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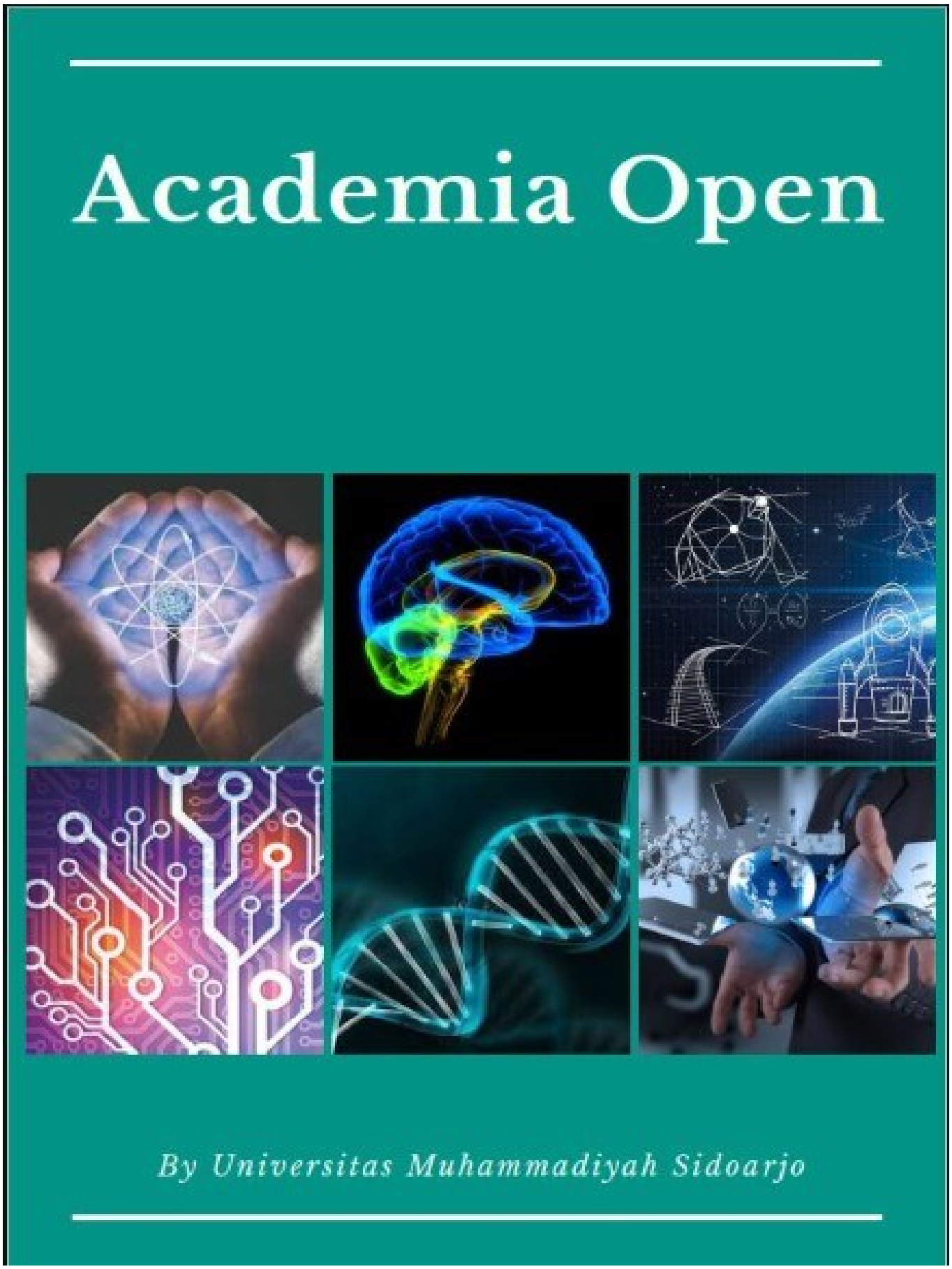
Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14079



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Academia Open

Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14079

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Academia Open

Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14079

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Academia Open

Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14079

Article information

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ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

Academia Open
Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14079

Waste in Contract Document Preparation Using Lean Service

Eunike Lastahan Sihombing, 22032010125@student.upnjatim.ac.id (*)
Industrial Engineering Department, Universitas Pembangunan Nasional "Veteran" Jawa Timur , Indonesia

Dira Ernawati, dira.ti@upnjatim.ac.id
Industrial Engineering Department, Universitas Pembangunan Nasional "Veteran" Jawa Timur , Indonesia

Sinta Dewi , sinta.dewi.ti@upnjatim.ac.id
Industrial Engineering Department, Universitas Pembangunan Nasional "Veteran" Jawa Timur , Indonesia

(*) Corresponding author

Abstract

General Background: Administrative procurement workflows depend on timely and accurate document processing to support operational continuity. **Specific Background:** At PT XYZ, manual contract document preparation involves sequential approvals, repetitive transfers, document accumulation, and extended waiting periods within the General Affairs Division. **Knowledge Gap:** Lean Service applications remain limited in administrative contract workflows characterized by variable documents, repetitive procedures, and manual handling. **Aims:** This study aimed to identify dominant wastes, determine their root causes, and formulate process recommendations using Value Stream Mapping, Value Stream Analysis Tools, Process Activity Mapping, fishbone analysis, and the 5 Whys. **Results:** The current state recorded 4,842 minutes of total lead time, comprising 235 minutes of value-added activity, 1,203 minutes of non-value-added activity, and 3,404 minutes of necessary non-value-added activity, with a Process Cycle Efficiency of 4.9%. Waiting ranked highest, followed by inventory, transportation, and motion. The future-state design reduced total lead time to 2,804 minutes, lowered activities from 41 to 32, eliminated transportation activities, and increased Process Cycle Efficiency to 8.4%. **Novelty:** The study integrates multiple Lean Service diagnostic tools to examine administrative contract document flow and develop a digitally supported future-state design. **Implications:** Early completeness checks, electronic document handling, scheduled reviews, real-time monitoring, and QR code-based approvals provide a structured pathway for reducing administrative waste and simplifying procurement support processes.

