International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

Reducing the Delayed Lead Time of Purchase Requisition to Purchase Orders for Standard Part Commodity in the Procurement Department of the Avionics Sector

Devina Affriani Reyga Riswandi[1], Gatot Yudoko[2]
[1,2] School of Business and Management, Institut Teknologi Bandung, Indonesia

ABSTRACT: The efficiency and effectiveness of procurement processes perform a critical role in the smooth operation of organizations, particularly in industries with intricate supply chains, such as the aviation sector. This thesis focuses on the delayed lead time of purchase requisitions to purchase orders for standard part commodities inside Procurement Department. Through a comprehensive analysis of the procurement workflow, data collection, and interviews with key stakeholders, this study aims to identify the root causes and consequences of the delayed lead time in the procurement and also determine the best strategy supply chain for the procurement department. The root cause reveals several factors that contribute to the delayed lead time, such as ineffective and inefficient processes, manual working procedures, particularly in the negotiation and evaluation process between buyer and Supplier, bureaucracy in the document, poor in managing and updating the data of requirements supplier, no back up for new prospect supplier, and a lack of monitoring and communication between internal and external departments. Furthermore, the consequences of this delay include delays in following processes in other departments, increasing the potential of product delivery delays to clients, and affecting customer satisfaction. Based on the findings of these studies, several business solutions have been proposed to address these challenges. The conclusion of the entire analysis process is the implementation of e-procurement with a vendor management system. By implementing these suggestions, the Procurement Department significantly reduced the lead time by 65%. The benefits obtained lead to increased operational efficiency, reduced possibility of product delays to consumers, and increased customer satisfaction.

KEYWORDS: E-Procurement, Fishbone Diagram, Lead Time, Procurement, Vendor Management System

INTRODUCTION

Covid-19, which occurred in the past three years, has significantly impacted the global economy and the instability of world supply chains in various sectors and commodities. Another effect is rising commodity prices and dynamic relations between countries (disruption of export and import cooperation). Because of these multiple things, many countries are tightening money by raising interest rates. The effect is a change in consumer behavior, inflation, and depreciation. Globally slowing economic development has impacted the Aerospace Industry in Indonesia in terms of increasing raw material costs and operational costs, especially in labor, service, and fuel costs. However, along with the post-Covid-19 recovery, there has been a slightly rising and quite optimistic projection for the aerospace industry, especially in the projected growth in global cargo transportation, around 3.5 % per year and 4% per year in Asia. To face the VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) conditions caused by COVID-19, Aerospace Industry needs to start the business transformation and movements to adapt and survive these uncertain conditions. One of the steps the company is taking is to develop, produce X19 aircraft, and improve business aircraft with the primary goal and focus on aircraft sales, aircraft product contracts, aircraft components, and as a supplier. In addition, the manufacture of the X19 aircraft is considered to be able to help increase the company's financial growth. However, one of the challenges faced by the company in the business strategy and process of the X19 aircraft and other aircraft products is the supply chain strategy, especially regarding on-time lead time for each process. These parameters significantly affect customer satisfaction and also the company's finances. It is because if the product is delayed, the company will be fined. The performance of procurement and the company's supply chain goals are then evaluated using the Key Performance Indicator. Completing continuous Key Performance Indicators (KPIs) will positively impact company growth and vice versa. If the KPI of a department/division of a company is not constantly achieved, it will harm company growth. The KPI in the aircraft product procurement division consists of four parameters: supply chain on-time delivery, lead time in

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

converting Purchase Requisition to Purchase Order, goods return, and mandatory hours. The overall KPI for Purchase Requisition to Purchase Order lead time for each commodity is still not reaching the target (≥ 90%). The percentage of on-time lead time Purchase Requisition to Purchase Order for 2019-2022 is 10.1%. The Purchase Requisition to Purchase Order process can be delayed if it does not meet the lead time target (<29 days) for procuring aircraft products.

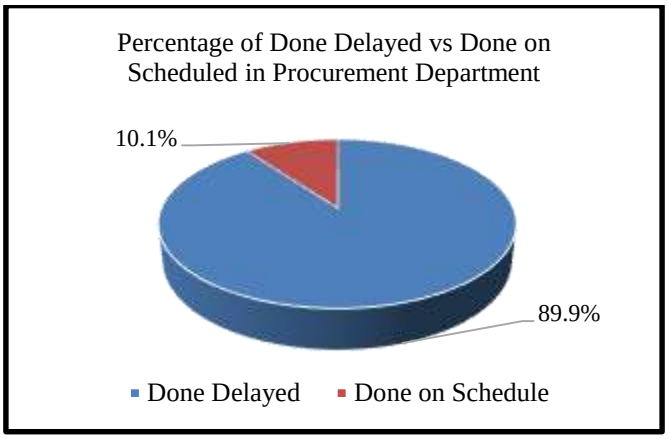

Figure 1. Percentage of Delayed and On-Time Purchase Requisition to Purchase Orders from 2019-2022

Data regarding on-time Purchase Requisition to Purchase Order lead time on aircraft product procurement is divided based on the commodities namely: Standard Part (SP1), Avionics and Electrical Instruments (AEI), Raw Material Metal (RMM), and Raw Material Non-Metal (RMN). Table 1. shows detailed data regarding the amount and percentage of Purchase Requisition to Purchase Orders delayed for each commodity. Based on these data, the commodity standard part has the most extensive delay**ed** lead time Purchase Requisition to the Purchase Order percentage value of **89.6**% with each commodity's formulation of Key Performance Indicator (KPI) calculations. If converted into quantity and price units, the delay on the commodity standard part is 31,518 EA, or the total price is $ 1,327,448.57 (USD) or IDR **19,950,755,537**. This issue must be solved because the delays can affect business value in the long term, such as customer satisfaction (customer trust and loyalty) and the company's brand reputation. Customer satisfaction and a low brand reputation will reduce product sales, impacting company revenue.

