac{a+b+c}{3} \dots\dots\dots(5)$$

for all m= 1, 2, y, M, and calculate NW<sub>m</sub>, the normalized weight of the mth attribute, by dividing

the priority weight of the mth attribute by the sum of the priority weights m:

$$NW_m = \frac{\beta_m}{\sum_{m=1}^M \beta_m} \dots\dots\dots(6)$$

Step 5: Obtain performance scores from domain-experts on the commodities under consideration, and calculate the average performance scores. Performance of a procurement system (raw material) can be considered a utility value and can be evaluated by multiplying the weight normalized ( $NW_m$ ) for each attribute by averaging the average achievement score ( $(1/E)\sum_{e=1}^E X_{jme}$ ) and summing all the attributes for each item purchases (of raw materials), by the formula

$$\hat{S}_j = \sum_{m=1}^M [NW_m \frac{1}{E} \sum_{e=1}^E X_{jme}] \forall j= 1,2,\dots,J \dots\dots(7)$$

Step 6: Positioning item with Multidimensional scale (MDS). MDS is used to find the dimensions and the pattern of dots within the most appropriate structure from the data. For this case the two axis of MDS is a supply risk and profit impact. For the n-dimensional Euclidean distance formula can be expressed as follows:

$$d_{jk} = \sqrt{\sum_{i=1}^n (s_{ij} - s_{ik})^2} \dots\dots\dots(8)$$

Where  $s_{ij}$  and  $s_{ik}$  shows the utility score of each item purchases (of raw materials)  $j$  and  $k$  respectively,  $i =$

1,2, ..., n. In this case  $n = 2$  (supply risk and profit impact). The Euclidean distance is shown in table 3.

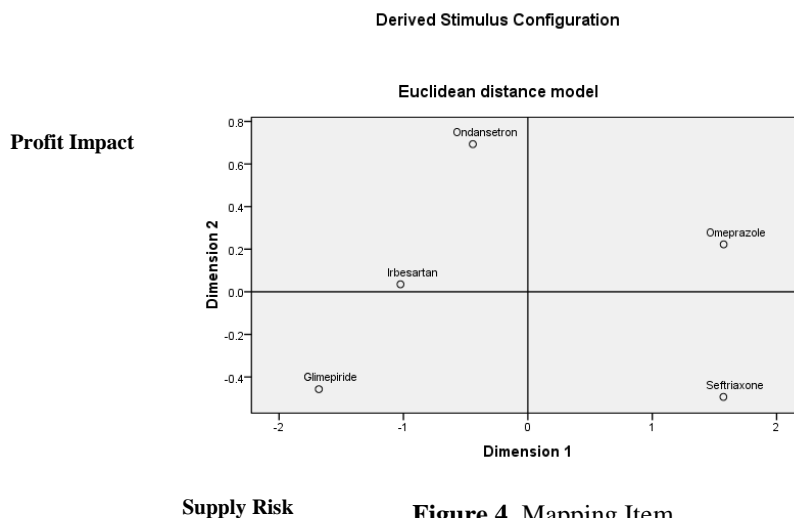
Figure 4 shows that this model groups ingredient items inside four quadrants including strategic, bottleneck, leverage, and non-critical quadrants. Those four quadrants each have different characteristics according to the supply risk and price impact (low and high) values. The position of where the medicines are in strategic quadrant is Omeprazole, in bottleneck is Seftriaxone, in leverage are Ondansetron and Irbesartan, and in non-critical is Glimepiride. Omeprazole conventional procurement system is shown by the following picture :

**Table 2.** Triangular Fuzzy Number

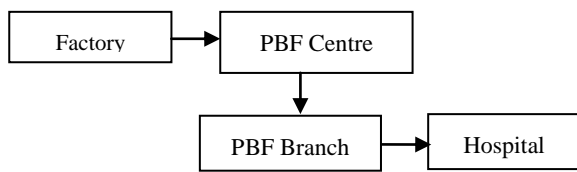
Linguistic Scale Point	Triangular Fuzzy Number (TFN)
None	{1,1,2}
Extremely low	{1,2,3}
Very low	{2,3,4}
Low	{3,4,5}
Medium low	{4,5,6}
Medium	{5,6,7}
Medium high	{6,7,8}
High	{7,8,9}
Very high	{8,9,10}
Extremely high	{9,10,10}

**Table 3.** Euclidean Distance

	Seftriaxone	Ondansetron	Irbesartan	Glimepiride	Omeprazole
Seftriaxone	0	0,611	0,692	0,849	0,187
Ondansetron	0,611	0	0,230	0,442	0,541
Irbesartan	0,692	0,230	0	0,214	0,680
Glimepiride	0,849	0,442	0,214	0	0,868
Omeprazole	0,187	0,541	0,680	0,868	0



**Figure 4.** Mapping Item



**Figure 5.** Conventional procurement system

Figure 5 shows that the supply chain of conventional procurement system of omeprazole starting from the manufacturer to Pedagang Besar Farmasi (PBF) Centre. PBF appointed by manufacturers to market their products.