Highlights:

- Waiting ranked highest among identified wastes, followed by inventory, transportation, and motion.
- Digital document handling removed nine activities and eliminated physical transfers.
- Process Cycle Efficiency increased from 4.9% to 8.4%.

Keywords: Contract Document, Lean Service, Value Stream Mapping, Waste

Published date: 2026-07-26

Academia Open
Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14079

Introduction

Supply Chain Management (SCM) is a strategic approach that focuses on integrating all activities, from raw material procurement, production processes, and storage to distribution and delivery to the end consumer. Through SCM, companies strive to create added value for customers by delivering products in the right quantity, of the right quality, on time, and at an efficient cost [1]. The most important aim of all supply chain is to provide maximum satisfaction to the customer. Some secondary objectives also include gainfulness, reliability, agility, reactivity, high overturn rate, effective communication and coordination along the supply chain. Inefficient performance in one part of the supply chain can have far-reaching consequences, as the supply chain relies heavily on the smooth flow of information, documents, and services between departments. Therefore, an approach is needed that can reduce waste while increasing value-added in every activity [2].

There are expectations that supply chains should be lean and smart [3], while Lean itself is a managerial approach aimed at creating maximum value for customers by minimizing waste in every business process and focuses on reducing activities that do not add value (waste) to enhance the value of products or services (goods and/or services) for customers. A company can be considered to have implemented Lean if this ratio reaches at least 30%. This approach focuses on identifying and eliminating non-value-added activities in planning, production, and customer-facing service operations [4]. Lean minimizes waste through fundamental continuous improvement to achieve operational excellence. Lean is built on five core principles, which are defining customer value, mapping the value stream for each product, eliminating non-value-adding activities, ensuring smooth flow using a pull system, and continuously improving processes to achieve operational excellence. Lean can be applied across various sectors, including Lean Manufacturing to improve production efficiency and quality [5], Lean Service for high-contact and variable service environments [6], Lean Six Sigma combining waste reduction and variation control [7], Lean Construction to enhance collaboration and workflow [8], and Lean Healthcare to optimize patient flow and service quality [9].

The concept of lean service is relevant because it focuses not only on eliminating non-value-added activities but also on improving the smooth flow of services within the supply chain so that supply chain performance becomes leaner, more responsive, and customer-satisfaction-oriented. Lean Service focuses on reducing non-value-adding activities to improve service quality and efficiency, while addressing the challenges of intangible outputs by minimizing time, cost, and resource waste to enhance customer satisfaction [10]. This philosophy emphasizes the integration of human resource development (*Hitozukuri*) with digital technology, highlighting the need for a unified lean–digital transformation model to provide comprehensive and adaptable implementation standards across service sectors [11].

The non-value-added activities is considered as a waste in lean principles, which are overproduction, inventory, waiting, transportation, overprocessing, defects, and motion, whose elimination enhances efficiency, productivity, quality, and customer satisfaction while reducing costs. VSM is then used in Lean Service as a visual tool to map material and information flows across the entire production process, enabling the analysis of current and future states while identifying waste. Value Stream Mapping involves two key stages, which are current state mapping that reflects the existing production process in detail, and future state mapping, which envisions a more efficient, waste-free value stream after improvements [12]. Lean principles also involve VALSAT, which is a set of tools used to map and analyze waste in value streams by focusing on value-adding processes, supported by seven detailed mapping techniques to identify, measure, and evaluate waste impact across operations [13]. According to [14], Lean activities are categorized into value-added, non-value-added, and necessary but non-value-added activities to distinguish those that create value, those that cause inefficiency and should be eliminated, and those that do not add value but remain essential to the process. Then 5 Whys can be used as a simple yet effective root cause analysis method by repeatedly asking “why” (typically five times) to uncover underlying problems and enable more accurate and sustainable solutions [15].

PT XYZ is a state-owned company responsible for electricity distribution and procurement support in the DKI Jakarta region. Within the General Affairs Division, contract document preparation is a critical administrative process that requires extensive document handling, coordination among multiple internal units and regional offices, and several approval stages. However, the process is characterized by high document volumes, repetitive administrative activities, and workload variability, making it susceptible to non-value-added activities and delays. These inefficiencies frequently hinder the timely execution of procurement projects, disrupt operational workflows, and negatively affect vendor performance. Company records indicate that delays in contract preparation range from 6 to 12 days, particularly during peak workload periods, highlighting the need for systematic process improvement. Therefore, improving the efficiency of the contract document preparation process is essential to enhance administrative performance and support more effective procurement operations.

