http://jurnal.unmer.ac.id/index.php/jtmt
TRANSMISI
ISSN (print): 9-772580-228020
ISSN (online): 2580-2283

The Lean Project Approach to Anticipate Delays in the Construction of 3.5 GT Fishing Boats (Case Study at PT. X)

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ARTICLE INFORMATION

Received: 19 February 2023
Revised: 6 March 2023
Accepted: 7 March 2023
Published: 15 March 2023

ABSTRACT

Projects generally have a deadline for completion. So far, PT. X often experiences delays in project completion. The problem is that waste often occurs in the production process. As a result, the company can suffer losses if waste m is not minimized immediately. The purpose of this research is to identify waste that contributes to delays in the construction of 3.5 GT fishing vessels and to increase the Value Stream by using the Lean Project methodology to estimate delays. Utilizing the Lean Project methodology, this research identifies and maps waste in every manufacturing step. The recommended value stream creation is based on the total time spent on each component, which is calculated from 18.7 hours to prepare the mould, 26.5 hours to manufacture the hull, 28 hours to assemble, 112 hours to manufacture the steering system, and 88 hours to manufacture the finish. The initial value stream for one unit of the Sumbawa 3.5 GT fishing vessel is 273 hours, or 34 days, according to the estimated time for each stage of the production process. The planned lead time is 678 hours or 84 days less than the previous lead time. The difference from the anticipated value stream is 405 hours or 51 days.

Keywords: Lean Project, Value stream, Lead time.

ABSTRAK

Proyek pada umumnya memiliki batas waktu pengerjaan.Selama ini PT. X sering mengalami keterlambatan dalam penyelesaian proyek. Kendalanya adalah sering terjadi waste pada proses produksi. Akibatnya perusahaan dapat mengalami kerugian jika waste m tidak segera diminimalkan. Tujuan dari penelitian ini adalah untuk mengidentifikasi pemborosan yang berkontribusi terhadap keterlambatan pembangunan kapal ikan 3,5 GT dan untuk meningkatkan Value Stream dengan menggunakan metodologi Lean Project untuk memperkirakan keterlambatan. Memanfaatkan metodologi Lean Project, penelitian ini mengidentifikasi dan memetakan pemborosan di setiap langkah manufaktur. Penciptaan value stream yang disarankan didasarkan pada total waktu yang dihabiskan pada setiap komponen, yang dihitung dari 18,7 jam untuk menyiapkan cetakan, 26,5 jam untuk membuat lambung, 28 jam untuk merakit, 112 jam untuk membuat sistem kemudi, dan 88 jam untuk menyelesaikan. Value stream awal untuk satu unit kapal penangkap ikan Sumbawa 3,5 GT adalah 273 jam, atau 34 hari, sesuai dengan perkiraan waktu untuk setiap tahapan proses produksi. Lead time yang direncanakan yaitu 678 jam atau 84 hari lebih kecil dari lead time sebelumnya. Selisih dari aliran nilai yang diantisipasi 405 jam atau 51 hari.

DOI: 10.26905/jtmt.v19i1.9635

Kata Kunci: Lean Project, Value stream, Lead time

1. Introduction

Intense competition and rapid changes in the corporate environment are the result of a period of economic globalization coupled with rapid technological developments. A company called PT X builds passenger boats, tugboats and fishing boats out of fiberglass, wood and steel on demand with the help of subcontractors (workers on a contract basis).

Based on the work orders distributed after the contract is concluded between the customer and the business, ship production at PT. X. So far, manufacturing results have fulfilled both domestic and international ship orders. The project to be worked on may be considered an order that the business has received. Most projects have a completion date, meaning the work must be completed ahead of schedule or on time. Currently, PT. X frequently faces delays in completion as a result of missed deadlines. The problem is that time is often wasted while waiting for one of them to complete an earlier task that has not been completed, resulting in many people losing their jobs.