Then the PBF will market the product to the next PBF Branch. PBF Branch offering products to hospitals through sales. Having agreed with the price offered, the hospital will buy the product.

Below is a table of selling price difference of each stakeholder obtained from interviews with relevant parties

**Table 4.** Price Comparison between Stakeholders

Factory	PBF
Rp. 7.417/pcs	Rp. 40.000/pcs

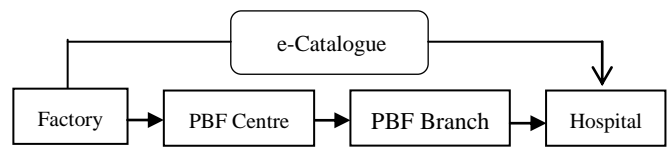
The price offered by factory and PBF depending on the volume of purchases and discounts offered. Following the calculation of mark up disposable syringe 5cc :

$$\text{Mark up percentage} = \frac{(\text{Selling price} - \text{Buying price})}{\text{Buying price}} \times 100\%$$

$$\frac{(40000 - 7417)}{40000} \times 100\% = 439,33\% \approx 493\%$$

The selling price at the PBF is Rp. 40.000 / pcs. Components of the cost of the e-catalog procurement system and the conventional procurement system the same such as profits, distribution costs, storage costs, fees of Human Resources (HR), and other costs (electricity, rent and others), the difference is the cost of promotion. In the e-catalog procurement system, there is no promotional costs. PBF do not need to submit offers to the hospital because the hospital directly select items with the desired specifications and price.

The 5cc disposable syringe supply chain e-catalog procurement system is shown by the following picture :



**Figure 6.** E-catalog system

Figure 6 shows e-catalog procurement system. supply chain starting from the factory or manufactures. Factories enter the price and specifications of the items into the e-catalog system. When hospitals purchase items through e-catalog, the factory will contact the appointed PBF to deliver the goods to the hospital. Hospitals accept the orders for goods and pay according to the price on the e -Catalog through distributors.

The difference occurring in the purchase using e-Catalog and conventional method is 10% in which the purchasing price through e-Catalog is lower than that through the conventional method. Calculation to determine the difference in prices is shown below:

$$\begin{aligned} \text{Difference percentage} &= \frac{\text{Difference price}}{\text{Highest price}} \times 100\% \\ \text{Difference percentage} &= \frac{(40000 - 36000)}{40000} \times 100\% = 10\% \end{aligned}$$

### Conclusion

According to the categorization using the Kraljic Portfolio Matrix, the medicine item omeprazole is in strategic item category so it is recommended to do a partnership with its supplier. The medicine item ondansetron and irbesartan are in leverage quadrant, the recommendation given is by building a partnership strategy with a competent supplier. Meanwhile, seftriaxone is in bottleneck strategy and glimepiride is in non-critical category.

By using e-Catalog, medicine item omeprazole which is in strategic item is expected to move to leverage quadrant, where the item will have a high profit impact but low supply risk.

The medicine supply chain begins with pharmacy factory, then it is distributed through central PBF and will be handled by PBF branches according to each region so it may arrive at the retailer, which in this case is hospitals. There is no difference between e-Catalog and conventional, it is just that the contract using e-Catalog is through pharmacy factory, while in the conventional system, the contract is through PBF.

The increase of value from factory to hospital includes tax, profit, distribution cost, retention cost, human resource cost, and other costs (electricity, rental place, and others). Purchase through e-Catalog have a 10% less price than the price through conventional method.

The plot of medicine supply chain cannot be shortened, because the distribution of medicine needs a complex handling in which medicine factories cannot do a direct distribution, instead having to do it through PBF.

The procurement of medicine through e-Catalog is an example of e-Marketplace, in which in e-Marketplace, there exists interaction between various companies in the cyberspace without it being limited by territory (geographical area) or time. Medicine e-Catalog is the meeting place between various suppliers (pharmacy factories) with consumers to do sale and purchase transactions.

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