Table 1. The Impact Of Delays In Contract Completion On Vendors

No	Vendor	Type of Work	Affected PLN Unit	Planned Start Date	Actual Start Date	Delay
1	PT Arta Vista Persada	Office Equipment (Sound System)	UID Jakarta Raya	30 May 2025	11 June 2025	12 days
2	PT Rangga Pratama Mandiri	Turbine Ventilator Installation	UP3 Cempaka Putih	21 July 2025	28 July 2025	7 days
3	PT Unedo Phazippo Utama	Procurement of L2 Managed Switch	UID Jakarta Raya	19 August 2025	29 August 2025	10 days
4	PT Exaudi Swaramindo	CCTV System Repair	UP3 Ciputat	18 September 2025	24 September 2025	6 days
5	PT Gohphas Grafis Utama	Fire Alarm System Installation	UID Jakarta Raya	14 October 2025	21 October 2025	7 days

ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

Academia Open
Vol. 11 No. 2 (2026): December
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Previous studies have widely applied Lean approaches in manufacturing and production settings [5]–[15]. However, the application of Lean Service in administrative contract document preparation remains limited, particularly in environments characterized by high document variability, repetitive procedures, and manual workflows. Therefore, this study applies Lean Service using VSM, VALSAT, Fishbone Diagram, and the 5 Whys method to analyze the contract document preparation process at PT XYZ. The objectives are to identify waste, determine its root causes, and propose improvement recommendations to reduce lead time and improve administrative process efficiency.

Method

This study was conducted at PT XYZ starting in August 2025, and data collection continued until all required information had been obtained. The study focused on the contract document preparation process within the General Affairs Division, covering request verification, contract drafting, review and approval, and the issuance of the Work Order (SPK). A Lean Service approach was applied to identify waste, analyze its root causes, and develop improvement proposals.

Primary data were collected through direct observation, interviews, and questionnaires. Observations were conducted over five process cycles to obtain the average processing time for each activity, while interviews were carried out with employees directly involved in the contract administration process to gain a comprehensive understanding of the workflow and operational issues. A questionnaire based on the seven wastes of Lean Service was distributed to five respondents selected using purposive sampling. The respondents consisted of three General Affairs staff members, one senior officer, and one assistant manager, all of whom were directly involved in the contract document preparation process. Their direct involvement enabled them to provide relevant information regarding waste occurrences throughout the workflow. Secondary data were obtained from supporting company documents and relevant literature.

The analysis began with Value Stream Mapping (VSM) to visualize the current state of the contract document preparation process, including the flow of activities and information. Process Cycle Efficiency (PCE) was then calculated to determine the proportion of value-added time relative to the total lead time. The questionnaire results were analyzed using Value Stream Analysis Tools (VALSAT) to identify the most appropriate detailed mapping tool, followed by Process Activity Mapping (PAM) to classify activities into value-added (VA), necessary non-value-added (NNVA), and non-value-added (NVA) categories. The dominant wastes identified through PAM were subsequently analyzed using the Fishbone Diagram and the 5 Whys method to determine their root causes. Based on these findings, improvement proposals were developed and illustrated in the Future State Map to evaluate their potential for reducing waste, shortening lead time, and improving process efficiency.

Result and Discussion

PT XYZ is an administrative service unit responsible for managing contract document preparation processes, which serve as a critical component in supporting procurement and operational activities. This study focuses on the contract document preparation process within the General Affairs Division, where activities begin with request verification to ensure document completeness and job requirements, followed by contract drafting based on the defined scope of work, and sequential approval stages involving the Assistant Manager, Senior Manager, and Department Manager. After all approvals are obtained, the process concludes with the issuance of a Work Order (SPK) as the basis for execution. The workflow, which involves multiple units and repetitive administrative steps, was observed directly and analyzed using process flow data, activity time data, and questionnaire data to represent actual conditions which can be seen in Figure 1 below.

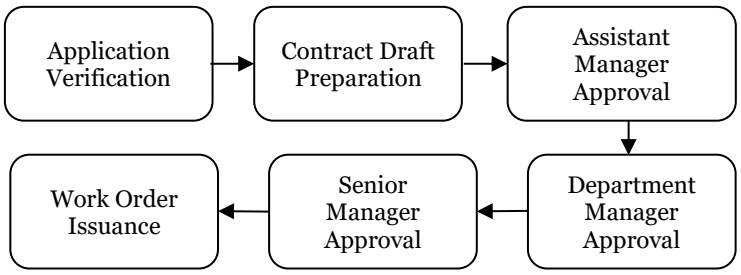

Figure 1. Contract Document Creation Process Flow

Based on direct field observations and information obtained from relevant staff, data on process time and the number of activities involved in the contract document preparation process at PT XYZ were collected, covering stages from application verification to the issuance of the Work Order (SPK). Process time data were gathered through five observation cycles, with the values used in this study representing the average of these cycles. To support waste identification, a waste assessment questionnaire was distributed to five respondents directly involved in the process within the General Affairs Division, consisting of three general staff members, one Senior Officer (SOF), and one Assistant Manager. The questionnaire items were developed based on activities within the contract preparation workflow to ensure they reflect actual field conditions. Respondents were asked to evaluate the frequency and impact of each type of waste using a Likert scale ranging from 1 to 5, where a score of 1 indicates no impact and a score of 5 indicates a very significant impact that may hinder process performance. The results were then compiled and analyzed to identify the most dominant types of waste, which serve as the basis for process improvement analysis.

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During the data processing stage, all data collected through observations, interviews, and questionnaires were systematically processed and analyzed to support the research objectives. The data processing was conducted to identify the current state of the contract document creation process, determine the types of waste occurring, and identify appropriate improvement measures based on the lean service approach.

