



Performance Improvement of Procurement Activities in Reaching KPI On-Time Delivery and Purchase Requisition to Purchase Order by Implementing E-RFQ Tools and Developing Team Collaboration and Communication

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ABSTRACT: Procurement activity in for an aircraft industry in Indonesia has suffered most during pandemic few years ago. The progress of Procurement at certain company is not that different. Moreover, one of the main problems in Procurement Division at the company is KPI On-Time Delivery target has not yet been achieved for aircraft commodities, especially for AEI. During these last 5 years, the procurement progress only achieved 48,5% on time, while the target is above 90% of total procurement activity. So far, mitigations has already been taken in order to reduce the delay rate. It give an impact, but the delay rate is higher than the target. The purposes of this study is to increase the On-Time progress and decrease the delay. this study uses conduct several analyses. Internal analysis using SWOT analysis method, while finding the root cause use method 5 Why's Analysis method. Also, there are quantitative analysis and qualitative analysis. Qualitative analysis is done by using DMAIC Method to analyze the problem in a larger scope, while quantitative analysis is done to analyze the procurement data with Regression Analysis. The root cause of it was PR which could not be converted to PO because of the long-lasting RFQ and EQ process. The second root cause is miscommunication in the preparation of ordering aircraft materials. For the issue of the RFQ and EQ process is solved by developing and using e-RFQ Evaluation Tools to make sure that the quotation process and feedback from the supplier are done faster than using the manual method. For the miscalculation problem with improving teamwork and communication. The recommendation is to conduct research further regarding strategy purchasing.

KEYWORDS: Key Performance Indicator, On-Time, Delay, Purchase Requisition, Purchase Order, Procurement.

INTRODUCTION

Indonesia, with a population of 273,52 million and a GDP per capita of 4.783,9 US dollars, has experienced rapid economic expansion, making it a significant economic growth engine in Southeast Asia. The aircraft industry, led by Airbus and Boeing, has grown due to its expertise in manufacturing military aircraft. However, not all aircraft manufacturers have the same financial results. Certain aircraft company in Indonesia faces challenges in managing its business, including financial difficulties, organizational issues, and procurement activity problems. The procurement of materials, particularly Avionic Electrical Instruments (AEI), is not yet optimal, causing delays in delivery and hindering company's efforts to fulfill contracts. Factors such as internal performance, human resources, equipment, and the pandemic have contributed to these challenges. The procurement of materials, particularly Avionic Electrical Instrument (AEI), is crucial for timely delivery. The company has focused on five core businesses since 2004: aircraft, aerostructure, aircraft & engine services, and technology & development.

BUSINESS ISSUE

The Procurement Division faces challenges in ensuring timely delivery of goods, particularly for Avionic Electrical Instrument (AEI) commodities. The highest rate of "Done Delayed" in 2022 is due to delayed delivery processes. The procurement process at the company requires a two-day lead time for creating a Purchase Requisition (PR) and a 20-day period for creating a Purchase Order (PO). However, the procurement activities for aircraft materials, including raw materials and important documents, have not reached the target set in the Procurement KPI. The progress achieved is only 48.5%, indicating problems in procurement processes, particularly in the PR to PO process. Additionally, Pos without approval from authorized parties can slow down the procurement process.



LITERATURE REVIEW

On-Time Delivery

On Time Delivery (OTD) is crucial for businesses to maintain customer trust and profitability. Key performance indicators (KPIs) are used to analyze on-time delivery, ensuring orders are ready to ship on the agreed-upon delivery date. These KPIs influence critical success factors, such as order quality, delivery time, and customer satisfaction. [Ramachandran & Neelakrishnan, 2017]

1. Nonfinancial measure
2. Regular measurements
3. A measure that is noticed by the management
4. Everyone in the organisation has an understanding for the KPI
5. Responsibility connections to individuals and teams
6. Significant effect
7. Positive effect

Globally, some manufacturing plants across industries are experiencing extended delivery times for various direct acting parts such as engine, propeller, bearings, screws, linear guides and others. Unfortunately, delays can and do happen, often without warning. There are a number of reasons delays occur:

1. Outdated Tech
2. Vehicle Issues
3. Incomplete or Inaccurate Information
4. Incorrect Customs Documentation
5. Traffic Conditions
6. Lost Packages
7. Weather

Continuous Improvement

Lean manufacturing (LM) is an approved manufacturing concept that reduces the time between a customer's order and product build-to-shipment by reducing waste causes [Ramachandran & Neelakrishnan, 2017]. However, challenges include lack of awareness of appropriate lean technologies and people's attitudes [Ramachandran & Neelakrishnan, 2017]. To achieve continuous improvement, all functional units and systems must be evaluated. This paper presents a strategy to increase OTD performance by connecting the system and personnel involved in planning and manufacturing for control and maintenance cycles with a user interface for CFT operations. To improve OTD performance, evaluate all functional units and systems, apply lean principles in the office, and implement a strategy connecting the system and personnel for control and maintenance cycles. This approach eliminates waste and achieves desired customer reactions.

Team Work

Teamwork is a cooperative process that enables ordinary people to achieve extraordinary results by working together in a cooperative environment. It relies on synergism between team members, creating an environment where they are all willing to contribute and participate. Key attributes for successful teamwork include commitment to team success and shared goals [Bradley & Frederic, 1997], interdependence [Johnson & Johnson, 1995, 1999], interpersonal skills [Harris & Harris, 1996], open communication & positive feedback [Critchley & Casey, 1996], appropriate team composition [Wageman, 1997], and commitment to team processes, leadership, and accountability [Bradley & Frederic, 1997]. These attributes help create a positive, effective team environment where goals are achieved through collaboration and social interdependence rather than individualized, competitive goals. Team members must be flexible and adaptable to these environments, fostering a caring work environment and valuing their contributions.

Five Why's Analysis

Pojasek (2017) suggests that organizations should incorporate root cause analysis into their problem-solving process, using the Five Whys and cause mapping. This approach helps employee teams move towards environmental excellence and identifies potential

root causes. The Five Whys approach involves asking questions throughout the process, establishing the likely problem source when it becomes difficult to answer.

CONCEPTUAL FRAMEWORK

The company faces a low level of On-Time Delivery due to delayed Purchase Requisition and Purchase Order processing stages. This affects aircraft production activities in various sub-divisions. A solution is needed to effectively run procurement materials order and delivery processes without wasting time.

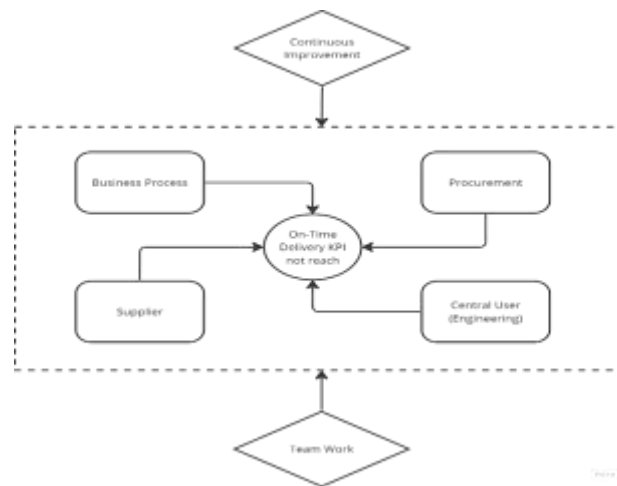


Figure 1. Conceptual Frame Work

Procurement

Procurement is a crucial aspect of supply chain management for companies requiring significant volumes of products or services. It aims to purchase goods or services at the lowest possible price, in the shortest time, with minimal risk, and with the most effective benefits. The procurement management process comprises three P's: Process, People, and Paperwork. Process involves reviewing, ordering, obtaining, and paying for goods or services, while People are stakeholders who approve each step. Paperwork refers to all paperwork and documentation generated during the procurement process, which is maintained for future reference and auditing purposes.

