EVALUATION OF PERFORMANCE OF PROCUREMENT SUB-DEPARTMENT AT PT PHR

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Abstract

Business Process Management (BPM) is a management approach concentrated on improving corporate performance by managing a company's business processes. BPM is a tool for operations to achieve good performance. Process improvement approach combined with statistical process control for measuring and limiting process variation and continuous improvement. One of the key performance indicators used is service time. Time delay on a particular project will impact a cost overrun. PT PHR, a state-owned oil and gas firm in Indonesia challenged to fulfill national energy targets of one million barrels/day. The company heavily relays on outsourced operational activities. Thus, the SCM department manages 60-80% of the company budget. In May 2022, the procurement sub-department in the SCM department faced decreasing lead time performance. This paper study evaluation of procurement sub-department service time performance using Statistical Process Control to know if there is any particular variation. Further, conduct a Capability Analysis to quantify the performance of a process. The procurement process is under control. Nevertheless, it is not a capable process (CPK value >1.33) and is underperformance lead time (PPM value >10%). The statistical result is the key for the SCM department to re-design its procurement business process. The method used is BPM. The author is mapping the business process in the SCM department for procurement or as-is. Then, analyze the business process using Value Added Analysis. The results revealed 21 activities identified for the procurement process that translated into BPMN. As the result, several activities non-value-added and non-essential still exist in the procurement process.

Keywords: Statistical Process Control, Capability Analysis, Business Process Management, Value Added Analysis, Procurement Performance.

1. Introduction

The Government Special Task Force for Upstream Oil and Gas Business Activities in Indonesia (SKK Migas) said that Indonesia's crude oil production is currently only capable of reaching 700,000 barrels/day. In contrast, the consumption goes from 1.4 million barrels/day to 1.5 million barrels/day. By 2030, the government targets oil production of one million barrels/day and gas of 12 billion cubic feet per day (Syarifah, 2022). PT PHR, a state-owned oil and gas firm operating upstream oil and gas activities in Regional 1 is challenged to fulfill one million barrels/day of oil production. Operational activities involve many departments, including the Supply Chain Management Department (SCM). PT PHR heavily relays on outsourced operational activities. Thus, the SCM department manages 60-80% of the company budget and is responsible for procuring materials and services through the procurement sub-department in the SCM department. The procurement sub-department selects the right materials and services based on required specifications, budget, capabilities, and supplier experience. Due to the

critical part held by the SCM department, top management monitors the performance of the SCM department and its procurement sub-department. In May 2022, the procurement sub-department in PT PHR showed that its service time performance was not going well. Many users are critics of the service time of procurement as more than 120 working days. This impacts the user's project timeline and becomes one of the delay factors in the user's project.

Users are planners, engineers from another department, and warehouse staff. Users want the process faster or at least the same as the PTK policy. PTK 007 Revision 04 Book II policy is a reference for the procurement sub-department in conducting a procurement process. In PTK, it is stated that the goods procurement process for bidding is 60 working days, and the services procurement process for bidding is 120 working days. The service time issue of procurement activities impacts the user's upstream project, such as drilling and production. Delays in those project consequence in wasting money and worse cannot fulfilling the production target from zona or field.

Therefore, this paper's purpose is to know the current performance and the current business process of the procurement sub-department using statistical process control and business process management approach. The outline of the paper as follows: section one introduction, section two literature review, section three methodology, section four finding results and analysis, and section five conclusion. The qualitative method is carried out by interviews and discussions with employees in PT PHR. The quantitative method is carried out by internal bidding progress report of procurement sub-department.

2. Literature Review

2. 1 Supply Chain Management

According to Simchi-Levi and Kaminsky (2021), supply chain management is a set of approaches that efficiently integrate suppliers, manufacturers, warehouses, and stores. Therefore, the right quantities and qualities of products and services produced could be distributed to suitable locations and at the right time. The SCM department in a company should be efficient and cost-effective across the chain with a systematic approach, considering customer and value requirements. Erdison, *et al* (2022) said the business process involved in the supply chain includes purchasing, manufacturing, marketing, logistics, and information systems.