1. *Current Value Stream Mapping*

This phase aims to map the current state of the contract document preparation process at PT XYZ. The mapping is conducted using the Value Stream Mapping (VSM) approach to comprehensively illustrate the flow of activities, the flow of information, and the time required at each workstation. Through current state mapping, the distribution of value-added (VA), non-value-added (NVA), and necessary non-value-added (NNVA) time occurring in the process can be identified, thereby providing an overview of efficiency levels and sources of waste that affect lead time. Based on the current state mapping, the total process time (lead time) for contract document preparation is 4,842 minutes, consisting of 235 minutes of value-added (VA) activities, 1,203 minutes of non-value-added (NVA) activities, and 3,404 minutes of necessary non-value-added (NNVA) activities. The longest processing time occurs in the SPK issuance stage (1,460 minutes), followed by Senior Manager approval (1,109 minutes), Division Manager approval (914 minutes), and Assistant Manager approval (560 minutes). Meanwhile, the application verification and contract drafting stages take 469 minutes and 330 minutes respectively, as presented in Figure 2.

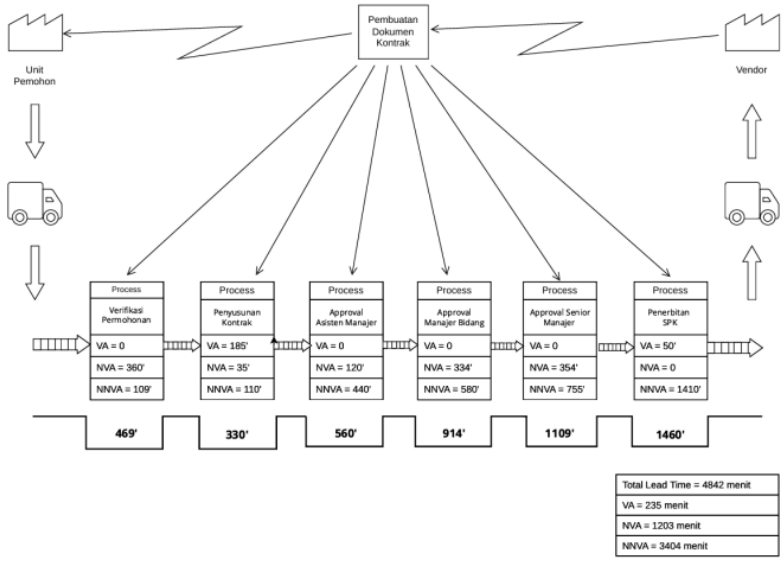

Figure 2. Current Value Stream Mapping

In the contract document preparation process at the General Division of PT XYZ, value-added (VA) activities include contract drafting and SPK issuance as they directly produce the main outputs, while non-value-added (NVA) activities such as waiting for managerial reviews and repeated document transfers, represent inefficiencies. Meanwhile, necessary non-value-added (NNVA) activities, including document verification and completeness checks, do not add direct value but remain essential due to administrative and organizational requirements, with classifications determined through discussions with company staff. Based on the current state mapping, the total lead time for contract document preparation was found to be 4,842 minutes, with a total of 235 minutes for value-added activities, 3,404 minutes for necessary non-value-added activities, and 1,203 minutes for non-value-added activities. The initial Process Cycle Efficiency (PCE) value of 4.9% indicates that the efficiency level of the contract document creation process remains relatively low. This suggests that the majority of the process time has not yet been optimized to provide added value.

2. *Questionnaire's Scoring*

After the questionnaires were distributed and responses were collected from five contract administration staff, the data were compiled and analyzed by calculating the average score for each type of waste based on its frequency and impact on process delays. The scores were then used to rank the wastes, identifying waiting (3.8) as the most dominant, followed by inventory (3.6), transportation (3.2), and motion (3.0), while other wastes such as defect, overproduction, and overprocessing showed relatively lower influence on the contract preparation lead time at PT XYZ which is presented as follows in Table 2.

Table 2. Recapitulation of Waste Weighting Questionnaire Scores

No	Type of Waste	Respondents					Score	Rank
		R1	R2	R3	R4	R5		
1	Overproduction	2	2	4	2	3	2.6	6
2	Waiting	4	3	4	3	5	3.8	1
3	Transportation	3	3	4	3	3	3.2	3
4	Overprocessing	2	2	3	2	3	2.4	7

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No	Type of Waste	Respondents					Score	Rank
		R1	R2	R3	R4	R5		
5	Inventory	4	2	4	4	4	3.6	2
6	Unnecessary Motion	2	3	4	3	3	3	4
7	Defect	3	3	3	2	3	2.8	5

3. *Value Stream Mapping Analysis Tools (VALSAT)*

Following the identification and ranking of waste types based on the questionnaire results, the next step involves analyzing the process using the Value Stream Analysis Tools (VALSAT) approach to determine the most appropriate value stream mapping tool for the contract document preparation process. Through the VALSAT matrix, each waste weight is multiplied by its corresponding correlation score to evaluate the suitability of each tool in analyzing value-added and non-value-added activities. The recapitulation of VALSAT calculation results for the identified waste types is presented in Table 3 below:

Table 3. Recapitulation of VALSAT Calculation

Waste	Weight	Mapping Tools						
		PAM	SCRM	PVF	QFM	DAM	DPA	PS
Overproduction	2.6	2.6	7.8	0	2.6	7.8	7.8	0
Waiting	3.8	34.2	11.4	0	11.4	11.4	34.2	11.4
Transportation	3.2	28.8	0	0	0	0	0	3.2
Overprocessing	2.4	21.6	0	7.2	2.4	0	0	2.4
Unnecessary Inventory	3.6	10.8	32.4	10.8	0	10.8	10.8	3.6
Motion	3	27	0	0	0	0	0	0
Defect	2.8	2.8	0	0	25.2	0	0	0
Total		127.8	77.4	21.8	30.2	32.4	32.4	6.8
Rank		1	2	6	3	4	4	7

The total score for each mapping tool is obtained by summing the scores of all waste types after being multiplied by their respective correlation values. A higher total score indicates that the tool is more relevant and better represents the actual conditions of the process. Based on the VALSAT calculation results, Process Activity Mapping (PAM) achieved the highest score of 127.8, followed by Supply Chain Response Matrix (77.4), Demand Amplification Mapping (32.4), Decision Point Analysis (32.4), Quality Filter Mapping (30.2), Product Variety Funnel (21.8), and Physical Structure (6.8). Therefore, Process Activity Mapping (PAM) was selected as the mapping tool to be used in the subsequent analysis stage, as it is considered the most suitable for representing the waste characteristics in the contract document preparation process at PT XYZ.