Business Process

Procurement organizes documents for pre-order steps, such as Purchase Requisition (PR) to Purchase Order (PO), to order materials to suppliers. PR is issued when a plan order is qualified by a planner, allowing quotations, negotiations, and surveys. POs are created if PT. DI obtains a supplier with appropriate standards and approval from top management. Delivery delays may occur if orders are placed outside the predetermined plan. A purchase order is a document that outlines the goods or services a business wants to purchase from a supplier [Ketsarapong, Suwantaranrangsr & Phusavat, 2012]. It should include detailed descriptions, quantities, prices, payment conditions, and delivery details. When a supplier accepts a purchase order, it becomes legally binding. Purchase orders (POs) allow employees to submit specific internal resource requests, find the best vendor, and their manager can review and accept the request. There are various types of purchase orders, including standard, planned, blanket, and contract [Sleimen, 2023]. A purchase requisition is an order form for products or services issued by a company's teams or departments to the finance department. It serves as a communication tool between the finance department and other departments, preventing direct purchases from vendors [Mandal, 2016]. Unlike Purchase Orders (POs), PRs are created by the finance department and sent to the supplier company. The approval process and PO creation are distinct, with PRs requiring a list of suppliers to expedite the process. While using a purchase requisition may increase the business process, it offers benefits such as establishing a clear procurement process, detecting and preventing fraud, and providing direct control over purchasing.



Central User (Engineering Team)

The engineering team is responsible for producing aircraft from materials produced within and outside the company. They draft blueprints and ensure stock needs for aircraft manufacturing raw materials. Insufficient aircraft material commodities must be processed immediately by the engineering and procurement teams. To submit material requests, the team creates a Plan Order, with explicit specifications for procurement department discovery. Acquiring precise material quantities and requirements helps create acquisition requests, but uncertain quantities and requirements require reconfirmation, causing delays in production.

Supplier

Organizations and suppliers are interdependent, and long-term relationships are more beneficial than traditional supplier management. A mutually beneficial relationship enhances value creation, joint responses to customer needs, and optimizes costs and resources [Project Management Institute, Inc., 2017]. The procurement department's decision to issue a purchase order is heavily influenced by the supplier's response. Over 200 suppliers cooperate in aircraft and non-aircraft materials, and each must be interviewed and surveyed to ensure compliance with AS9100, the aerospace industry's quality management system. Researchers should identify suppliers with repetitive or lengthy evaluations, as long RFQ and EQ evaluations can delay the PR to PO conversion process.

Continuous Improvement

The Lean Six Sigma methodology is an advanced method for enhancing logistics processes. It involves defining issues, measuring performance, analyzing procedures, improving process performance, and controlling future performance. The study aims to identify the root causes of business issues at PT. DI, specifically the KPI On-Time Delivery of aircraft material, which has not reached the target. The data collected through semi-structured interviews and the 5 Why's method will be used to identify root causes and develop long-term strategies for improvement. The researchers will also use control variables to enhance the procurement process and prevent variables that may interfere with the procurement process.

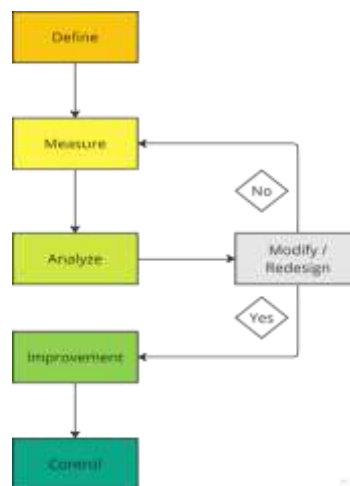


Figure 2. DMAIC Working Chart

Team Work

Teamwork is crucial in procurement, as it involves multiple parties in the supply chain to achieve common goals and minimize failures [Tarricone & Luca, 2002]. Successful supply chain relationships involve stakeholders acknowledging the common mission and the impact of failures. External teamwork involves partnerships with vendors, while internal teamwork involves internal collaboration between company parties. This study focuses on the importance of teamwork between sub-divisions, such as Outsourcing, Buyer, Planner, and Production, in the procurement process of aircraft materials at PT. DI. Proper communication and transparency are essential, as PR evaluations and PO conversions can delay the procurement process.