Due to the inefficiency of the variables involved in project implementation (people, methods, materials, machines, and the environment), which may result in delays in project completion, the word waste is sometimes referred to as an activity that does not add value [1]. According to [2], the following eight wastes will apply to the maintenance industry: 1) Errors More commonly referred to as "rework" in the maintenance industry and are caused by work that does not meet requirements. Skills of worker technicians, suitability of processes to job applications, and substandard material specifications are just a few of the possible causes of this problem. 2) Extra Manufacturing When it comes to maintenance, it is possible to waste time and money by performing unnecessary maintenance. After treatment, breakdown (baby failure) is also possible. 3. Waiting Because the time needed to complete an activity is too long, there is no added value. Workers who are waiting for equipment or materials that have not arrived are also included. 4. Don't Use. This might be described as substandard utilization of resources. This includes assigning employees to tasks that are outside their area of competence, which prevent the effective use of their skills. 5) The process of getting workers from office to workplace is referred to as transportation in a project. Taking too long during the transportation process wastes time and fuel. 6) Inventory In this case, it is understood to mean having abundant stock or goods. Waste often results from inadequate inventory inspections. In order for more of the same type of material to accumulate. In addition, as inventory builds up, inventory conditioning work will be required. If you don't do this, the inventory will be destroyed. 7) Migration This often occurs during the project, especially labor that is not needed, such as traveling back and forth between the office and the field, keeping tools, and the field as a result of equipment or information being left behind. 8) Overprocessing This waste comes from the use of improper work techniques, which causes the anticipated results to not meet the required standards.

Lean project management (LPM), which has concepts that can be used for the execution of production processes, or a lean thinking approach is needed to address this challenge.

Lean is an enterprise concept, systemic strategy and method for identifying and eliminating waste or non-value-added operations through continuous improvement. This idea aims to eliminate all forms of waste and provide a smooth flow of goods during the value flow process [3]. To avoid delays and cost overruns during project implementation, [4] claims that the Lean Project Management methodology combines a Critical Chain Project Management (CCPM) approach to scheduling with lean tools to detect waste and its resources.

The following is the guiding concept of Lean Project Management [5] :

1. Project System a. Identify waste through fishbone diagrams and if-then statements

B. Use a work breakdown structure to identify specific tasks (WBS),

2. Managing Others

A. Name the parties involved.

B. Manage stakeholders by defining the tasks of each stakeholder using the RICA matrix, which is used for projects with multiple partners (usually up to hundreds).

3. Embarkation In the chartering phase, the vision and objectives of the project are established, and the project leader is assigned responsibility for the project plan. The project manager can use the charter form to simplify the charter steps so that relevant stakeholders can obtain information from related projects.

4. Ideal Response In choosing a way to deal with the waste that may develop during project implementation, this approach is applied.

5. Controlling Variation Since uncertainty in a project is known as variation, implementers must control variation by estimating before the project is executed in terms of cost, time (schedule), and resources used.

a. Cost projections. The first step is to estimate the project cost based on the required materials and labor (before 10% VAT and reserve money). The cost estimation process involves breaking down the labor and material requirements for each type of work.

B. Estimated timeframe. The Critical Chain Project Management (CCPM) approach to scheduling planning seeks to prevent Parkinson's law and the impact of student syndrome. A fresh answer to this problem is a scheduling technique known as Critical Chain Project Management (CCPM). 3, No. 1 (2017) Journal of Industrial Engineering Journal of Research Results and Scientific Papers of Industrial Engineering 41 The Critical Path Management (CPM) approach has developed into CCPM. One of the drawbacks of the CPM scheduling method is that the free time allocated to each activity causes resources to waste time available (Parkin's law effect), even though work can be completed more quickly or even workers tend to take work seriously. at the end of the work deadline.

c. Resource estimation. The need for the number of workers is inversely proportional to how long it takes to complete a task. More personnel are needed for jobs that take less time (less time) to complete, and vice versa.