4. *Process Activity Mapping (PAM)*

Process Activity Mapping (PAM) for the contract document preparation process was developed based on field observations and data obtained from the company. All activities occurring in this process were classified into five types of activities: operation (O), transportation (T), inspection (I), storage (S), and delay (D). Subsequently, these activities are regrouped based on their value-added nature into three categories: value-added (VA), which are activities that add value to the process; non-value-added (NVA), which are activities that do not add value; and necessary non-value-added (NNVA), which are activities that do not add value but are still necessary for operational processes. The results of the activity mapping using Process Activity Mapping (PAM) for the contract document preparation process at PT XYZ can be seen in the Table 4 below.

Table 4. Process Activity Mapping (PAM)

Process Flow	Activity	O	T	I	S	D	Duration (minutes)	Activity Category
Application Verification	Receive contract preparation request document	✓					10	NNVA
	Check document completeness				✓		38	NNVA
	Ensure contract value matches the value in the work order				✓		25	NNVA
	Notify vendor regarding incomplete documents				✓		21	NNVA
	Wait for document completion revision from vendor					✓	360	NNVA
Contract Draft Preparation	Record contract data into administrative system	✓					15	NNVA
	Identify contract type according to characteristics	✓					20	VA
	Prepare contract template (standard company)	✓					20	NNVA
	Prepare draft contract from TOR & RAB references	✓					90	VA

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Process Flow	Activity	O	T	I	S	D	Duration (minutes)	Activity Category
Assistant Manager Approval	Prepare work schedule	✓					45	VA
	Prepare payment terms mechanism	✓					30	VA
	Prepare general and special conditions clauses	✓					20	NNVA
	Include supporting documents	✓					45	NNVA
	Re-check and format document before revision			✓			25	NNVA
	Correct document errors	✓					35	NVA
	Send document to Assistant Manager		✓				10	NNVA
	Document placed on Assistant Manager's desk and waiting in queue				✓		30	NNVA
	Assistant Manager reviews document					✓	90	NVA
	Return document to staff		✓				10	NNVA
	If incorrect, revise accordingly	✓					45	NNVA
	Send document again		✓				10	NNVA
	Wait for approval from Assistant Manager			✓			365	NNVA
	Send document to Manager		✓				12	NNVA
	Document placed on Manager's desk and waiting in queue				✓		60	NNVA
Department Manager Approval	Wait for Manager's review process					✓	300	NNVA
	If incorrect, document is returned		✓				10	NNVA
	Revise document	✓					35	NNVA
	Send document again for revision		✓				12	NNVA
	Manager approval signature			✓			485	NNVA
	Send document to Senior Manager		✓				12	NNVA
	Document placed on Senior Manager's desk and waiting in queue				✓		90	NNVA
Senior Manager Approval	Senior Manager reviews document					✓	330	NVA
	Senior Manager approval signature			✓			605	NNVA
	Return document to staff		✓				12	NNVA
	Contract document temporarily stored until SPK issuance				✓		60	NNVA
Work Order Issuance	Vendor coordination (technical clarification)	✓					8	NNVA
	Vendor fills out qualification form					✓	420	NNVA
	Create Work Order (SPK)	✓					50	VA
	Check SPK and revise if necessary			✓			12	NNVA
	Obtain approval if needed			✓			960	NNVA
	Send Work Order (SPK)	✓					10	NNVA

Based on the data, operation activities account for 37% of the frequency but only 10% of total process time, while transportation represents 19% of frequency and 2% of time. Inspection activities contribute 22% of frequency but dominate the time at 52%, followed by delay activities with 12% frequency and 31% of total time. Storage activities make up 10% of frequency and 5% of time. In terms of activity categories, value-added (VA) activities represent 12% of frequency and 5% of time, necessary non-value-added (NNVA) activities dominate with 54% of frequency and 70% of time, and non-value-added (NVA) activities account for 34% of frequency and 25% of time. These figures indicate that most of the process time is consumed by inspection and delay activities, and overall the process is heavily dominated by NNVA activities.

5. *Fishbone Diagram*

The fishbone diagram is used in this study to identify the root causes of inefficiencies in the contract document preparation process. Based on the questionnaire results, four dominant types of waste were selected for further analysis, namely waiting (3.8), inventory (3.6), transportation (3.2), and motion (3.0). These wastes were analyzed using a cause-and-effect approach by categorizing potential causes into five main factors: materials, man, environment, machines, and methods. This approach aims to provide a structured understanding of the key factors contributing to process inefficiencies before presenting the detailed visualization of each fishbone diagram

ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

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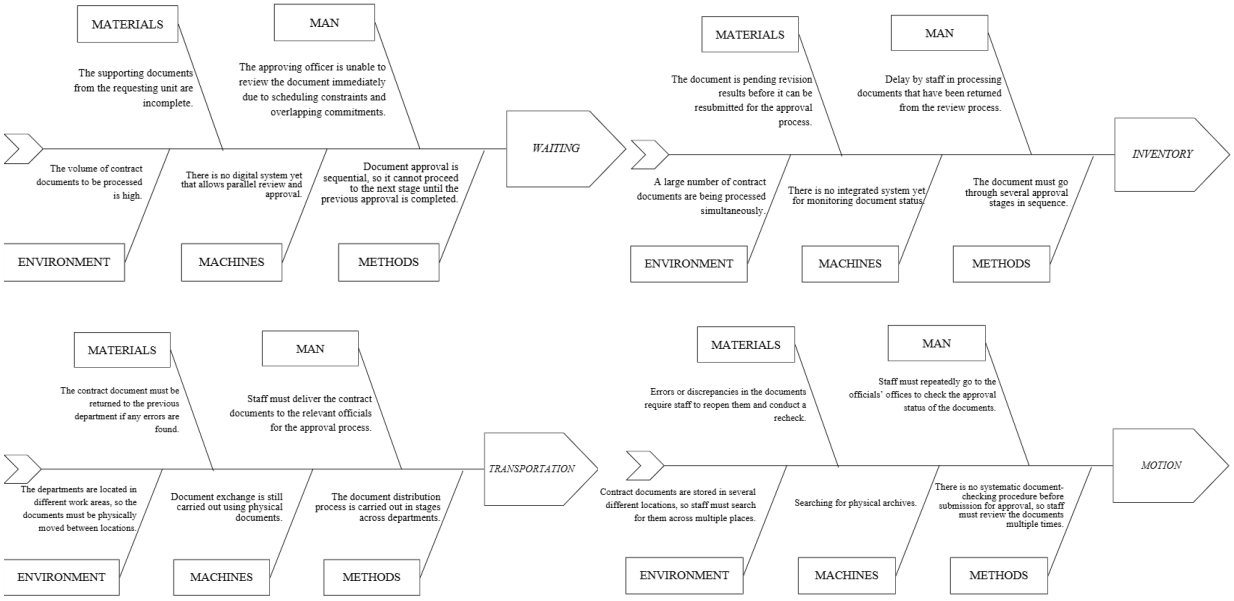

Figure 3. Fishbone Diagram of 3 Critical Wastes

After analyzing the fishbone diagrams, it can be seen that the main causes of waste are interconnected across all factors. Waiting waste is primarily caused by incomplete documents, limited availability of approvers, manual approval systems, and sequential approval processes. Inventory waste arises from document accumulation due to revision cycles, lack of monitoring systems, and process dependency on specific personnel. Transportation waste is driven by repeated physical movement of documents between departments due to manual and paper-based processes. Meanwhile, motion waste occurs due to unnecessary staff movements such as searching for documents and repeatedly checking approvals. Overall, these findings indicate that the lack of digital systems, inefficient workflows, and high dependency on manual processes are the key root causes of inefficiencies in the contract document preparation process.

6. *5 Whys*

After identifying the causes of waste using a cause-and-effect diagram (fishbone diagram), the next step is to conduct a root cause analysis using the 5 Whys method. The 5 Whys method is used to trace the primary cause of a problem by repeatedly asking "why" until the most fundamental root cause is identified. In this study, the 5 Whys analysis was applied to the four most dominant types of waste: waiting, inventory, transportation, and motion. Through this analysis, it is hoped that the root causes of waste in the contract document preparation process can be identified, thereby enabling the formulation of appropriate improvement proposals to enhance process efficiency, which is shown by Table 5.

Table 5. 5 Whys

	Waiting			Inventory	
Step	**Question (Why)**	**Answer**	**Stage**	**Question (Why)**	**Answer**
Why 1	Why does a long waiting time occur in the contract document preparation process?	Because the contract document must wait for review and approval from the relevant officials before proceeding to the next stage.	**Why 1**	Why do contract documents accumulate at several process stages?	Because incoming contract documents must wait to be processed before proceeding to the next stage.
Why 2	Why does the document have to wait for the review and approval process?	Because the contract approval process must go through several approval stages.	**Why 2**	Why do documents have to wait before being processed?	Because contract documents are often handled in batches, resulting in many documents being processed simultaneously.
Why 3	Why is the approval process carried out through several stages?	Because the contract document must be reviewed and approved by several officials who have authority.	**Why 3**	Why are many documents processed at the same time, causing delays in each stage?	Because contract submission is carried out by various units within relatively close time periods.
Why 4	Why must the document be reviewed by several officials sequentially?	Because the contract document approval process has been established in sequential stages according to the organizational structure.	**Why 4**	Why are contract documents not processed immediately when received?	Due to limited staff capacity in handling contract documents.
Why 5	Why is contract document approval carried out in multiple stages?	Because the contract document approval procedure has been designed to ensure document verification before finalization.	**Why 5**	Why is staff capacity limited when document volume increases?	Because contract document processing is still manual and requires considerable processing time.
Root Cause	The contract document approval process must wait for the completion of review at each stage before it can proceed to		**Root Cause**	The volume of contract documents to be processed is relatively high compared to handling capacity, leading to	