Table 1. Data of Total Amount and Percentage Delayed and On-Time PR to PO each Commodity

Commodity	Total of PR-PO Create	%Total of PR-PO	Delayed PR-PO	On-Time PR-PO	% Delayed PR-PO	% Total On-Time PR-PO
AEI	404	42.7%	362	42	89.6%	10.4%
SP1	272	28.7%	246	26	90.4%	9.6%
RMM	49	5.2%	46	3	93.9%	6.1%
RMN	222	23.4%	190	32	85.6%	14.4%
Total	**947**	**100%**	**844**	**103**		

LITERATURE REVIEW

Procurement

Procurement is a crucial role or component of supply chain management (SCM), which is responsible for finding, acquiring, and purchasing goods, services, or works from external sources, often through tenders or competitive bidding processes (Weele, 2018). This process is carried out to ensure that buyers receive goods and services at the right products, at the right amount, at the right time, and at the right price (Hasibuan, 2018). In general, items obtained through procurement in manufacturing organizations can be divided into three categories, namely (Pujawan & Mahendrawathi, 2017):

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

- Raw Material and production components
- Capital Equipment, such as machines and other long-term equipment.
- Maintenance, Repair, and Operation (MRO), which focuses on acquiring the necessary goods, supplies, and services to support the maintenance and repair activities within an organization for the day-to-day operations, such as procuring machine parts, lubricants/fluids, tools/equipment, testing instruments, and office equipment (Neef, 2001).

Procurement has competitive advantages that need to be continuously improved, namely (Pujawan & Mahendrawathi, 2017); pricing strategy, product quality, speed and timeliness of delivery or optimal lead time, and supplier relationship. Pricing strategy means procurement must be able to procure raw materials, components, MRO, costs, etc., at a low price and by the specified budget to protect the company's cost structure. Product quality, procurement must have the ability to obtain excellent quality materials and other components from the Supplier. Speed and timeliness of delivery or optimal lead times (having short lead times without sacrificing quality and price). It dramatically affects the performance of manufacturers to produce and deliver products to customers promptly. It reduces inventory levels of raw materials and components that must be stored so that companies can save costs (Pujawan & Mahendrawathi, 2017). Supplier Relationship: Procurement must be adept at communicating, negotiating, and collaborating with essential suppliers. The relationship between supplier and buyer must be more than just a 'transactional' one. Transactional connections involve money and effort, but mutual relationships include Supplier and buyer confidence, technology, commitment, efficiency, information, and assistance. (Baily, Farmer, Crocker, Jessop, & Jones, 2015).

Procurement Objectives

These procurement objectives are the guidelines for the procurement process to ensure it matches the organization's broader strategic goals and supports the operational requirements (Monczka, Handfield, Giunipero, & Patterson, 2009). Obtaining suitable material in the correct quantity, at the right time, from the right source, and at the right price is a well-known summary of the procurement objectives (Weele, 2018). However, according to (Baily, Farmer, Crocker, Jessop, & Jones, 2015), these objectives are too simple. Hence, they need to break down in more detail from various aspects, namely providing a constant flow of materials and services, guaranteeing supply continuity, buying efficiently and wisely, and ensuring the organization's efficiency. The objectives in procurement should fulfill the concept of SMART or Specific, Measurable, Achievable, Relevant, and Time-Bound (Baily, Farmer, Crocker, Jessop, & Jones, 2015). If the detailed procurement objective is suitable with the SMART concept, common issues like delays, unsatisfactory service levels, low performance, and fragmented resources may be solved, and procurement objectives can be reached with an appropriate procurement process and strategy (Weele, 2018)

Supply Chain Strategy for Procurement

Strategic procurement is a process that involves all functional areas and departments of a business and goes beyond the purchasing activities of the department of procurement or sourcing (Chenini, Iqbal, Qurrahtulain, Mahmood, & Aldehayyat, 2020). Strategic procurement is the long-term strategy for ensuring an organization has an on-time supply of goods or services that the company requires to accomplish its business goals (Weigel & Ruecker, 2017). There are several common types of strategies for procurement, such as cost reduction strategy, green procurement strategy, risk management strategy, global sourcing strategy, supplier development, total quality management, Supplier Management Inventory (VMI), and e-procurement (Baily, Farmer, Crocker, Jessop, & Jones, 2015).

Vendor Management Inventory

Vendor Management Inventory (VMI) is one of the procurement strategies that allows information to be used more effectively. Not only the information provided but the information's content, such as forecast, sales, and schedule of production, is expertly evaluated to get a precise result (Rosalina, 2018; Radzuan, Omar, & Nawi, Vendor Managed Inventory Practices: A case in Manufacturing Companies, 2018). The Supplier can access the customer's information in this technique, which is essential to inventory management. The data is transferred from the customer to the provider through an IT solution. Despite this, the information can be physically or electronically shared(Danielsson & Lundqvist, 2005). VMI benefits consumers and suppliers by improving service, reducing inventory, lowering ordering costs, facilitating supply chain coordination, and minimizing transportation costs (Radzuan, Omar, & Nawi, Vendor management inventory practices: A case in manufacturing companies, 2018). According to (Radzuan, Omar, & Nawi, 2018), the component of VMI consists of some points, such as inventory location, inventory ownership, level of demand visibility, inventory control limits, and replenishment decision.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

E-procurement

E-Procurement is the implementation of electronic commerce in business-to-business purchasing to identify prospective sources of supply, purchase goods, and services, exchange funds, and correspond with suppliers (Pattanayak & Punyatoya, 2019). Some key benefits of implementing an e-procurement strategy include improving collaboration between suppliers and buyers, lowering personal requirements, lowering transaction costs, receiving more potential offers, improving coordination, making the procurement cycle more effective, and increasing audit accountability (Noum & Egbu, 2016). Based on the literature review, e-procurement has a lot of advantages: increasing productivity, decreasing lead time, integrating inventory management, and lowering human error (Ngeno & Kinoti, 2017). The other literature explains that e-procurement can reduce labor costs by up to 30-65%, decrease material costs by 5-20%, and lowered times by 25-30% (Whyte, 2000). There's also research about increasing the procurement lead time effectiveness and cost efficiency by 15% in oil and gas companies by implementing e-procurement and six sigma (Batubara, 2019).