METHODOLOGY

This company needs to develop a better solution for delivery time and inefficiency issues in the material delivery process. The company's objective percentage of all delivery activities per year is 90%, and the company needs specific techniques to reduce delivery time and become more efficient. To address this issue, researchers will conduct multiple analyses, including internal SWOT analysis, Root Cause Analysis, and Qualitative Analysis. Internal analysis will determine the company's condition, including employee quality as strength, resource availability as opportunity, weaknesses, and potential threat.

Root Cause Analysis will be used to identify the root causes of academic fraud and take corrective or preventive action to increase progress towards achieving KPIs in the Procurement Division. Qualitative analysis will use the Define-Measure-evaluate-Improve-Control (DMAIC) Six Sigma approach to evaluate for process improvement and detect the fundamental causes of failures in existing processes. Quantitative analysis will use regression analysis to analyse the pattern of achieving KPIs of PR to PO targets in business processes over the past few years. The analysis will calculate the average time of PR to PO activities per month for the last 5 years, and the annual progress of PR to PO processing will be compared to the Lead time objective line. The analysis of the calculation will be discussed in the next chapter.

Table 1. List of Interview Question

No	Question
1	Have there been any recent changes to purchasing processes or policies?
2	Are there any issues that cause the delivery rate for commodity has not reached the KPI target (starting from the order until the PO is issued)?
3	Regarding the business process that has been carried out so far, how is it implemented, especially by the Procurement Division which takes care of AEI commodities?
4	What if there is a delay related to the delivery of goods? Does the company have a policy to implement safety stock by buying some goods as a form of anticipation in the future?
5	What kind of problems are still difficult to overcome in the procurement process? Procurement process?
6	What kind of initiatives have been done to solve problems in the procurement process?
7	How about communication between parties related to the procurement process? Procurement process?
8	Are there any problems related to human resources that have a significant impact on the procurement process? On the procurement process?
9	Has there ever been an issue in entering into a contract with a vendor so that the delivery of goods for AEI commodities is delayed?
10	How does PT.DI get suppliers and vendors who can produce aircraft materials and non-aircraft equipment?
11	What is the role of technology in assisting the procurement process at PT.DI? ? Has there ever been an issue that was actually caused by technology?
12	Are there any problems that have been caused by other external parties? Other external parties?
13	What compensation will be given to PT.DI customers if the aircraft production process is not completed according to the specified time?
14	What is PT.DI's target for the future?

RESULT AND DISCUSSION

The Procurement Division faces challenges in ensuring timely delivery of goods, particularly for Avionic Electrical Instrument (AEI) commodities. The highest rate of "Done Delayed" in 2022 is due to delayed delivery processes. The procurement process at the company requires a two-day lead time for creating a Purchase Requisition (PR) and a 20-day period for creating a Purchase Order (PO). However, the procurement activities for aircraft materials, including raw materials and important documents, have not reached the target set in the Procurement KPI. The progress achieved is only 48.5%, indicating problems in procurement processes, particularly in the PR to PO process. Additionally, Pos without approval from authorized parties can slow down the procurement process.



A. Internal Analysis

The SWOT analysis focuses on a company’s progress in achieving KPI on-time delivery from both internal and external aspects. The procurement division has strengths, such as the implementation of Purchase Requisition and Purchasing Order, which minimize potential losses. However, on-time delivery is still not achieved due to delays in the process between PR and PO. The external side explores the strengths of procurement, such as trust and business relationships between stakeholders, cost emphasis, and improved inventory management. Threats include the company’s weaknesses and competitors’ advantages.