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Waiting			Inventory		
Step	**Question (Why)**	**Answer**	**Stage**	**Question (Why)**	**Answer**
	the next stage.			document accumulation at several stages.	
Transportation			**Motion**		
Stage	**Question (Why)**	**Answer**	**Stage**	**Question (Why)**	**Answer**
Why 1	Why does contract document movement occur repeatedly across departments?	Because documents must be delivered to different parties for further processing.	**Why 1**	Why do staff perform many additional movements during document processing?	Because staff must search for documents and check approval status directly.
Why 2	Why must documents be delivered directly to related officers?	Because contract documents need to be checked and approved by authorized personnel before further processing.	**Why 2**	Why do staff need to check document status directly?	Because staff cannot easily access review status information.
Why 3	Why is document distribution still carried out directly to related officers?	Because the distribution process still uses physical documents.	**Why 3**	Why is document status information not easily accessible?	Because document status information is not recorded in a system.
Why 4	Why does the distribution process still use physical documents?	Because contract documents require direct signatures from related officers.	**Why 4**	Why is document status information not recorded in a system?	Because contract document management is still performed manually.
Why 5	Why are signatures done directly on physical documents?	Because the approval process still uses a manual system and documents have not been digitized.	**Why 5**	Why is document management still manual?	Because there is no integrated information system for contract document management.
Root Cause	The contract document distribution process still relies on physical documents, requiring movement between departments for review and approval.		**Root Cause**	There is no integrated monitoring system, forcing staff to manually check document status with related parties.	

7. *Improvement Recommendation*

The proposed improvement recommendations for waiting waste focus on reducing delays in the document approval process by transitioning from manual to digital workflows. This includes implementing an electronic approval (e-approval) system to enable faster and more flexible review and authorization without requiring physical document movement. In addition, establishing a scheduled review timeline for responsible officers helps ensure that documents are processed within a defined timeframe rather than waiting indefinitely. Prioritization mechanisms based on document urgency are also recommended so that critical documents can be processed first. Furthermore, conducting thorough document completeness verification prior to submission can minimize revisions that often cause repeated delays in the approval cycle.

For inventory waste, the recommendations aim to minimize document accumulation by improving flow management and visibility. This can be achieved by developing a real-time document monitoring system that allows staff to track the status and location of documents throughout the process. Regular scheduling of review activities is also suggested to prevent bottlenecks at specific stages. Implementing a structured document queue management system helps ensure a smoother and more balanced workflow. Strengthening coordination among involved units further supports faster processing and reduces unnecessary buildup. Meanwhile, to address transportation waste, the adoption of a digital document management system is proposed to eliminate the need for physical document transfers between departments. Integrating administrative systems enables stakeholders to access documents electronically, while simplifying distribution flows and optimizing internal information systems can significantly reduce unnecessary movement. Lastly, for motion waste, improvements focus on reducing non-value-added staff activities by introducing digital archiving systems, standardized document storage structures, and integrated administrative platforms. These measures allow quicker document retrieval, reduce repetitive checking, and eliminate the need for manual status verification, ultimately enhancing overall operational efficiency.

8. *Future Value Stream Mapping*

An analysis of process activities and the identification of waste in the current state has resulted in several process improvement proposals. The next step is to develop a Future State Map to illustrate the process conditions after the improvements are implemented. The future state is developed by proposing improvements to activities that do not add value or activities that can still be optimized. These improvement proposals include eliminating unnecessary activities and reducing the time spent on activities that cause process delays. Details of the improvement proposals can be seen in the following Table 6.

Table 6. Comparison of Previous and Proposed Activity Times

Number	Activity	Waktu Time Before (minutes)	Improvement	Proposed Time (minutes)
5	Wait for document completion revision from vendor	360	Eliminated	0
15	Correct document errors	35	Reduction	15
16	Send document to Assistant Manager	10	Eliminated	0
18	Assistant Manager reviews document	90	Reduction	60
19	Return document to staff	10	Eliminated	0
21	Send document again	10	Eliminated	0

ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo

Academia Open
Vol. 11 No. 2 (2026): December
DOI: 10.21070/acopen.11.2026.14079

23	Send document to Manager	12	Eliminated	0
25	Assistant Manager reviews document	300	Reduction	180
26	Return document to staff	10	Eliminated	0
28	If incorrect, document is returned	12	Eliminated	0
30	Send document to Senior Manager	12	Eliminated	0
32	Senior Manager reviews document	330	Reduction	250
34	Return document to staff	12	Eliminated	0
17	Document placed on Senior Manager's desk and waiting in queue	30	Reduction	15
22	Approval signature by assistant manager	365	Reduction	90
24	The document is placed on the official's desk in queue for the division manager	60	Reduction	30
29	Approval signature by division manager	485	Reduction	120
31	The document is placed on the official's desk in queue for the senior manager	90	Reduction	40
33	Approval signature by division senior manager	605	Reduction	180
37	The vendor fills out the form	420	Reduction	240

The comparison between current and proposed processing times shows that several non-value-added activities in PT XYZ are either eliminated or reduced. Activities that are fully eliminated include waiting for revised documents from the requesting unit (Activity No. 5), which is resolved through an initial document completeness checklist, and manual document delivery and return between officials (Activity Nos. 16, 19, 21, 23, 26, 28, 30, and 34), which are replaced by digital document sharing. In addition, document revision (Activity No. 15) is reduced from 35 to 15 minutes through the use of standardized templates and checklists. Waiting time for document review (Activity Nos. 18, 25, and 32) is also reduced by implementing scheduled review sessions, decreasing the waiting time across different managerial levels. Furthermore, queue-related delays such as document placement on officials' desks (Activity Nos. 17, 24, and 31) are reduced through the use of monitoring systems, cutting waiting times significantly. The approval process (Activity Nos. 22, 29, and 33) is accelerated by implementing a digital authorization system using QR codes, reducing approval times from 365, 485, and 605 minutes to 90, 120, and 180 minutes respectively. Lastly, vendor form completion (Activity No. 37) is reduced from 420 to 240 minutes by enforcing clear deadlines and simplifying the forms. Overall, these improvements eliminate waste and significantly enhance process efficiency in the future state, which can be seen in Figure 4 below.