Procurement Performance

Performance in procurement refers to an organization assessing how successfully it works toward its stated goals, identifying areas of strength and weakness, and designing upcoming initiatives to initiate performance improvements (Kakwezi & Nyeko, 2019). According to data, nearly 75% of survey respondents believe the inability to measure procurement performance has hampered management's recognition of the function (Baily, Farmer, Crocker, Jessop, & Jones, 2015). Performance improvement should be driven by actual performance reports measured against some standard. The procurement performance history data is valuable in terms of organizational functions and relationships with the broader organization and also has some benefits, such as low turnover because targets and performance are measured with certainty and clarity, improvement in quality and profitability, and increased probability to get great Supplier (Kakwezi & Nyeko, 2019). According to (Baily, Farmer, Crocker, Jessop, & Jones, 2015)**,** there are five areas for measuring procurement performance: quality, quantity, timing, price, and operational cost. To calculate the performance at procurement, the company uses some standard tools, that as Key Performance Indicators (KPI) and Balance Scorecard (BSC) (Boddy, 2017). KPIs summarize the most critical actions that notify managers of how effectively an operation fulfills organizational goals. There are several main requirements to generate effective and efficient KPIs, such as (Brink, 2020): Company objectives must determine KPIs and can measure both the effectiveness and effectiveness with which goals are accomplished.

- The set of KPIs should, in a specific manner, represent the maturity of supplier relationships.
- The optimum number of KPIs should be at least two to seven points

METHODOLOGY

This research thesis utilizes both qualitative and quantitative research methodologies and techniques. The quantitative method calculates the number of delayed Purchase Requisitions to Purchase Orders in procurement for 2019-2022 for each commodity. Calculations involving the amount of delayed Purchase Requisitions to Purchase Order data also include calculating the total quantity and amount of the delayed commodities prices. Furthermore, qualitative data is used to analyze the business issue exploration and root cause analysis and support the survey/questionnaire. This qualitative research included interviews and questionnaires with buyers from various commodities, supervisors, and the outsourcing team. The author undertakes a root cause analysis utilizing the fishbone method, which consists of five components: Man, Machine, technique, Environment, and Material. The author used the results of the literature review and root cause analysis to identify three optimal supply chain strategies to solve the problem. From these outcomes, a weighting and scoring process was carried out by distributing questionnaires to several buyers, focusing on commodity standard parts. The author developed the conceptual framework in Figure 2 for this research, as shown below. Lastly, the author makes some implementations of the selected strategy results. Then, the author will provide all the information and insights that can be obtained from the effects of calculations and research. Additionally, the insights gathered will be translated into suggestions to support the procurement department to achieve the KPI on-time lead time in Purchase Requisitions to Purchase Orders.

Data Collection Method

The quantitative data of this research consists of two types: data about the details process of Purchase Requisitions to Purchase Orders in the procurement department and the result of the scoring system from several staff in the procurement department. The

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

first data that is details of Purchase Requisitions to Purchase Order in the procurement department consist of some column such as Plan Order code, the date of Purchase Requisition created, Purchase Orders number, date of Purchase Order created, date of Purchase Order final, purchasing group of commodities, and name of materials, quantity and unit of measurements, unit price (USD), schedule of delivery date, BPBI/BPBL date, and status of delivery date. The second quantitative data used the result of the scoring survey conducted with the buyer and staff of the procurement department. The scoring consists of five main criteria: lead time effectiveness, cost efficiency, material availability, data confidentiality, and time needed to develop the strategy. There's also the other result of the scoring system, which is the existing and purposing strategy. The current design is MRP and the proposed is VMI and e-procurement. The other data collection method is done by qualitative approach, that is, a semi-structured interview with the standard part buyer, and the author does some discussion with the material planning procurement and outsourcing team. This semi-structured interview data will support the author in developing the root cause analysis using the fishbone diagram.

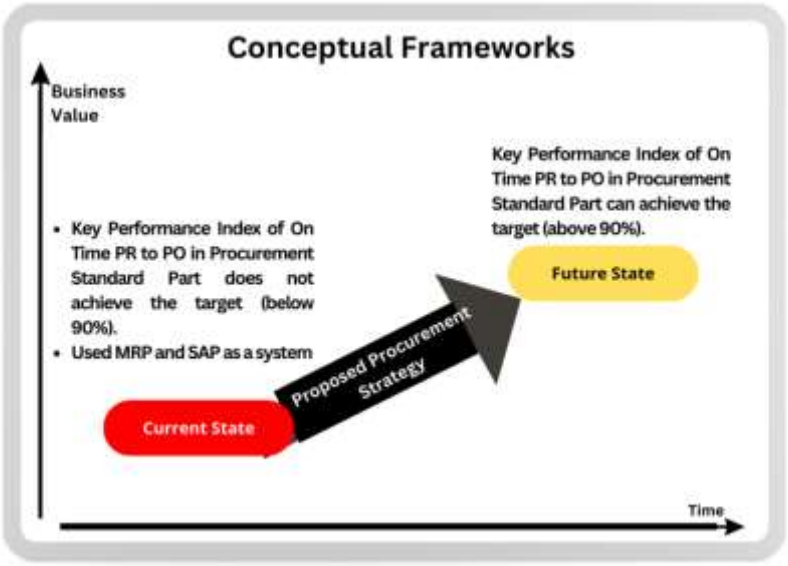

Figure 2. Conceptual Frameworks

Data Analysis Method

Data visualization is the first method used to identify the lead's performance in quantitative data analysis. The steps needed to generate data visualization are:

1. Collecting the historical data on time lead time in the Procurement Department.
2. Cleaning the raw data. The cleaning process consists of several activities, such as identifying the missing value of the dataset, removing the duplicate data record in the dataset, detecting and handling the outlier data, and standardizing and formatting data according to the data type.
3. Calculate the lead time from Purchase Requisitions to Purchase Order and continue with the logical test to define the status of lead time.
4. Calculate the percentage of delayed Purchase Requisitions to Purchase Orders, the total quantity of delayed material, and the total price for each commodity.
5. Visualize the lead time calculation result using a graphic or chart and determine which commodity needs improvement.