Table 2. SWOT Analysis

Strength	Weakness
<ul style="list-style-type: none"> • Have Experience Human Resources • Have production equipment and MRP system • Applied PR and PO for better purchasing activity 	<ul style="list-style-type: none"> • Delay in preparing order document for Aircraft material • No tracking control in maintaining document in business process • Long preparation for ordering materials
Opportunity	Threat
<ul style="list-style-type: none"> • Streamline Process reducing ambiguity and paper work. • Regulatory Compliance • Supplier Collaboration • Strategic Sourcing 	<ul style="list-style-type: none"> • Aircraft Production Delay • Supplier Dissatisfaction and • Poor Inventory Management • Reputational Damage

B. Root Cause Analysis

This study uses causation mapping to analyze the company’s slow progress towards meeting the On-Time Delivery KPI. The 5 Why’s method, an iterative interrogative technique, is used to identify the underlying cause. The brainstorming procedure involves employees from the Procurement Division, dividing it into Outsourcing, Buyer, Production, and Planner. The analysis reveals a delay in converting material requirement planning to purchase request to purchase order as the major root cause of insufficient LT.

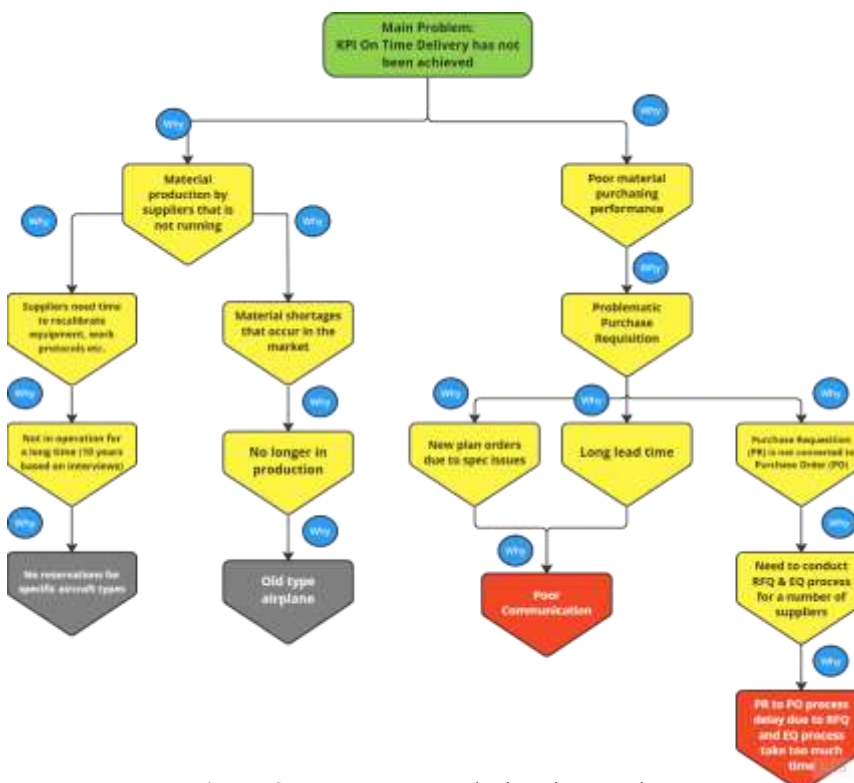


Figure 3. Root Cause Analysis using 5 Why’s



C. Qualitative Analysis (DMAIC Analysis)

The define phase aims to identify issues within the business process and identify areas for improvement. The company faces challenges in meeting the key performance indicator (KPI) of the Procurement Division, “On-Time Delivery of Aircraft material.” The focus is on improving the procurement division’s aircraft material ordering procedure, which causes delays in various commodities and suppliers. This delay is a result of EQ’s time-consuming RFQ to suppliers, which requires PT.DI to create a new order plan to replace obsolete material specifications. The measure phase focuses on KPIs, which are quantifiable values that indicate a business’s effectiveness in achieving its objectives.

D. Quantitative Analysis (Regression Analysis)

Table 3. PR to PO Activity and Lead Time

Month \ Year	2018			2019			2020			2021			2022		
	Delay	OT	LT	Delay	OT	LT	Delay	OT	LT	Delay	OT	LT	Delay	OT	LT
Jan			21			31			31			31	162	14	31
Feb			21			31			31	612	8	31	193	5	31
Mar			21			31			31	192	12	31	214	30	31
Apr			21			31			31	62	-	31	64	-	31
May			21			31			31	59	17	31	35	-	31
Jun			21			31	690	-	31	761	-	31	375	10	31
Jul			21	1040	-	31	68	4	31	129	1	31	53	12	31
Aug			21			31	204	22	31	216	-	31	-	0	31
Sep	-	3	21	53	-	31	273	-	31	248	17	31	40	0	31
Oct	1095	-	21			31	182	-	31	123	21	31			31
Nov	-	12	21			31	537	-	31	143	-	31			31
Dec			21			31	347	-	31	328	16	31			31

The analysis of the PR to PO activity performance in ordering aircraft materials ranges from 2018-2022, revealing the required and target time for the process.