2. 2 Procurement

Lysons and Farrington (2020) define procurement as a business management function that performs activities from identification, sourcing, access, and management of external resources to deliver the best possible supply outcome that the organization needs to fulfill its organization stakeholder's and customers' objectives. Procurement as a strategic role requires specialist knowledge and skills—for instance, liaison and collaboration with cross-functional departments like finance, legal, and security. Has the skills of managing relationships with key strategic suppliers, negotiating with suppliers, finding alternative suppliers, knowing the goods or services procured, and monitoring the lead time.

2. 3 Statistical Process Control

Statistical process control or SPC was introduced by Walter A. Shewhart in 1920. Oakland (2008) said SPC includes a set of tools for managing processes and determining and monitoring the quality of the output of an organization by statistical analysis. The main strategy is improving the process continues by reducing variability – the cause of most quality problems. Variation can be in products, in time of deliveries, in ways of doing things, in goods, in people's attitudes, in equipment and its use, in maintenance practices. Variation, however, should be understood and assessed to be managed one of the methods used is the control chart. The

control chart is used for performance analysis and helps to visualize it and detect if there is any significant change (factor or special cause) in the process. The process is considered 'under control' if only natural variation appears; meanwhile, the process is considered 'out of control' if showing a special cause. If any special cause is detected in the process, it is recommended to take action to get rid of it. Further, analysis capability is conducted to quantify the performance of a process. It can describe how closely the process reaches the target or fulfills the specification and how consistent it is

The control chart contains information about the centreline ($\bar{X}$) bar represents the mean value of time of procuring. The upper control limit (UCL) and the lower control limit (LCL) represent three standard deviations from the center line, which is determined to range from natural variation. Every out-of-control limit value shows a special cause exists and needs further investigation.

2. 4 Business Process Management

Business Process Management (BPM) is a management discipline focused on improving corporate performance by managing a company's business processes. The business process treated as an assest of company. The business process is overseeing how activities are performed in an organization to ensure consistently positive outcomes and deliver maximum value to the organization in servicing its client. BPM can be a tool for improvement as such as reducing cost, reducing execution times, and reducing error rates, gaining competitive advantage through innovation.

Dumas, *et al* (2018) explained the initial step to understanding the business process is to gather information about important activities to construct a process map or business process mapping. The mapping is effective in visually illustrating the process steps and picturing how a process should perform from beginning to finish. A good process map shows the workflow, who is doing what, and the clear performance indicator. A clear process map avoids the company from duplicating or losing a process. If a business process does not clearly illustrate it through mapping, each division and individual creates its sequence and assignment. This leads to mess, confusion, and blame when the task owners are not clearly designated. One of the standard methods for mapping the business process is Business Process Model and Notation (BPMN). Process map should help to identify the key issues: defining supplier–customer relationships, defining the process, standardizing processes, designing a new process or modifying an existing one, and identifying complexity or opportunities for improvement.

Business process management can be linked to value-added analysis to acknowledge whether those processes are value-added or not. A process is categorized as a value-added activity if meets three criteria: the customer is willing to pay for the process, there is a change in form produced by the process, and done right from the first time. Agrawal, *et. al* (2006) introduce that activity may be considered to have two dimensions: Does an activity add value? Is it essential? Based on these dimensions, activities are classified into four categories are shown in figure 1
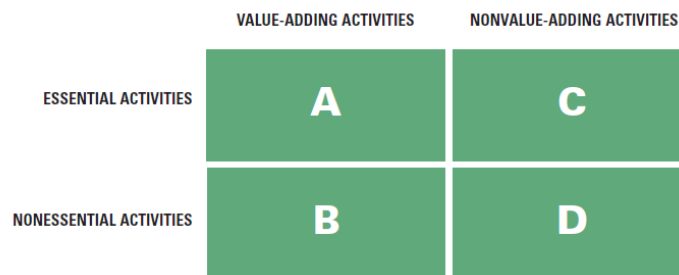
	VALUE-ADDING ACTIVITIES	NONVALUE-ADDING ACTIVITIES
ESSENTIAL ACTIVITIES	A	C
NONESSENTIAL ACTIVITIES	B	D

Figure 1 : Basic model of activity classification

Source: Agrawal, *et. al* (2006)

3. Methodology

The methodology used in this study is qualitative and quantitative approaches. Qualitative data is collected from primary sources through interviews and discussions with the manager of SCM Department Mr. AFY, assistant manager Mr. IRW, senior analyst Mr. FGP, junior analyst Mr. AR and users from the drilling department Mr. RZ and Mrs. EY. The idea of interviews Mr. AFY, Mr. IRW, Mr. FGP, and Mr. AR to get deeply understanding the business process in SCM department especially procurement sub-department and to get the richness of story and perspective in explore issue in SCM department. The purpose of interviews Mr. RZ and Mrs. EY to get users perspective from drilling department - someone outside the SCM department and confirm the effect of the SCM issue to users.

Quantitative data uses the internal bidding progress report and PTK 007 Revision 04 Book II policy. The internal bidding progress report made by the administration officer in the department. The report contains record of procurement process from late 2021 until May 2022. The author only chooses completed procurement activities. The internal bidding progress report of the procurement sub-department obtained 78 services procurement and 46 goods procurement data. The data used to running performance analysis by statistical process control (SPC) method using Minitab. İn Minitab, the author performs a data out-of-control test to know if there is any special cause in the procurement process. Later, perform capability analysis by PPM and Cpk test values. PPM shows nonconforming parts or failure rate in the process declared by parts per million or in this case, means data that categorized failure upper the day's limits. Cpk estimates how close the existing process is to a given target and how consistent it is to around average performance. Table 1 show the flowchart of the methodology.

Table 1: Flowchart of Methodology
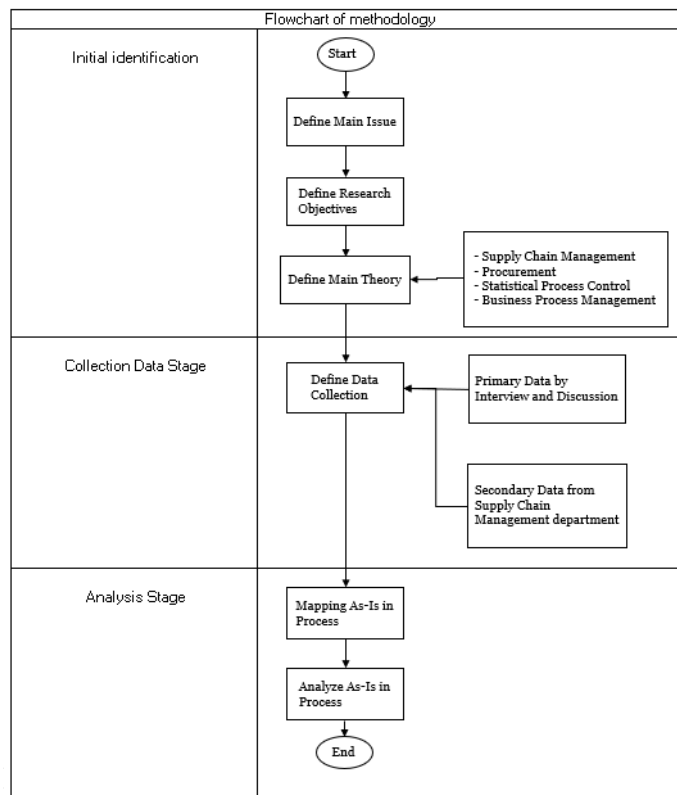
Source: The author's

4. Finding Result and Analysis

4.1 Current Business Performance Result and Analysis

In this section, the author performs the statistical process analysis that is divided into two stages. The first pre-analysis stage and the second analysis stage. The author collects the number of working days in each procurement activity based on the internal bidding progress report as the data for analysis. In the pre-analysis stage, the author performs a normality test to determine whether the data follow the normal distribution using Minitab. The normal distribution is the most typical statistical distribution because approximate normality occurs naturally in numerous physical, biological, and social measurement situations. Many statistical analyses need data from normally distributed populations (Simplilearn, 2013). The data result is non-normal, referring to a p-value less than a significant level of 0.05 and the data points roughly follow a straight line (Meredith, 2015). Then, performed the individual distribution identification chart to find the highest p-value. Individual distribution identification helps to confirm the known distribution that fits the current data. Results show that the best individual distribution of services procurement is 3 Parameter Weibull and goods procurement is lognormal. The author does not choose to transform the data due to the use of underlying data.

After finding the data distribution, the author performs a control chart. The control chart is one of the quality controls tools that is frequently used to analyze process stability (Ahmadi and Shariari, 2020). Based on the distribution, there are two control charts, i.e., the individual variable chart and the moving range chart. The individual variable chart represents the mean time value of goods or services procurement within the period. Meanwhile moving range chart represents the variation in the time value of goods and services procurement. The histogram data show the capability of processes related to some determined targets. The target of working days in procurement data obtained from an interview with Mr. AFY as SCM manager and referring to *Petunjuk Pelaksanaan* PTK 007 Revision 04 Book II for goods procurement is 85 working days and services procurement is 145 working days.

In the analysis stage, the author performs capability analysis on Minitab to determine whether procurement activities meet the established standard. The result is all goods procurement and services procurement samples inside the upper and lower limit. This means the process is under control. Table 2 summarizes the stability and capability results.

Table 2: Stability and capability result

Type of activity	Mean of procure time (working days)	Standard deviation (working days)	Data distribution	Stability	PPM	Proportions that meet the standards	Cpk
Goods procurement	85.8	58.103	Lognormal	Under control	38.97%	61.03%	-0.01
Services procurement	109.3	55.72	3 Parameter Weibull	Under Control	23.41%	76.91%	0.24

Source: The author's property

Based on Table 2. The mean value ($\bar{X}$) of goods procurement is 85.8 working days – which is exceed the upper specification limits of 85 working days. The standard deviation value is 58.103 means on average, goods procurement deviates from the mean days by about 58.103 working days. The PPM value is 38.97% means 38.97% goods procurement exceed 85 days in procuring, only 61.03% can meet 85 working days. Process capability index or Cpk value is -0.01 means

that the process is away from the target and variation in the process is too wide compared to the specification limits.

The mean value ($\bar{X}$) of services procurement is 109.3 working days. The standard deviation value is 55.72 means on average, services procurement deviates from the mean days by about 55.72 working days. The PPM value is 23.41% means 23.41% services procurement exceed 145 days in procuring, only 76.91% can meet 145 working days. Process capability index or Cpk value is 0.24 means that the process is away from the target and variation in the process is too wide compared to the specification limits. Based on process analysis result, it can be concluded that procurement process is under control. However, the Key Performance Indicator (KPI) of the SCM department is minimal achieving 90% of the procurement process meets the lead time standard. Therefore, it needs improvement due to the PPM value of > 10% and the Cpk value of < 1.33 for all processes. This becoming the key to stating that SCM department should re-evaluate its procurement business process.

4.2 Current Business Process Result and Analysis

The business process is not stagnant. It can transform depending on parameters as such as market shift, company strategy transformation, target shift, target unachieved, or any shift. Surely there is a process variation in nature that exist. The concept of continuous improvement always be part of process management in the company. Based on current business performance analysis, the PPM value of procurement activity is higher than 10%. Therefore, it is necessary to evaluate the business process. Business process evaluation is carried out in 2 stages, namely business process mapping and business process analysis. The first stages, business process mapping results in the process map for procurement sub-department is not yet mapped by SCM department. The author tries to map the procurement process map by interviewing Mr. AFY, Mr. IRW, Mr. FGP, and Mr. AR about what following steps-to-steps process to define the details flow process of procurement in actual conditions. Figure 2 show the as-is flow process of the procurement sub-department in the SCM department using Bizagi Modeler. The colors that value difference between all processes. The yellow represents value-added and essential (VA&E), the blue represents non-value-added but essential (NVA&E), the red represents non-value-added and non-essential (NVA&NE)
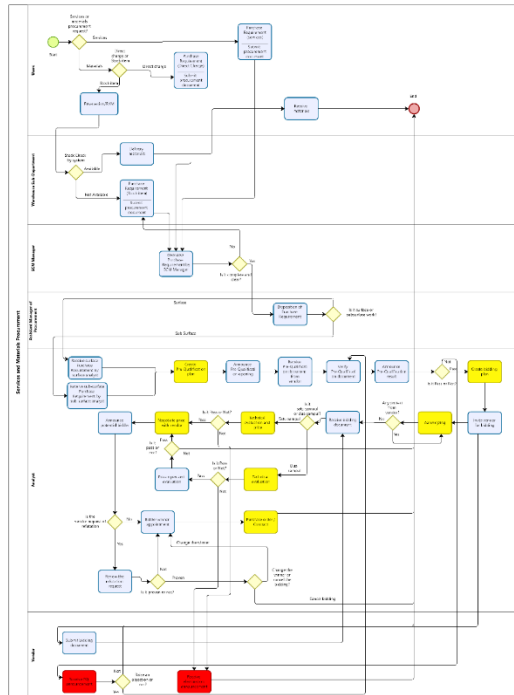
Figure 2 : As-is flow process of procurement

Source: The author's property

The second stage, business process analysis can be done after mapping the business process. Several methods can be used for the analysis the business process. One of them is Statistical Process Control or SPC which is already described in the 4.1 current business performance result and analysis section. Another method that give a significant effect on the process business is Value Added Analysis. Using value-added analysis, the activities show in figure 2 can be analysed which activities considered as Value-Adding and Essential (VA&E), Value-Adding and Non-Essential (VA&NE), Non-Value-Adding and Essential (NVA&E), Non-Value-Adding and Non-Essential (NVA&NE). The analysis are follows:

Overview purchase requirement (PR) by SCM Manager

Are users willing to "pay" for this overview activity? The answer may be relative. Are there any changes in the form after the overview process? The PR that was reviewed did not change. If indeed previously contained an abnormal component, then the overview only found the abnormality but did not change it. On the opposite, nothing is found in clear and complete PR. These are considered as Non-Value-Added activities. It is essential because the SCM manager is an actor who should manage every project in the department. He is the first gate of PR and makes decisions regarding the next PR action. PR will forward to the assistant manager of procurement SCM after being reviewed by the SCM manager.

Disposition of PR

The disposition is interpreted as moving the information from the previous activity. Moving neither adds value for users nor changes the form of PR. So, it's considered a Non-Added-Value. However, the activity is essential because the assistant manager should know the PR and decide to distribute the PR to the analyst and control each analyst's progress and workload.

Receive Surface or Sub-surface PR by analyst

The analyst receives PR from the assistant manager. The activity only moves the PR, neither adding value nor changing the PR form. This activity is considered as Non-Value-Added but essential, because by receiving the PR analyst can have the information and begin to procure either goods or services.

Create Pre-Qualification Plan

Creating a Pre-Qualification plan is the activity that changes the form of PR into the Pre-Qualification form. The users may "pay" for it. This activity is considered Value-Added. It is essential because planning would be easier for the analyst and the Pre-Qualification activity will eliminate unqualified vendor candidates.

Announce Pre-Qualification opening

An announcement does not change the form of Pre-Qualification; it is only a publication. Also, it is not related to users' satisfaction. However, announcing the Pre-Qualification opening should be done so that the vendor knows how there is available bidding and can be prepared. This activity is considered a Non-Value-Added but essentials

Receive Pre-Qualification document and Receive bidding document from the vendor

These activities are quite similar to each other. These activities only move information on Pre-Qualification or bidding documents from a vendor to the analyst. There is no transforming stage. These activities are considered Non-Value-Added, but essential to do because receiving a Pre-Qualification or bidding document means the vendor joins the Pre-Qualification or bidding stage.

Verify the Pre-Qualification document
Verifying is considered as Non-Value-Added. The document should be right and complete at first place to avoid wasting time for verifying the document. This activity considered a Non-Essentials because it is unnecessary verify the document. The requirement of PQ document already announces in the website clearly.

Announce Pre-Qualification result

This activity is considered as Non-Value-Added. The announcement is the publication of information that does not transform the Pre-Qualification form. It is essential because vendors can prepare for the next stage.

Vendors receive PQ announcement and Vendors receive elimination announcement

These two activities are considered Non-Value-Added and Non-Essentials because wasting time and are fine to be removed. It is not necessary to notify each vendor regarding the announcement. The announcement can post publicly. Therefore, any vendors can see by themselves. The analyst can directly move to the next activity inviting qualified vendor for bidding.

Create a bidding plan

This activity is considered Value-Added because the Pre-Qualification form turned into a bidding form. The users may "pay" for it. It is essential because bidding is the core of procurement to find the best vendors to meet the requirements which is expected by users.

Invite vendor for biding

The activity is considered as Not-Added-Value for the users but essential. Inviting not transform the bidding form nor satisfy the users. It is essential because the invitation to the vendor for bidding notifies them that the bidding process will start shortly. So, the vendor can better prepare for the bidding.

Aanwidjzing

This activity is considered Non-Value-Added because *aanwidzing* is a part of a bidding activity that does not transform the bidding form. It is only transferring the information of specification. It is essential because it gives vendors and analysts a mutual understanding of goods or services specification.

Technical evaluation and price

This activity is considered Value-Added and essential. Technical evaluation is key for matching specifications expected by users with a suitable vendor who can satisfy the expectation. The users may "pay" for the activity to achieve their expectation goods or services with the right vendors. The price evaluation as one of the KPI in the department is considered essentials activity.

Negotiate price with vendor

Negotiation is considered a Value-Added activity. Negotiation output is getting a lower price than the owner's estimate. The users may "pay" for it because it gives the user's budget advantages. It is also an essential activity because total price spending in the SCM department is one of the KPIs in the department. With match specification, the lower the price, the better.

Announce potential bidder

This activity is considered a Non-Value-Added. The announcement is the only publication of information. It is essential because, with the announcement, all vendors can know the result and prepare if there is any refutation regarding the result or for potential bidders can prepare for the next stage.

Review the refutation request

Review is Non-Value-Added activity because it is not changing the procurement process. However, it is essentials because if the refutation is reasonable, the analyst can take another action depends on situation

Bidder winner appointment

Appointment is Non-Value-Added activity, nothing is changes in this activity. It is only emphasizing who is the winner. However, this is essentials activity because the winner can prepare for any purchase order or contract.

Purchase order

This activity is the output which expected from users. It is transforming procurement into Purchase Order. The users may "pay" for it. So, it is considered as Value-Added. This also essentials to procurement activity as a sign that the procurement already done successfully.

4.2.3 Organization Analysis

Interview results

Users' perspective

Purchase requirement (PR) already has a draft provided by the SCM department that each user can access. The direction to fill the PR is also clear and can be followed quickly. Users know the PTK 007 Revision 04 Book II policy as procurement guidelines. Users already predicted about three to four months of procurement lead time. The analyst is cooperating and helpful regarding procurement activities. In the condition of urgency about extending a contract, the last interview with the users from drilling department said the process for SP3MK or interim agreement is not difficult to process if there is justification. They are expecting that procurement activities and

release a contract activity will be shorter than before. The workload of exploring and production in the future is rising from 4 rig to 11 rig for drilling department.

Procurement Analyst perspectives

Procurement activity is unique. The process can be different between each other depends on the complexity of work. There are two stages that the analyst did. First is the Pre-Qualification stage. These activities began when PR arrived at the analyst desks, assuming the PR was already complete and precise. Some of the PR does not clear enough for analysts. The analyst should confirm several things to the users regarding PR. Verifying PR takes time because this involves the user's judgment. In another case, the PR is not complete. Therefore, it takes additional working days to complete the PR document. If the PR is straightforward and entirely in the first place, it will not waste time verifying or waiting.

The second stage is the procurement stage. These activities begin when the analyst is inviting the vendor to the bidding. There is an issue regarding technical evaluation. Some procurement that involves users' judgment in technical evaluation need long working days depending on the work's complexity. Users have many jobs to do in their department. Their focus is not only to the technical evaluation for procurement.

The workload of each analyst in SCM department Zone 4 is about 80 PR per year. One analyst said his previous experience as an analyst in Zone 9 was only 30 to 35 PR per year per analyst. This is affecting the quality of procurement itself. The best negotiation takes time. With limited time the analyst should split their time to complete all PR. The analyst has difficulty achieving bigger cost savings for their KPI. Better to avoid the PR with small value or spot buying PR. If it is possible, make an outland agreement, COO contract, or "*kontrak payung*" and release a purchase order when needed.

Sometimes there is urgent PR that should be done as soon as possible. Unfortunately, there is no special task force to handle the critical PR. Postponing current PR makes the procurement process longer than expected.

The existing application mySAP, PIS, and GEP SMART still need development. Because those three applications not integrated each other. Submit PR process using mySAP, the procurement process using PIS, and for purchase order/contract using GEP SMART and then after successfully PO/contract the analyst input in mySAP.

SCM Manager Perspectives

The performance of procurement activity regarding lead time is one of the concerns for SCM managers. The target of procurement performance is at least 90% service level within the standard lead time i.e for goods procurement is 85 days and services procurement is 145 days. SCM manager wants the author to evaluate the performance of procurement. The detailed result of evaluating performance using SPC and business process analysis can be seen in the previous section. There will be more procurement activities in the future. SCM department prepared for better procurement activities.

The draft of PR is easy to fill and follow the instruction. Users are expecting shorter procurement lead time. 60 days for goods procurement and 120 days for services procurement. In the future users workplan is 11 rigs means more PR should processed by SCM department. Procurement activity is unique. The process can be different between each other depends on the complexity of work. Clear and precise PR will not waste time for verifying or waiting. The technical evaluation stage sometimes becoming a bottleneck in procurement activities. Because the intervene from users. The user's focus is not only the technical evaluation. The workload of analyst is distributed by assistant manager. The status of some PR is hold due to over workload is doing by analyst now. The assistant manager roles are regulating the number of PR working

on by analyst. In zone 4 the PR is about 80 per analyst per year. Sometimes there is urgent PR that should be done as soon as possible that postponed the current PR. With limited time the analyst should split their time to complete all PR. This makes the negotiation not get best result. The current existing application mySAP, PIS, and GEP SMART still need development. The best is integration the procurement process in one application.

5. Conclusion

The result and discussion in this paper is the performance of the procurement sub-department using statistical process control and business process management approaches. The business process in the SCM department for the procurement process is not yet defined. The author did the identification of procurement sub-department business process by interviewing and discussing Mr. AFY, Mr. IRW, Mr. FGP, and Mr. AR. Results there are 21 activities identified for the procurement process that translated in BPMN Figure 2. Then perform a value-added analysis. Results, there are 3 activities considered non-value-added and non-essential. There are 12 activities considered non-value-added but essential. There are 6 activities considered value added and essentials.

The author evaluates the current business process performance with SPC method using minitab tool. Results the procurement of the goods has PPM values of 38.97% which is higher than 10%, the proportion that meets the standard lead time under 61.03%, and Cpk values is -0.01. The services procurement has PPM values of 23.41%, the proportion that meets the standards is 76.91%, and Cpk values is 0.24. The summary of SPC results show in table 2. Means the performance of procurement process is still unstable and uncapable. The procurement process still away from the target of 90% service level within the standard time.

This study is the preliminary stage of the research road map in business process reengineering. Further studies of designing the to-be process and monitoring should be performed to complete the cycle of reengineering the business process.

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