The next stage analyses the root cause of the highly delayed Purchase Requisitions to Purchase Orders for standard part commodities in the procurement Department. There are several steps to solve the root cause analysis such as:

1. Prepare the content discussion and question list for the semi-structured interview for buyer standard part and material planners in the procurement department to get deeper information about procurement department activities and exploration of the issue. Table 2 shows the content of the question list for the semi-structured interview:

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

2. After the interview, the author starts to analyze the root cause using the fishbone diagram. This study will use the parameters of Man, Method, Tools, Materials, and Mother Nature or Environment. These parameters are selected based on interviews and discussions conducted with standard part buyers and advisors.
3. After doing the study literature, discussion, and analyzing the root cause of the business issue, the author proposes some strategy supply chain in procurement that can solve the problem. To determine the final strategy, the author generates some questionnaires for buyers of standard parts and procurement staff. The total of respondents is six people from the procurement staff. The value of the priority score for the five criteria is one to five, the value of one is the lowest Score for prioritizing the requirements, and 5 is the highest Score or top priority of the criteria to be decided. For the scoring of the three proposed strategies, the score range is zero to one hundred (1-100). the lower the value given, the more the strategy does not meet the available criteria, and vice versa

Table 2 Question List for Semi-Structured Interview

No.	Question List
1.	What do you think about the procurement department's overall Purchase Requisition to Purchase Orders process?
2.	What is the most challenging process in procurement so that there are frequent delays in Purchase Requisitions to Purchase Orders?
3.	What was the most common issue you experienced while converting Purchase Requisitions to Purchase Orders?
4.	What do you think about the overall parameter and result of the Procurement Department's Key Performance Index (KPI)?
5.	What is your opinion regarding the low KPI on time PR to PO? Are there any internal or external factors that impacted this situation?
6.	What tangible and intangible impacts occur when the KPI from PR to PO didn't achieve? And is there any punishment from the department regarding this matter?
7.	Is there room for improvement to increase the Procurement Department's Key Performance Index (KPI) results? How about evaluating and monitoring the KPI value in the Procurement Department?

4. After this scoring stage, the author calculates the result and determines the optimal strategy to improve the Key Performance Index of on-time lead time on Purchase Requisition to Purchase Orders in the procurement department. The calculation is done by summarizing the total point of the result of each parameter and then dividing it by the total Score of five criteria. The result will be a decimal; after that, the Score regarding the proposed strategy will be averaged. After that, the average value of each design will be multiplied by the decimal value calculated from the existing criteria. The table below shows an example of a calculation that will be done. The highest total final Score will be the strategy chosen to improve the KPI of on-time lead time Purchase Requisitions to Purchase Order for standard part commodities in the Procurement Department.

RESULT AND DISCUSSION

Analysis

The first stage that should be done to generate the Data Visualization is the data cleaning process because there is some duplicate data, null or missing values, unmatched data type, etc. Raw data is obtained from the procurement department by extracting data from the SAP program. Then, after the cleaning process, the total data Purchase Requisition to Purchase Order is 947 items. The analysis examines the total Purchase Requisition to Purchase Order, Total Delayed Quantity, and Total Delayed Price. In terms of the total number of delays in Purchase Requisition to Purchase Order, the most extensive analysis results are as follows, first is Raw Material Metal (93.9%), Standard Part (90.4%), Avionics Electrical Instruments (89.6%), and last is Raw Material Non-Metal (85.6%). The calculation is done by dividing the total delayed Purchase Requisition to Purchase Order per commodity by the complete Purchase Requisition to Purchase Order per commodity.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

The following analysis parameter is the quantity and price of each commodity's delayed Purchase Requisition to Purchase Order. Table IV-2 shows the result of the analysis total delayed amount for each entity. Regarding the delayed quantity, the highest impact is a standard part commodity, 31,518 EA, which equaled 63.9% of the total amount delayed. The second result is Raw Material Non-Metal (21.4%), the third is Avionics Electrical Instruments (9,9%), and the last is Raw Material Metal (4.7%).
In the term of the result of the total delayed price for Purchase Requisition to Purchase Order, the highest value is from the Avionics Electrical Instrument (AEI), that is $ 3,112,697,539 (67.1%), the second is Standard Part (28.6%) and the third is Raw Material Non-Metal (3.9%). The lowest result is Raw Material Metal (0.38%). After looking at the third parameter, the next stage is discussing with the procurement supervisor to determine the weighted value of the third parameter and choose the commodity for improvement. The result of the discussions is quality and price have the same weight percentage for scoring, that is, 35%, and the total data of delayed Purchase Requisition to Purchase Order weighs 30%. The table below shows the result of the weighted score calculation to determine the commodity that will be chosen to improve. The result shows that the Standard part has the highest score that's 0.5. It became the choice commodity to improve.

Table 3. The Result of Total Data Delayed and On-Time PR to PO each Commodity

Commodity	Total Purchase Requisition to Purchase Order	Complete Delayed Purchase Requisition to Purchase Order	Total On-Time Purchase Requisition to Purchase Order	%Delayed Purchase Requisition to Purchase Order	%On-Time Purchase Requisition to Purchase Order
Standard Part	272	246	26	90.4%	9.6%
Avionics Electrical Instruments	404	362	42	89.6%	10.4%
Raw Material Metal	49	46	3	93.9%	6.1%
Raw Material Non-Metal	222	190	32	85.6%	14.4%
Total	947	844	103	89.9%	10.1%

Table 4. The Result of Total Quantity and Price Delayed PR to PO for each Commodity

Commodity	Delayed Quantity	%Delayed Quantity	Total Price of Delayed (USD)	%Price of Delayed
Standard Part (SP1)	31,518	63.9%	$1,327,448,573	28.6%
Avionics Electrical Instruments (AEI)	4,906	9.9%	$ 3,112,697,539	67.1%
Raw Material Metal (RMM)	2,324	4,7%	$ 17,604,139	0.38%
Raw Material Non-Metal (RMN)	10,581	21.4%	$179,319,586	3.9%
Total	49,328	100%	$ 4,637,069,837	100%

Table 5. The result of Scoring per Commodity

Commodity	**Total Delayed Quantity (35%)**	**Total Delayed of Price (35%)**	**Total Delayed PR to PO (30%)**	**Result**
Standard Part (SP1)	63.89%	28.6%	90.4%	0.50
Avionics Electrical Instruments (AEI)	9.95%	67.1%	89.6%	0.45
Raw Material Metal (RMM)	4.71%	0.38%	5.2%	0.03
Raw Material Non-Metal (RMN)	21.45%	3.9%	23.4%	0.14

Root Cause Analysis

In the root cause analysis process, the cause-effect or fishbone diagram method is used. At this stage, factor and risk analysis is carried out based on the causal relationship faced by the procurement department, especially for commodity standard parts. Fishbone diagrams are used to focus the author and procurement team on the cause and effect of the main problem, visualize the problem to

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

be more readily understood from various aspects, produce solutions and agreements, and help in future decision-making (Lenawati, Setiawan, & Kurniawan, 2023). In this fishbone diagram analysis, five categories are used, namely:

- Man/People: Employees involved in the procurement department's Purchase Requisition and Purchase Order processes.
- Methods: how the process is conducted and the specific requirements for executing it, such as policies, procedures, rules, and regulations.
- Material: Existing materials used in the standard part commodity
- Environment: Conditions regarding location or distance and culture in the procurement environment that affect the purchase requisition to purchase order process
- Measurements: Measurement indicators, such as Key Performance Indicators (KPI), are used in procurement.

These five aspects were used based on the results of discussions and interviews with standard part buyers at procurement. The picture below shows the development of the fishbone diagram. The summary from the root cause analysis using the fishbone diagram is as follows:

- The process and system of converting Purchase Requisition to Purchase Order are not effective and efficient because of manual working procedures, especially in the negotiation and evaluation process between buyer and Supplier, bureaucracy in the document, and the process of evaluating the Supplier (ASL and New Supplier)
- There's poor management and updating of the requirements suppliers' data, and there's no backed up for new prospective Suppliers if the ASL Supplier doesn't match the negotiation. The data management system is Silo.
- There is low monitoring and communication between internal and external departments and lacking motivation to achieve the Key Performance Indicators (KPI).

The result of this root cause analysis of category man, measurement, and material is controllable by the procurement department. In contrast, several root causes, such as price increases that fluctuate in the market and slow response from suppliers, are uncontrollable for the procurement department.

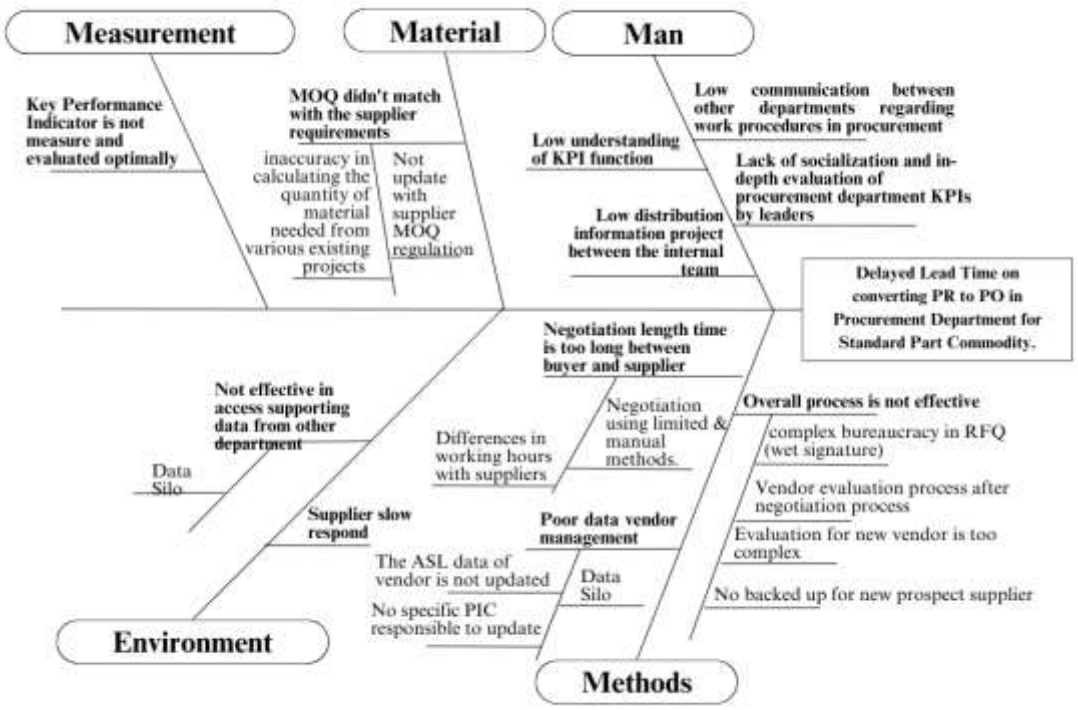

Figure 3. Fishbone Diagram

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

Calculating and Analysis the Weighted and Scoring System

After the root cause analysis, the next stage calculates the survey result to propose the optimal solution. Table 9 shows the effect of weighted priority and final weighted scores for each parameter and strategy that have been calculated. The respondents of this survey consisted of six persons from the procurement department, two of whom are buyers of standard part commodities and material planners, and the rest are procurement staff who are experts in their fields. After determining the weighted Score, the proposed strategy is calculated and analyzed in the following stages. The result of the calculation from the weight score analysis is that e-procurement has the highest Score and will be the proposed strategy to solve the business issue in this thesis. The result of the weighted Score for each method indicates that e-procurement is the best supply chain strategy to solve the delayed lead time in processing Purchase Requisition to Purchase Orders in the Procurement Department.

Table 6. The result of the Priority Weighted Score

Criterion	R1	R2	R3	R4	R5	R6	Total Score	Weighted Score
Material Availability	3	3	3	5	4	4	22	0.24
Lead Time Efficiency	4	4	5	4	5	5	27	0.30
Cost Efficiency	5	5	4	3	3	3	23	0.26
Time to develop	2	1	2	1	2	2	10	0.11
Data Confidentiality	1	2	1	2	1	1	8	0.09
Total							90	1.00

Table 7. The result of the Weighted Score for Each Strategy

Criterion	Weight Score (k)	Score (0-100)			Weighted Score		
		MRP (l)	VMI (m)	E-Procurement (n)	MRP (k*l)	VMI (k*m)	E-Procurement (k*n)
Material Availability	0.24	80	80	80.8	19.56	19.56	19.76
Lead Time Effectiveness	0.30	77.5	80.8	81.7	23.25	24.25	24.50
Cost Efficiency	0.26	78.3	80	85	20.02	20.44	21.72
Time for develop	0.11	79.2	81.7	83.3	8.8	90.7	9.26
Data Confidential	0.09	79.2	83.3	83.3	7.04	7.41	7.41
Total	1.00				78.66	80.73	82.65

Business Solution

After completing the previous stages, which are data analysis, root cause analysis, and the result of weighted Score from procurement staff, the business solution will be developed following the root causes discovered. Each possible solution is explained below.

Table 8. The Table of Root Causes and Proposed Solution

Root Cause	Proposed Solution
No Updated data of Supplier in ASL	Develop Vendor Management System
There is no new and competent data backup supplier.	
Data Silos in some system	
Not practical, manual, repetitive work procedure, and complex bureaucracy (wet signature)	Develop E-procurement

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

- Develop a Vendor Management System (VMS) to Improve Database Management

The procedures to develop Vendor Management System will be divided into two categories: a strategy for existing suppliers and a new Supplier.

- Existing Supplier in ASL:

1. Buyer inputs the supplier data that is owned into the Vendor Management System database.
2. Buyers inform suppliers about the Vendor Management System and e-procurement that the company is developing and create IDs and passwords for suppliers to check, update or repair their data.
3. After updating, the buyer evaluates the data. If it is stated that it is correct and complete, the Supplier will be verified as a company partner in the Vendor Management System.
4. Lastly, the quality department updates the information about supplier performance history.

- New Supplier Flow Process

  Reaching new suppliers increases the company's chance of getting the best price and quality in procurement. For this reason, the performance of buyers must start reaching out to new suppliers and socializing about e-procurement and Vendor Management Systems. The following is the Flow Process for new suppliers:

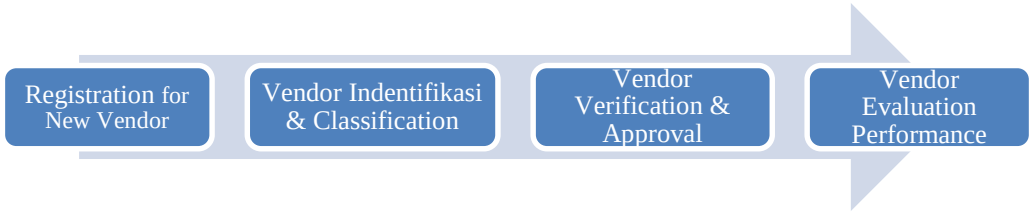

Figure 4. The Stages of Vendor Management System for New Vendor

1. Registration for Supplier: The main objective of this stage is to facilitate Suppliers to register and become partners with the company so that if there are offers or projects, suppliers can participate in e-auctions. The Supplier will fill out a registration form containing company information consisting of essential qualifications, other qualifications, certification, financial statements, and a portfolio of previous projects that have been handled.
2. Supplier Identification and Classification: The purpose of this stage is to carry out the process of identifying the data that has been inputted by the Supplier regarding the completeness of the data. The goal is that the data owned by the procurement is complete and facilitates the classification process. The figure below shows the classification of the Supplier will be done.
3. Supplier Verification and Approval of Supplier: Verification is carried out by conducting online interviews to ensure that each document that has been uploaded is correct and follows the facts. If a supplier has excellent prospects, procurement can submit a request to conduct a survey directly to the Supplier. After it is deemed sufficient, procurement will check the verification column to become a verified supplier (company partner).
4. Evaluation of Supplier Performance: This feature was developed to assist buyers in future Supplier selection. The procurement team will conduct Supplier evaluations based on agreed-upon indicators and requirements. It is intended that the existence of indicators and parameters will lead to their becoming standards in objective assessments. The indicators include competitive pricing, quality, lead time, and process efficiency, particularly in negotiating and delivering goods.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

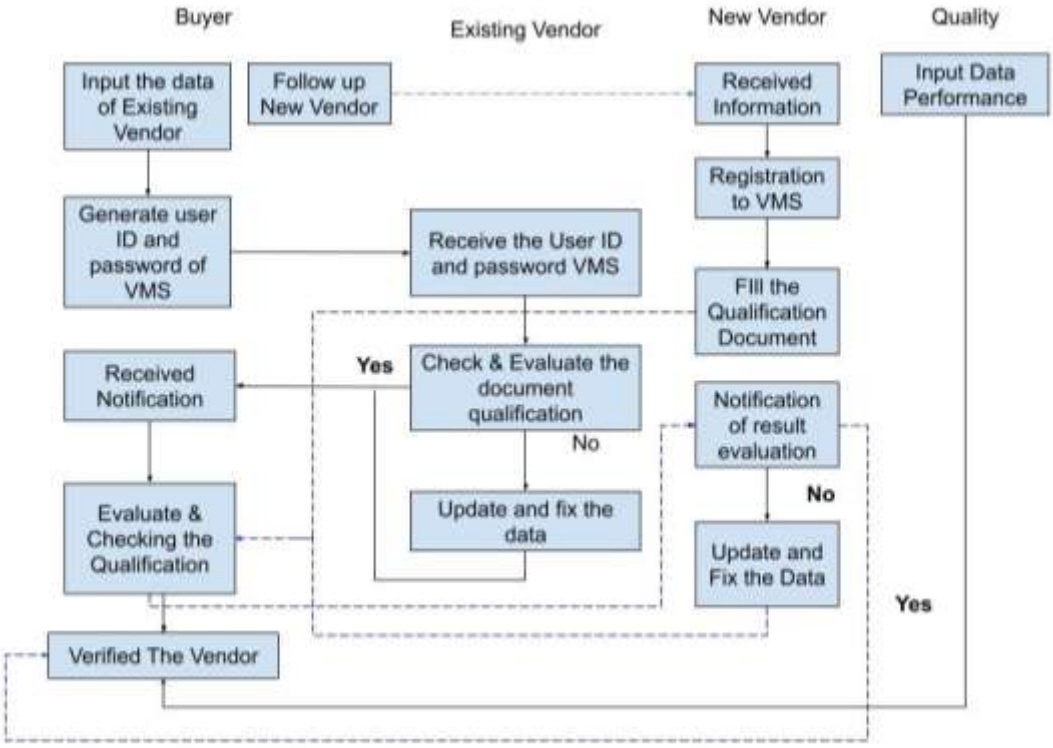

Figure 5. The Flow Process of the Proposed Vendor Management *System*

- **Implementing the E-Procurement**

The design process for implementing E-procurement has the primary objective to reduce the operations and administration that are too manual and repetitive to increase the possibility of achieving the target lead time of Purchase Requisition to Purchase Order. According to (Ahmad & Haq, 2020), other benefits of implementing e-procurement are providing services quickly, efficiently, and accurately and maintaining transparency. In addition, e-procurement increases efficiency in the procurement process and cost, monitoring, tracking, and supports the concept of real-time in providing information. In this implementation process, the users who will run and monitor this application are the Supplier, users, procurement Staff (Buyer and Material planner), Manager and Team Leader, Procurement, Quality Department, Logistics, and IT Support. The proposed flow process of E-procurement shows in the figure below. From the process flow have been proposed, the exact lead time of the process will be explained below in the table. The reduction is around 65% from the previous manual process.

Table 9. The Detail Lead Time of the E-procurement Process

Activity	**Lead Time (days)**
Create PR-invitation and send invitation to Supplier	1-2
Receive the invitation until the submitted bidding document	2
Document evaluation, negotiation, and published winning letter	2 -3
Repudiation period for other candidates	2
The result, a closed process, generates a Purchase Order	1
Total Lead times	8-10

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

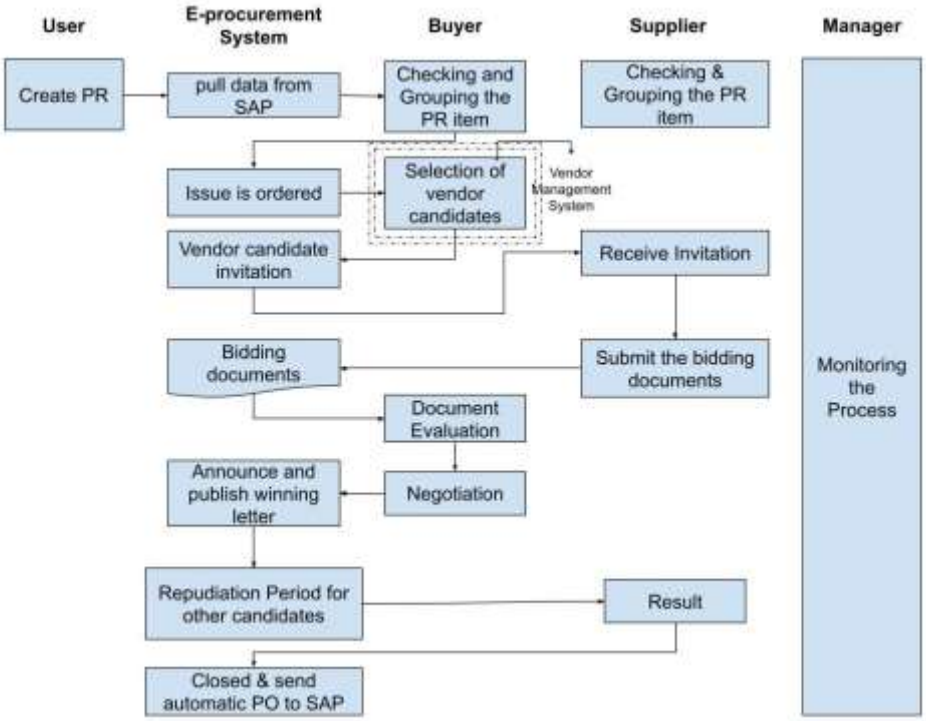

Figure 6. The Proposed E-procurement Work Flow

CONCLUSION AND RECOMMENDATION

Conclusion

- To answer the first research question, a fishbone analysis diagram is used with five parameters: Man, Method, Material Measurement, and Environment. The output of this root cause analysis is the process and system of converting Purchase Requisition to Purchase Order are not effective and efficient because of manual, repetitive, and bureaucracy (wet signature), poor in managing, and updating the data of requirements about vendor ASL and no backed up for new vendors, data silos, low in monitoring and communicating between internal and external departments, and poor evaluation in KPI department.
- The best supply chain strategy as a business solution is e-procurement equipped with a vendor management system to improve the performance of the Procurement Department, especially in the case of lead time Purchase Requisition to Purchase Order.
- The proposed new flow chat process of procurement to reduce the lead time purchase requisition to purchase orders by up to 65%.

Recommendation

After proposing project implementation and analyzing each phase, it can be concluded that the information technology project is one of the essential business resources for the company since it determines whether or not the organization's business strategy implementation process is successful. The successful development of an information system also assesses organizational performance regarding the company's operational aspects and its potential to increase customer satisfaction. To succeed in this project, several tangible and intangible support are needed. The support in form of tangible that is needed is the process of hiring competent human resources and the optimal number of people to carry out the project, develop the comprehensive training program and transfer knowledge. For intangible support, what is needed is leadership and support from management in implementing, monitoring, and developing continuous improvement for the system.

Several points can be continued for the process of developing the information system project in the future so that it can work well, namely:

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

- Determined whether the development project approach will be made insourcing or outsourcing, the development technique must be appropriately chosen. Additional research on the weaknesses and strengths of the two methods is required to assess whether the process is outstanding. It is suggested to perform other literature studies and research when selecting the right approach.
- Developed the optimal cyber security system to protect the confidential data between the internal company and external users such as vendors.
- After this e-procurement runs regularly in the procurement department, future researchers can research programs that facilitate continuous improvement based on evaluation results from ongoing e-procurement performance.

REFERENCES

1. BAILY, P., FARMER, D., CROCKER, B., JESSOP, D., & JONES, D. (2015). *PROCUREMENT PRINCIPLES AND MANAGEMENT*. UNITED KINGDOM: PEARSON.
2. Batubara, A. H. (2019). Increasing Procurement Efficiency in Oil and gas Company using Six SIgma Concept and E-Procurement Implementation. *The Indonesian Journal of Business Administration*.
3. Boddy, D. (2017). *Management an Introduction.* United Kingdom, Harlow, Edinburg: Pearson Ediucation Limited.
4. Brink, V. (2020). Purchasing performance measurement through selecting and implementing key performance indicators. *Universit of Twente*, 1-78.
5. Changalima, Ismail A. (2022). Procurement Skills and Procurement Performance in Public Organizations: The Mediating Role of Procurement Planning. *Changalima & Mdee, Cogent Business & Management*, 1-14.
6. Chenini, A., Iqbal, J., Qurrahtulain, K., Mahmood, M. A., & Aldehayyat, J. S. (2020). Strategic procurement, supplier integration, and speed-to market: The mediating role of procurement lead-time performance and manufacturing performance. *Wiley*, 2-3.
7. Danielsson, M., & Lundqvist, A. (2005). VMI and its Effects on the Small and Medium-Sized Supplier. *Ekonomiska institutionen*, 19-21.
8. DiCicco-Bloom, B., & Crabtree, B. F. (2006, April). The Qualitative Research Interview. *Medical Education*, *40*(4), 314-321. doi:https://doi.org/10.1111/j.1365-2929.2006.02418.x
9. Hasibuan, S. (2018). *Module 1 Procurement Logistic.* Indonesia: Universitas Mercu Buana.
10. Kakwezi, P., & Nyeko, S. (2019). Procurement Processes and Performance: Efficiency and Effectiveness of The Procurement Function. *Journal of Social Sciences Management and Entrepreneurship*, 172 - 182,.
11. Lenawati, M., Setiawan, D., & Kurniawan, W. R. (2023, February 17). Menentukan Prioritas Audit Sistem dan Teknologi Informasi Berdasarkan Root Cause Analysis Menggunakan Pareto Chart dan Fishbone. *Fountain of Informatics Journal*, *8*(1), 1-6. doi:http://dx.doi.org/10.21111/fij.v8i1.9440
12. Monczka, R. M., Handfield, R. B., Giunipero, L. C., & Patterson, J. L. (2009). *Purchasing & Supply Chain.* United State: South Western.
13. Neef, D. (2001). *E-procurement from Startegy to Implementations* (Vol. 10). (P. Guerrieri, Ed.) United State: Prentice Hall.
14. Ngeno, K., & Kinoti, J. (2017). Effect of E-Procurement on Effective Supply Chain Management Process in Energy Sector in Kenya. *International Journal of Supply Chain Management, 2*(3), 18-37. Retrieved from www.iprjb.org
15. Noum, G., & Egbu, C. (2016, April 4). Modern Selection Criteria for Procurement Methods in Construction. *Journal of Managing Projects in Business, 9*(2), 309-336. doi:https://doi.org/10.1108/IJMPB-09-2015-0094
16. Pattanayak, D., & Punyatoya, P. (2019, September 23). Effect of Supply Chain Technology Internalization and e-Procurement on Supply Chain Performance. doi:10.1108/BPMJ-04-2019-0150
17. Pujawan , N., & Mahendrawathi. (2017). *Supply Chain Management.* Surabaya: Andi Yogyakarta.
18. Radzuan, K., Omar, M. F., & Nawi, M. N. (2018). Vendor Managed Inventory Practices: A case in Manufacturing Companies. *International Journal Supply Chain Management*, 196-200.
19. Radzuan, K., Omar, M., & Nawi, M. (2018). Vendor management inventory practices: A case in manufacturing companies. *International Journal of Supply Chain Management*, 196.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 06 Issue 08 August 2023
DOI: 10.47191/ijcsrr/V6-i8-14, Impact Factor: 6.789
IJCSRR @ 2023

20. Rosalina, E. S. (2018). Supply Chain Risk Based Analysis on Vendor Managed Inventory (VMI) Implementation in PTDI. 26.
21. Weele, A. (2018). *Purchasing and Supply Chain Management* . Netherlands: Cengage Learning.
22. Weigel, U., & Ruecker, M. (2017). *The Strategic Procurement Practice Guide (Know-how, Tools and Techniques for Global Buyers).* Switzerland: Springer.
23. Whyte, C. (2000, April). E-procurement: The new competitive weapon. 25.
24. Yang, F., & Zhang, X. (2017). The impact of sustainable supplier management practices on buyer-supplier performance: An empirical study in China. *Review of International Business and Strategy 27*, 112-132.

Cite this Article: Devina Affriani Reyga Riswandi, Gatot Yudoko (2023). Reducing the Delayed Lead Time of Purchase Requisition to Purchase Orders for Standard Part Commodity in the Procurement Department of the Avionics Sector. International Journal of Current Science Research and Review, 6(8), 5480-5493