The procurement division’s performance in 2018 was far from expected, with the PR to PO process taking longer than expected. This was due to material ordering activities where Purchase Requisitions were not converted into Pos within the specified time period. The root cause analysis suggested conducting RFQ and EQ to suppliers within 12 days, but the process took more than 12 days and some even took months. Additionally, Purchase Orders without revisions from upper parties had to be revised first to become Final Pos. The rate of delays decreased in subsequent years, and the procurement division aimed to increase the target time for all business processes, including the PR to PO stage, from 21 days to 31 days starting in 2019.



Figure 4. KPI measurement of Lead Time in Days



BUSINESS SOLUTION

The Procurement Division faces challenges in ensuring timely delivery of goods, particularly for Avionic Electrical Instrument (AEI) commodities. The highest rate of "Done Delayed" in 2022 is due to delayed delivery processes. The procurement process at the company requires a two-day lead time for creating a Purchase Requisition (PR) and a 20-day period for creating a Purchase Order (PO). However, the procurement activities for aircraft materials, including raw materials and important documents, have not reached the target set in the Procurement KPI. The progress achieved is only 48.5%, indicating problems in procurement processes, particularly in the PR to PO process. Additionally, POs without approval from authorized parties can slow down the procurement process.

A. Electronic RFQ (e-RFQ) Evaluation Tool

Request for Quotation (RFQ) is a crucial stage in procurement activities, requiring buyers to issue an offer request after a Purchase Requisition. This process involves submitting details of the desired product and budget to the supplier to obtain the best offer. However, the current manual RFQ process can lead to confusion, missed deadlines, and potential loss of competitive advantage. A solution is the development of Electronic RFQ, which automates data collection, compares quotations based on predefined criteria, generates reports, and expedites decision-making.

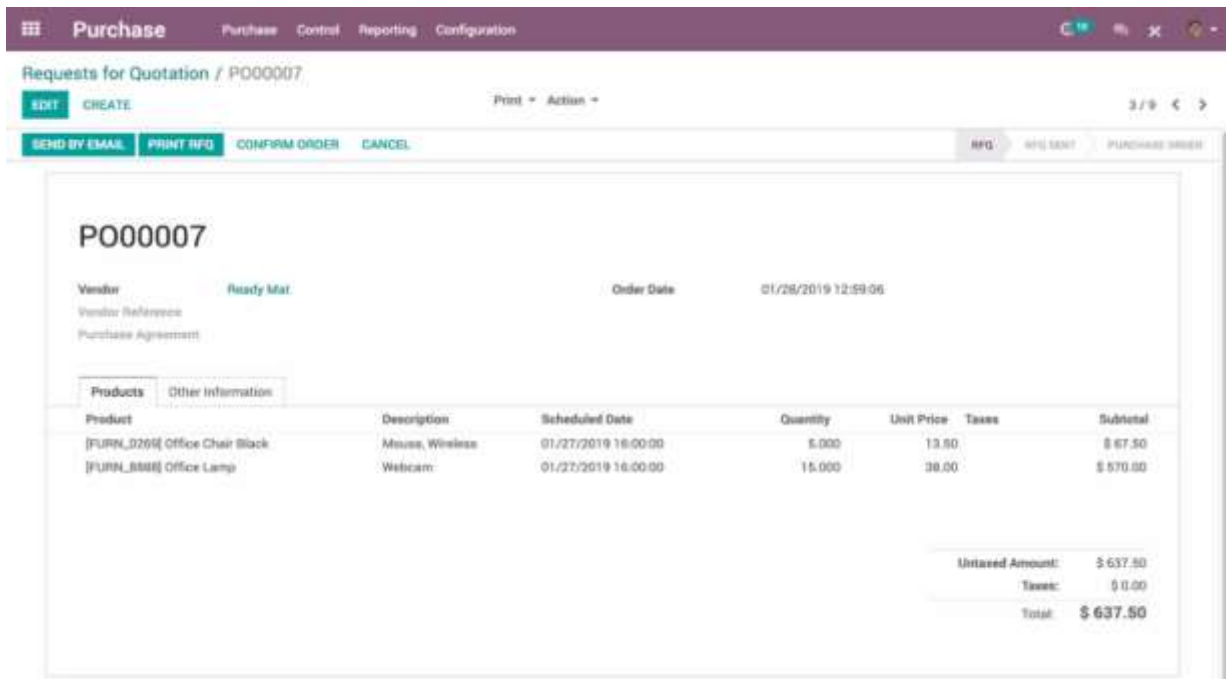


Figure 5. Electronic RFQ Tool – ODOO

The RFQ Automation platform enables companies to streamline the quote request process by offering three features: automated request generation, supplier database management, and seamless communication and collaboration. These features save time, ensure consistency in quote requests, and improve transparency and reduce miscommunication during the procurement process. By collaborating with the IT department, the platform streamlines the procurement process and ensures a more efficient and effective procurement process. The procurement division's mitigation measures resulted in reduced delay rates in the PR to PO process. Using the RFQ Automation method with lead time as an independent variable, the delay rate is expected to decrease, improving efficiency and quality in material procurement activities.

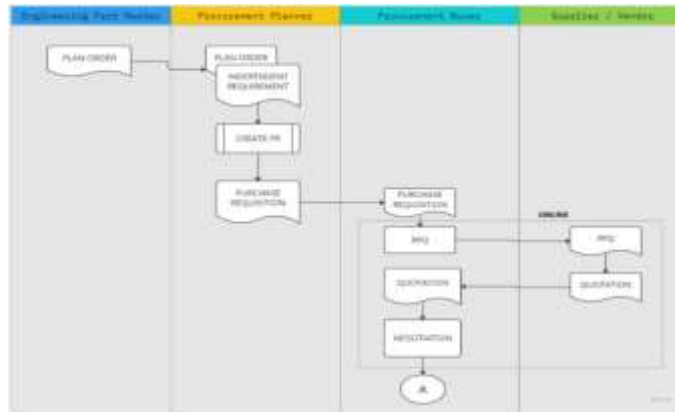


Figure 6. RFQ and EQ Process Improvement by Online

B. Team Work Improvement and Communication

Team Work

Interviews reveal no commonality in procurement processes among various departments. The author proposes improved teamwork based on six key characteristics, including outsourcing, material planning, production material, and finance departments.

Table 4. Attribute in Achieving Successful Teamwork

Key Attributes	Description
Commitment to team success and shared goals	<ul style="list-style-type: none"> It is required that every member of the team is familiar with the KPI and SOP for each department. The responsibility for all activities related to procurement falls on the shoulders of the Manager of Procurement.
Interdependence	Every member of the team needs to be aware of their own responsibilities and refrain from placing blame on one another in order to achieve on-time delivery in an effective manner.
Interpersonal Skills	Every single member of the team needs to have strong interpersonal skills, namely the capacity to pay attention to the other team's requests and react to them swiftly.
Open Communication and positive feedback	Open communication and constructive criticism for all members of the team, with this communication available across all channels (including the phone, WhatsApp, email, chatting, and official memos).
Appropriate team composition	One or two members of staff from each department were chosen to be a part of the team responsible for delivering the materials.
Commitment to team processes, leadership & accountability	Every single member ought to be committed to reaching the KPI.

Interventions, not barriers, can help address issues like communication delays, disagreements, conflict avoidance, poor involvement, and lack of transparency. These interventions clarify group responsibilities and lead to more productive interactions in future projects.

Standard Operating Procedure

Mastering department standard operating procedures (SOPs) is crucial for team performance and quality management. To ensure compliance, provide clear, accessible SOP documentation, continuous training and education, regular communication channels,



checklists, and document control. Regular reminders, checklists, and documentation notation ensure correct activity sequence and prevent noncompliance. Regular communication and reinforcement are essential for maintaining compliance.

Communication

The Project Management Body of Knowledge (PMBOK) emphasizes the importance of identifying stakeholders related to a project, including internal and external stakeholders. A project with 10 stakeholders has 3 potential communication channels, with a total of $n(n-1)/2$. The communication model demonstrates how information is sent and received between parties, while the communication method involves external stakeholders like suppliers. Push communication is used for negotiating prices on RFQ processes, while Interactive Communication is carried out by the procurement division. Effective information distribution involves techniques such as sender-receiver models, media choice, writing style, meeting management, presentation, and facilitation techniques. These techniques help to improve communication and reduce barriers in the PR to PO process.

IMPLEMENTATION PLAN

RFQ and EQ Solution

These steps include identifying needs, selecting the right software, preparing and configuring resources, providing user training, migrating data, conducting internal testing, launching and day-to-day use, and conducting continuous evaluations and enhancements. By following these steps, the RFQ software can be effectively implemented to improve the efficiency and effectiveness of these processes. By implementing these steps, the RFQ software can be used for automating manual tasks, integrating processes with existing systems, and improving team visibility and collaboration.

Poor Communication

The procurement division faces miscommunication issues in ordering materials preparation. To improve team cooperation, implement a centralized collaboration platform, regular meetings and check-ins, clearly define team objectives, establish clear roles and responsibilities, ensure transparent documentation, and offer training and development courses to enhance communication techniques, active listening skills, and cross-functional collaboration abilities.

Table 5. Implementation Plan

No	Recommendation for Improvement	Activity	PIC	2023																				
				Aug				Sep				Oct				Nov				Dec				
				W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	
1	Automation RFQ Evaluation	Assessment and RFQ Software Selection	IT & Procurement Manager	█	█																			
		Preparation and Configuration	IT Division			█	█	█																
		User Training	Procurement Division					█	█	█														
		Data Migration	IT and Procurement Division								█	█												
		Testing and Adjustments	IT Division									█	█											
		Launch and Day-to-Day Use	Procurement Division													█	█	█	█	█	█	█	█	█
		Continuous Evaluation and Enhancement	Supervisor																█	█				█
		Survey for feedback from team member and stakeholder	Procurement Division																	█				█
2	Improved Teamwork	Clearly Define Team Objectives	Procurement Manager	█																				
		Centralized Collaboration Platform	Procurement Division	█				█				█				█					█			
		Establish Clear Roles and Responsibilities	Procurement Manager		█																			
		Regular Team Meetings and Check-Ins	Procurement Division					█				█				█					█			
		Transparent Documentation and Knowledge Sharing	Procurement Division					█				█				█					█			
		Training and Development	Supervisor			█	█					█	█				█	█			█	█		█



CONCLUSION & RECOMMENDATION

CONCLUSION

This research highlights the issue of the company, the only aircraft manufacturer in Indonesia, facing challenges in achieving On Time Delivery KPI in the Procurement Division. To address this, the company should implement a new strategy, such as enhancing business processes on-time and reducing delays. Internal analysis using SWOT analysis and 5 Why's analysis revealed that the root cause of the problem is PR, which cannot be directly converted due to longer RFQ and EQ processes. The authors suggest developing e-RFQ Evaluation software to address these issues and improve team communication and cooperation. Procurement should focus on defining team objectives, centralized collaboration platforms, clear roles and responsibilities, regular team meetings, transparent information sharing, and training and development.

RECOMMENDATION

To implement the e-RFQ Strategy proposed in the previous chapter, The company should support top management in technology, infrastructure, and budget. The development team should be formed from the Procurement Division, with IT creating the software. Training sessions should be provided for all employees, and socialization should be encouraged for employees and suppliers involved. Technical support from IT should be provided to maintain and resolve technical issues. Further research is needed on financial aspects and start-up purchasing, as PT. Indonesia has unique payment methods for reservations.

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