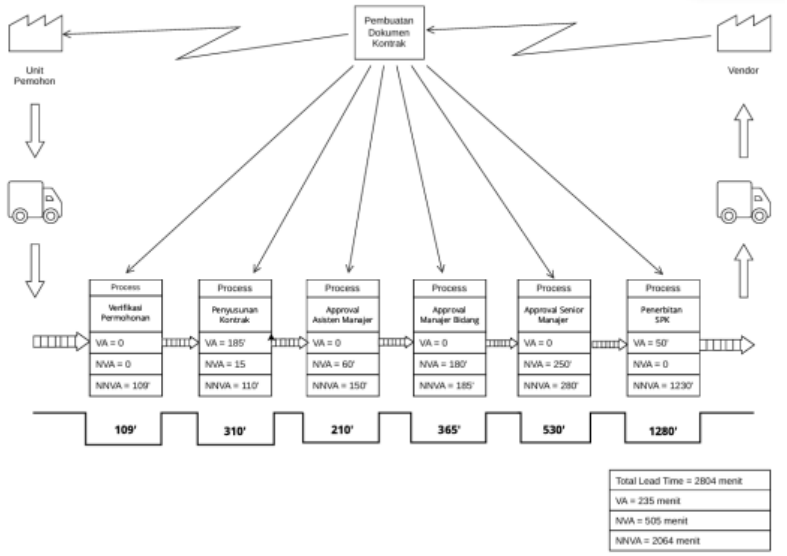

Figure 4. Future Value Stream Mapping

Based on the future state mapping, the total lead time for contract document preparation at PT XYZ after improvements is reduced to 2,804 minutes, consisting of 235 minutes of value-added (VA), 505 minutes of non-value-added (NVA), and 2,064 minutes of necessary non-value-added (NNVA) activities. Compared to the initial condition, the process time significantly decreases from 4,842 minutes (80.7 hours) to 2,804 minutes (46.6 hours), indicating improved efficiency. The proposed process includes 32 activities, dominated by operations (15 activities, 47%) and inspections (9 activities, 28%), with inspection contributing the largest portion of time at 1,471 minutes (53%). Storage and delay each account for 4 activities (12.5%), with 145 minutes (5%) and 730 minutes (26%) respectively, while transportation activities are fully eliminated. In terms of value classification, VA activities account for 5 activities (16%) and 235 minutes (8%), NVA for 4 activities (12%) and 505 minutes (18%), and NNVA for 23 activities (72%) and 2,064 minutes (74%), showing that although non-value-added activities have been reduced, the process is still largely dominated by necessary non-value-added activities.

Result and Discussion

The results show that the contract document preparation process at PT XYZ initially had a total lead time of 4,842 minutes, with only 235 minutes classified as value-added or about 5 %. Meanwhile, 1,203 minutes or about 25 % were non-value-added and 3,404 minutes or about 70 % were necessary non-value-added. Process Activity Mapping indicates that inspection activities dominated 52 % of total time, followed by delay at 31 %, showing that most time was spent on review, approval,

and waiting. In terms of activity composition, necessary non-value-added activities accounted for 54 % of total activities and 70 % of total time, while non-value-added activities accounted for 34 % of activities and 25 % of time. Waste analysis shows that waiting was the most dominant waste with a score of 3.8, followed by inventory at 3.6, transportation at 3.2, and motion at 3.0. These findings indicate that delays mainly occurred due to approval queues, document accumulation, frequent physical transfers, and inefficient work movements. Based on VALSAT analysis, Process Activity Mapping was identified as the most suitable tool with the highest score of 127.8. Improvement efforts focused on eliminating unnecessary activities and reducing delays, such as removing manual document transfers, minimizing revision loops, and improving review scheduling. The comparison between both can be seen in Table 7 below.

After improvements were implemented, the total lead time decreased to 2,804 minutes, resulting in a reduction of 2,038 minutes or 42.09 %. Non-value-added time decreased from 1,203 to 505 minutes, while necessary non-value-added time decreased from 3,404 to 2,064 minutes. Value-added time remained constant at 235 minutes. The total number of activities was reduced from 41 to 32, showing a reduction of 9 activities or 21.95 %. In addition, Process Cycle Efficiency increased from 4.85 % to 8.38 %, reflecting an improvement of 3.53 %age points or about 72.78 %, which indicates a significant increase in overall process efficiency.

Conclusion

The study shows that the contract document preparation process at PT XYZ still contains significant inefficiencies, with waiting identified as the most dominant waste, followed by inventory, transportation, and motion. The current state mapping reveals a total process time of 4,842 minutes, consisting of 235 minutes of value-added activities, 1,203 minutes of non-value-added activities, and 3,404 minutes of necessary non-value-added activities. This means that around 95 % of the total time is spent on activities that do not directly add value. As a result, the Process Cycle Efficiency is only 4.9 %, indicating a relatively low level of process efficiency. After implementing lean service improvements, the total lead time decreases to 2,804 minutes, resulting in a reduction of 2,038 minutes or 42.09 %. The number of activities is reduced from 41 to 32, while Process Cycle Efficiency increases from 4.9 % to 8.4 %. These improvements are supported by process changes such as early document completeness checks, digital document handling, and QR code-based approvals, which reduce delays and unnecessary activities. Overall, the numerical results demonstrate a significant improvement in efficiency through waste reduction and process simplification. Future research is recommended to validate the proposed improvements after implementation and to explore the integration of Lean Service with digital technologies or other continuous improvement approaches, such as Lean Six Sigma, in different organizational settings.

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Academia Open

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ISSN 2714-7444 (online), https://acopen.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo