THE EFFECT OF SUPPLY AND PURCHASE POWER TO PREDICT COST SAVING ON PROCUREMENT TECHNOLOGY INFORMATION IN THE COMPANY

Novendar Cahyo Pratama [1], GadangRamantoko[2]

Economics and Business Faculty of Telkom University,
INDONESIA.

[1]novendar.cahyo.p@gmail.com, [2]gadangramantoko@gmail.com

ABSTRACT

Company has invested more than 2 trillion rupiahs for information technology. The growth on investment in 2017 has massively increased compared to 2016. On the other hand, the average ratio of cost saving in 2017. Evaluating this phenomenon, it is necessary to conduct research related to cost saving on procurement of information technology in the company to increase performance and contribution and to support sustainability to win competition on the current information technology era. This research analyzed the supply and demand power based on procurement data during January 2016 – October 2018. The data were collected from internal procurement data from company's ERP system which have all of procurement data and included all information from purchase request (PR) to purchase order (PO) issuance. Those data were processed to align with the aim of this research and theoretical basis of supply and demand power, and cost saving. Data were analyzed by using R tools with regression logistic method to analyze the effect of supply power and demand power to predict cost saving on procurement process for technology information in the company. Referring predictive modelling which is built based on logistic regression on this research, the accuracy of the model to predict procurement process whether achieve or not saving target is 82.98%. According to the research that has been conducted and analyzed further, there are two variables which are supply power (low) and demand power (high) that have higher effect to predict cost saving potential on procurement process of technology information in the company.

Keywords: procurement, supply power, demand power, cost saving, technology information.

INTRODUCTION

As a famous procurement of mobile telecommunication service in Indonesia, PT. X, is charged to always give the best service for the customer. Service that was given not only tend to legacy services such as voice service and short messaging system, but also digital services for maintaining the company sustainability to win the competition not only with fellow mobile telecommunication service providers, but also with Over-The-Top (OTT) service providers, such are whatsapp, youtube, and any kind of similar services where OTT services using infrastructure that has provided by the company to do the services.

The company also decided its mission to give service and digital solution service application that beyond the users' expectation, create more value for the stockholders as well as support the economy growth of country. In this case, the company has invested more than 2 trillion rupiahs since 2016 for supporting the mission and achieving digital transformation target of company by using the latest techonological development. Total investment that has been

issued by PT. X related to the information technology during 2016 until the end of 2017 is as follows:

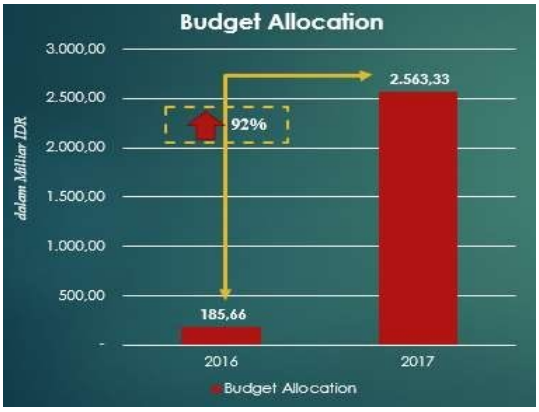

Figure 1. Total Investment of Information Technology Procurement during 2016-2017 (according to internal data of PT. X)

However, the ratio of cost saving which was got for information technology procurement during 2016-2017:

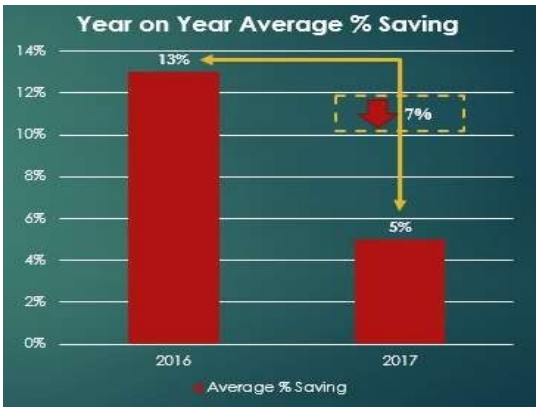

Figure 2. Ratio of Cost Saving Technology Information Procurement during 2016-2017 (according to internal data of PT. X)

According to above data of total investment procurement and ratio of cost saving technology information procurement during 2016-2017, there is a phenomenon where the total value of procurement significantly increased from 2016 to 2017, yet the ratio of cost saving significantly decreased. Ratio of cost saving is the on of KPI's procurement function that has been decided by management which the KPI's target is 5% from total budget allocation on procurement process. Even though the average in 2017 is still 5% but looking at the decreasing of the cost saving average ratio from 2016 to 2017, so it is necessary to be worried.

On the procurement function, management seemed that this phenomenon needs to be worried, so it is needed to find a way to increase the performance of cost saving include looking at the potential of cost saving that can be achieved based on the procurement data. Research of procurement data itself has got many supports since Kraljic (1983) and Porter (1980) gave a challenge to procurement function for thinking more strategic whether theoretically or pratically procurement in the company. Procurement function developed to give a strategic recommendation rather than administrative, especially in the case of procurement in the company. The development of information technology affects VUCA condition which is about volatility, uncertainty, higher complexity, and ambiguity that can

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cause shifting values and procurement function become more critical to support the companies in winning competition (Admatsu, 2017). Cost saving is a vital component from a measurement of procurement function performance (Gurr, 2017) and be defined as benefit or outcome of the difference between budget allocation and procurement value obtained by procurement process (Lemmens, 2009; Blomberg, 2006). Industrial competition is tighter where the latest competition is not only with fellow mobile telecommunication service providers, but also with Over-The-Top (OTT) service providers, so it is needed to find a way to maintain the sustainability company and win the competition in the development of information technology era.

PT. X allocated a large funds to provide a digital service to the customer by using the sophisticated information technology today. By investing in a large number, it is still needed a way to ensure procurement performance is maintained. Schuh *et al.* (2008) stated that even though it has achieved a lead position in the company with a good advantage either in a scale or market share, it does not mean that it would be protected from the high competition. The competition is not only happened on the buyer/companies, but also supplier. Because of that, it is important to maintain the sustainability company by using the development of technology and the latest competition.

Gurr (2017) stated that cost saving become a vital component of procurement function. Procurement function itself has transformed become strategic function in the company because related to the cost control and resource utilization. If these can be managed well, so it can increase the company performance within the competition include maintaining the competitiveness with competitors (Kocabasoglu and Suresh, 2006; Admatsu, 2017).

According to the following explanation above, this research focused on analyzing the effect of supply power and demand power toward cost saving, then, creating a model based on the logistic regression to predict cost saving on information technology procurement based on the procurement data.

REVIEW OF LITERATURE

In procurement process, the evaluation related on supply and demand power was becoming an important thing in reaching for the cost saving target. The evaluation could gave information on company bargaining value in the procurement process to get the cost saving achievement (Cox, 2014; Parniangtong, 2016).

Power analysis had been widely known as a basic negotiation process with supplier to achieve cost saving (Thomas et al, 2015; Reimann et al, 2016). Generally, power could be defined as individual/group ability in influencing the desire and action of other individual/group (Ambrose et al, 2010). The understanding of the usage and power analysis could helped negotiator or company in getting the expected cost saving target (Reimann et al, 2016).

Using the law of supply and demand, company could evaluated the bargaining power and identified the potential of cost saving within the procurement process (Schuh et al, 2008). Schuh et al (2008) added, a company had high demand power if one of the condition below was fulfilled. If it was not fulfilled, then the demand power was categorized as low.

1. The working product had big market share potential and high usage level proved by traffic usage and profit development obtained from the product which growth positively from time to time (based on company target).

2. The company offered collaboration with supplier to innovate the product/service within long term cooperation to develop the competition, product, or working steps and brand and image development from both parties (company and supplier).
3. New product was included into company transformation program, targeted as new source income or source in increasing the efficiency of company's business activity which had full support from company management.
4. The company had strong reputation based on market share and/or achievement on brand and image or other data which justify the market share and/or brand company power.

Meanwhile, the supplier will have high supply power if the following condition is fulfilled. However, if it was not fulfilled yet, then the demand power can be considered as low.

1. Supplier can be a monopolist market;
2. The products from supplier were protected by intellectual property rights which made the goods/product had unique characteristics and cannot be copied by other suppler;
3. The complexity in the implementation of new products or services in case if the company decided to change the products, hence it needed business process change, company policies change, technology change involving changes in more than a primary system, and other change which supported the implementation of products/services replacement;
4. The effect obtained from implementation have risk in company's business activity including the risk of lost income, the bad impact on company's profile, the lost trust of customers.

The analysis of supply and demand power can be used as basic for procurement function in making strategic decision related to the process obtained. By the development of technology, it was possible to analyze supply and demand power based on the data in the procurement document including obtaining evaluation from external information related to research's result from the third parties. It can be used as reference to identify the potential cost savings in the procurement process (Pandit & Marmanis, 2008; Schuh et al, 2008).

METHODOLOGY

This research used quantitative method by using the secondary data that was taken from the company internal procurement system. The writers verify the analysis theory of supply power and demand power toward costs saving potential within the information technology procurement. The type of casual investigation is carried out by analyzing the effect of supply power and demand power on cost saving in the procurement process. Data was taken from the company internal procurement system that would not be changed or manipulated by the writers. By using cross section methodology, data collection is carried out in one period which is the data would be managed and analyzed, and concluded.

Instrument of Data Collection

The writer used data from interval system of PT. X (ERP system) that has been collected and processed by preprocessing data. Preprocessing data is conducted to make sure that the analyzed data is free of attributes or incomplete, error, and inconsistent variables (Han & Kamber, 2006). However, processed variables refer to supply power and demand power.

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Within the level of supply power or demand power was using high/low category which demand power can be called high if one of the conditions below is fulfilled. If the condition below is not fulfilled, so demand power is categorized as low. However, the fellow would have a high supply power if one of the conditions below is fulfilled. If the condition below is not fulfilled, so supply power is categorized as low. However, the fellow would have a high supply power if one of the conditions below is fulfilled. If the condition below is not fulfilled, so supply power is categorized as low.

Cost saving is categorized as high and low category. High cost saving is categorized by the percentage savings obtained more than 5% or exceeding the KPI target, however, low cost saving is categorized by the percentage savings less or as same as 5% which is suitable or lower than KPI's company.

Research Steps

This research used CRISP-DM approach (The Cross-Industry Standard Process for Data Mining). Chapmen et al. (2000) said that data mining consists of several process such as: (a) Business Understanding, (b) Data Understanding, (c) Data Preparation, (d) Modelling, (e) Evaluation, (f) Development.

Population and Sample

Population that was used is procurement data related to information technology procurement in the company stored in ERP company system, include; annually procurement data, colleague, scope of work, allocation value, savings value obtained. The data obtained from January 2016 until October 2018 with 805 initiative of information technology procurement.

RESULT AND DISCUSSUION

Population or Sample Test

Formation of Prediction Model with Logistic Regression

Formation of Logistic Regression Model with independent variable which was involved to model is supply power and demand power. The model built used training datasets about 70% from the amount data that was used. Training data was taken by randomly sampling, while data testing is data that was not included in the training data.

Compatibility Test of Logistic Regression Model

This test was conducted to know whether model is appropriate to be used for predicting cost saving of company on information technology procurement or fulfilled Goodness of Fit (GoF). This test was conducted by Hosmer and Lemeshow (HL) test involving all of independent variables. Benedict (2016) stated that HL test was conducted by using classification basic on the estimated chance that spreads at. Test procedure was established by using evaluation against groups that consists of range of probabilities (Hilbe, 2015). Hilbe (2015) also added that evaluating group can be used three types such as 8, 10, 12. If p-value in each group was bigger than 0.05, so it indicated that the model built was appropriate.

According to this reference, the writer conduct the HL test steps as follows.

H_0: Suitable Model
H_1: Model does not match the level
Significance: $\alpha = 0{,}05$

Critical Area: Reject H_0, if $\chi^2 > \chi^2$ or p-*value* < α

Table 4.1. HL Test Result

Group (Bin)	Range Probability	Y0	Y1	Y0hat	Y1hat	X^2	Df	P-*Value*
8	[0.0266,0.228]	373	69	375.4	66.6	0.3628	6	0.9991
	[0.228,0.741]	34	88	31.6	90.4			
10	[0.0266,0.21]	191	12	191	12	0.39919	8	0.9999
	(0.21,0.228]	182	57	184.4	54.6			
	(0.228,0.741]	34	88	31.6	90.4			
12	[0.0266,0.21]	191	12	191	12	0.39919	10	1
	(0.21,0.228]	182	57	184.4	54.6			
	(0.228,0.741]	34	88	31.6	90.4			

Y0 and Y1 showed that Y0 represented as saving = 0 or showed that procurement does not fulfill saving target, whereas Y1 represented as saving = 1 or showed that procurement fulfill saving target. However, Y0hat and Y1hat showed that saving predictation result from the model built based on data that was used which means that Y0hat represented as procurement predictation result does not fulfill saving target and Y1hat represented as procurement predictation result fulfill saving target. To analyze the feasibility of the model built with Hoslem-Lemeshow test, the writer evaluated the relationship between Y0-Y0hat and the relationship between Y1-Y1hat using R software with results that showed in table 4.1, where according to Hilbe (2015) the margin between Y0-Y0hat and Y1-Y1hat are decent groups. Small margin showed that the ability to predict good models and the differences between the result of observations and the result of predictions are quite similar. Based on table 1 above, Y0-Y0hat or Y1-Y1hat margins for each small group. For example, group 9bin) 10 with a probability range [0,02666,0.21], Y1-Y1hat margins are 57-54.6 and Y0-Y0hat are 182-184.4. Both examples found a margin between Y1-Y1hat and margin Y0-Y1hat and margin Y0-Y0 the model built is feasible (installed). Based on Table 4.1, the processing result with R software was also known for each group obtained value of χ^2 and the value of p-value are obtained while value of p-values of each group is bigger than 0.05. The value of p-value > α than H0 can be accepted, which means that the suitable model is used to predict cost saving in the procurement of company information technology.

Simultaneous Test of Parameter Significance

The writer conducted this test to reveal whether independent variable gave significant effect to the model or not. It was analyzed by R software from variables that was expected influence cost saving of information technology procurement by using G test.

H_0: $\beta 1 = \beta 2 = 0$ (all independent variables do not give significant effect to the model)

H_1: $\beta i \neq 0$ with $i = 1, 2$ (there is at least one independent variable that give significant effect to the model)

Significance level: $\alpha = 0, 05$

Critical are: Reject H_0 if $\chi^2 > \chi^2$ or p-*value* < α

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Statistic Test:

Table 2. Simultaneous Test of Parameter Significance

G-Test Result		
X^2	Df	P-Value
101.4	2	0.0

Table 4.2 showed that χ^2 value is 101.4 with degree of freedom 2 and p-value 0,0. If p-value $< \alpha$ (0,05), it means that H_0 was rejected and can be concluded that there was minimum one independent variable which influence significantly to the model.

Partially Test of Parameter Significance

This test was established to know whether significant variable from simultaneous test of parameter significance gave significant effect to the model built.

Significance level: $\alpha = 0{,}05$

Critical area: Reject H_0 if $|W^2| > Z_{\alpha/2}$ or p-*value* $< \alpha$

Statistic test:

Table 3. Partially Test of Parameter Significance

Variable	Intercept Information	Koef.	Error Standard	Z-Value	P-Value
	Intercept	-1.2183	0.1501	-8.115	4.87e-16***
$X_1(1)$	Supply_Power (Low)	2.2715	0.2387	9.515	<2e-16***
$X_2(1)$	Demand_Power (Low)	-2.3798	0.3394	-7.013	2.34e-12***

Note: ***) significant variable

According to the partially test of parameter significance on table 3 above, it was revealed that demand power variable and supply power variable are significant variable to predict cost saving on information technology procurement in the company. It was showed by p-value that was lower than $a = 0{,}05$. Logit model that was formed as follows:

$$g(x) = -1{,}2183 + 2{,}2715\ X_1(1) - 2{,}3798\ X_2(1)$$

According to logistic regression model that was got in previous, it can be established the calculation of the opportunity value of a company case in the procurement of IT whether in the category of cost-effective or not. Logit model above was changed become this model below:

$$\pi = \frac{\exp\big(g(x)\big)}{1 + \exp\big(g(x)\big)}$$

$$\pi = \frac{e^{-1{,}2183+2{,}2715\ X_1(1)-2{,}3798\ X_2(1)}}{1 + e^{-1{,}2183+2{,}2715\ X_1(1)-2{,}3798\ X_2(1)}}$$

If the opportunity value was $\pi \leq 0{,}5$, so procurement for information technology was categorized as ineffective cost (fulfilled saving target). Next step was done by checking the accuracy of classification.

The Accuracy Classification of Logistic Regression Model

Percentage of the accuracy of classification is a ratio between total observations that was classified accurately by model and model with total all observations. In this case, the writer was conducted the accuracy test to the model built with dataset training (70% of the amount data) then, this model was tested by dataset testing (30% of the amount data). The accuracy classification result was formed as in table 4.4 below:

Table 4. The Accuracy Classification of Logistic Regression Model

Y	Prediction	
	Ineffective Procurement (0)	Effective Procurement (1)
Ineffective Procurement (0)	157	28
Effective Procurement (1)	13	43
Accuracy	82.98%	

Table 4 showed that information technology procurement that ineffective cost (does not fulfilled saving target) accurately classified about 157 procurements, however, 28 procurements were inaccurately classified. 13 procurements were inaccurately classified as effective cost (fulfilled saving target) in the process of information technology procurement, while effective cost procurement (fulfilled saving target) was accurately classified about 43 procurements. Based on this evaluation, logistic regression model that was built can be classified accurately 82.98%.

Interpretation of Logistic Regression Model for Cost Saving Status on Information Technology Procurement

After testing the compatibility model and accuracy classification in evaluating variable that influence the cost saving status on information technology procurement in the company, so the next step was model interpretation. To interpret logistic regression model, the writer used odds ratio that was got from the formula e^{β} as the table 4.5 depicted. Odds ratio (OR) portrayed the functional relationship between response variable and independent variable where the OR value indicated that these variables have higher effect rather than another variable.

Table 5. OR Value

Independent Variable	β	OR (low)	OR (high)
Supply Power	2,2715	$e^{2,2715} = 9{,}69$	$\frac{1}{9.69} = 0.10$
Demand Power	-2,3798	$e^{-2,3798} = 0.09$	$\frac{1}{0.09} = 11.11$

According to the table 5 above, it can be concluded that the procurement which was involved the fellow who have higher supply power only got the impact about 0,10 times more influential compared to the fellow who have lower supply power on deciding the procurement which fulfilled the company saving target. Procurement who involved the fellow who have lower supply power would be 9,69 times more influential compared to the fellow

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who have higher supply power on deciding the procurement which fulfilled saving target in the information technology procurement company. Company position on each initiatives which have high supply power would have about 11,11 times more influential than the company position which has low supply power on deciding the procurement which fulfilled company saving target. It can also be mentioned that company position on each initiatives or programme which have low supply power, only have 0,09 times more influential than the procurement which have high supply power on deciding the procurement ehich fulfilled company saving target. If each variable was compared to, demand power and high category have bigger impact than another variable in logistic regression based on the odds ratio from logistic regression model.

Based on the result of odds ratio value, it revealed that high demand power has the highest odds ratio value, thus the writer recommended to the functional procurement management in the company (PT. X) to focus on the procurement depended on high procurement power or evaluate further or make a plan to increase demand power, so that the company has higher demand power.

CONCLUSION

According to those explanation about the result and discussion above, the conclusion is as follows:

1. Based on the logistic regression model built revealed that supply power variable and demand power are significant variables to predict cost saving on information technology procurement in the company. According to the analysis of logistic regression model, it showed that this model was compatible to be used to predict the potential of procurement cost saving in PT. X wit accuracy classification of model to predict either fulfilled company saving target (cost saving) or not was 82,98%.
2. Procurement that involved the fellow who has high supply power was only 0,10 times more influential compared to procurement that involved the fellow who has low supply power to determine the procurement which fulfilled company saving target. It can also be stated that procurement who involved the fellow who have lower supply power would be 9,69 times more influential compared to the fellow who have higher supply power on deciding the procurement which fulfilled saving target in the company.

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