6. Risk management for the project

7. Project Plan The idea of lean project management is incorporated into the Project Plan.

8. Performance

A. Develop an integrated costing or schedule system B. Track time performance C. Implement project control procedures

Value stream mapping, sometimes referred to as big picture mapping, is a technique used to describe an entire system and the value streams that compose it, according to [6]. Big picture mapping is useful for providing a macro-level description of the entire process, for visualizing process flow and lead times, and for identifying waste. Big picture mapping is used to map the real conditions that exist in the company than the organization has anticipated [7]. Any activity that uses resources but does not add value to consumers can also be seen as an activity or waste that does not add value [2]. The Critical Path Method (CPM), a technique for organizing and managing projects, is the most popular of the five systems that implement network development ideas, according to [8]. Activities with the longest implementation time are on the critical path (Critical Path). Therefore, the path indicated by the bold arrow as the important path is the path that most influences the overall project completion time [9]. The advantages of understanding the critical route according to [9] are as follows: A. All project work is delayed when work on the crucial path is delayed. B. If ongoing work on vital lines can be expedited, then project completion can be carried out more quickly. C. Completion of the critical path on time, and potential trade-offs (exchanging time for efficient costs) and crash programs (completed in the best possible time, accelerated with increased costs) or shortened time by adding overtime costs are ways to control supervision or management. D. Jobs that do not follow the critical route often have extra time available to them. This allows managers and projects to allocate resources more effectively and efficiently by moving labor, tools and costs to work the paths that matter.

By reducing waiting waste to anticipate project delays at PT.X, this study aims to apply the Lean Project idea to a 3.5 GT FRP fishing boat construction project. The following objectives will be achieved as a result of this study: 1. Understand the waste that contributes to the delay in the construction of 3.5 GT fishing vessels 2. Use the Lean Project methodology to increase the Value Stream to anticipate delays in the construction of 3.5 GT fishing vessels.

2. Methodology of Research

The process of collecting primary and secondary data to be studied. The 3.5 GT fishing boat construction project at PT. X is the subject of this research. The stages of this research include the following:

a. collect primary and secondary data. Primary information was collected through observation and interviews. The time for each action in the construction of a 3.5 GT FRP fishing boat is determined by taking primary data. Secondary data is in the form of information obtained from documents for making fishing boats measuring 3.5 GT.

b. Calculates standard time for each task.
c. Network planning preparation. Making Network Planning is done to provide a visual picture of the sequence of work processes and the interdependence between the two.
d. Finding the Critical Path is step d. The total duration of the longest process is determined using the Critical Path. From the initial node to the final node, the critical path is identified.
e. Determine the Waiting Waste for each Critical Path activity.
f. Diagram Identification of Causes and Effects of Waiting Waste.
g. Collect suggested Value Streams. Assembling a suggested value stream depends on the location of the workforce and the amount of time spent on each part. The research flowchart is depicted in Figure 1.

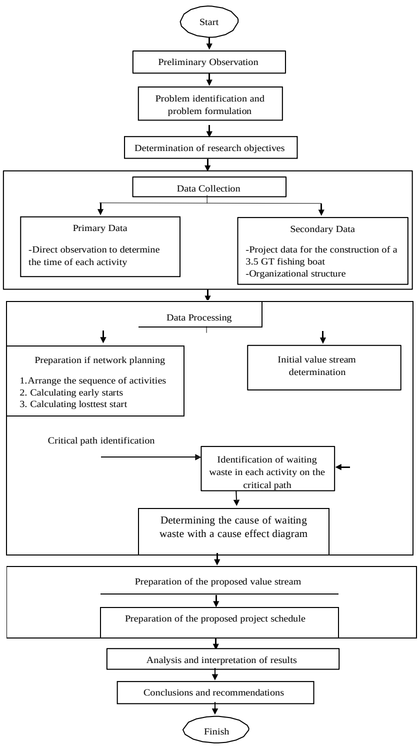

Figure 1. Research Flowchart

3. Result and Discussion

In a previous study conducted [10] regarding the evaluation of planning and controlling clean water development projects using the Lean Project Management Method. Based on the results of identification in the construction of clean water supply in Pekanbaru City, waste that has the potential to appear is waiting, defects and unneeded processing. Possible risk factors that arise during project implementation are bad weather factors, damage to work tools (generator components), delays in the arrival of raw pipe materials, K3 (Occupational Health and Safety), Theft, negligence and dishonesty as well as damage to equipment, property or physical buildings. Meanwhile, scheduling using the CCPM method obtained savings in project processing time of 4 days so that the costs incurred by the implementing party were also reduced. So as to solve the problem in the case study at PT. X, then used the method "Lean Project Approach To Anticipate Delays In The Construction Of 3.5 GT Fishing Vessels (Case Study In PT. X)".

3.1. Sequence Data for The Construction of The FRP 3,5 GT

Table 1 provides information on work orders, normal working hours, and labor used in the construction of the Sumbawa fishing vessels.

Table 1. Job Order Data and Man Hours Standard Construction of a 3.5 GT Fishing Boat

No. Activity	Name of activity	Predecessor Activities	*Man Hours Standard (Hours)*
1	Mold Preparation	0	56
2	Making Hull	1	56
3	Making deck	1	56
4	Construction	1	112
5	*Making Superstructure*	1	56
6	*Making component*	1	56
7	*Assembly*	2,3,4,5,6	168
8	Installation *Mechanical*	7	112
9	Installation *Electrical*	7	56
10	Propulsion Installation	7	56
11	Steering system installation	7	112
12	*Finishing process*	8,9,10,11	224

The results of calculating the standard time for each activity in the process of making a 3.5 GT fishing boat carried out at PT.X can be seen in table 2.

3.2. *Calculation of Standard Time for Each Activity*

Calculates the standard time for each action in his book "Time And Motion Studies" [11].

Standard time = *Man Hours Standard* (Person Hours)

Number of human resource (Person)

The standard time for each activity can be seen in table 4.3 below.

Calculation example:

- Mold preparation

Standard time = *Man Hours Standard* (Person Hours)

Number of human resource (Person)

Standard time = 56/3 = 18.7 hours.

3.3. *Identify Critical Path*

After making the network planning, the critical path is determined. The longest process duration is calculated using the critical route. Activities whose LS-ES equals 0 are activities that are on the critical (zero) path. Values for the earliest and latest start for all activities.

From *Network planning*, the most prominent critical path is the installation part *steering system* and *finishing.* In the installation section *steering system* takes 112 hours consisting of 24 hours of rudder making, 16 hours of steering gear making, 16 hours of rudder mounting, 8 hours of rudder shoe installation, 8 hours of rudder mounting, 8 hours of steering mounting, 8 hours of installation of hydraulic rudders, installation *helm pump* 8 hours, 8 hours of manual installation, and 8 hours of hydraulic hose installation. Meanwhile in process *finishing* takes 88 hours. For more details about the activities included in the critical path, can be seen in Table 3.3

Table 2. *Standard Time Calculation Results*

No. activity	Activity	*Man Hours Standard*	Number of Normal HR (People)	Standard Time (Hours)
1	Mold preparation	56	3	18.7
	Hull			
2	a. *Waxing process*	5	3	1.7
3	b. G*el coating process*	16	3	5.3
4	c. Lamination	19	4	4.8
5	d. Release from print	16	4	4
	Construction *Hull*			
6	a. Making reinforcement	40	6	6.7
7	b. Skate making	16	4	4
	Deck			
8	a. W*axing process*	5	3	1.7
9	b. G*el coating process*	16	3	5.3
10	c. Lamination	19	4	4.8
11	d. Release from print	16	4	4
	Superstructure			
12	a. *Waxing process*	5	3	1.7
13	b. G*el coating process*	16	3	5.3
14	c. Lamination	19	4	4.75
15	d. Release from print	16	4	4
	Component			
16	-Making of gold poles	8	1	8
17	- Making place blower	8	1	8
18	- Door making	16	4	4
19	- Window making	8	4	2
20	- Tank making	16	4	4
21	*Assembly*	168	6	28
	Installation *Mechanical*			

22	a.. Inserting the machine	8	2	4
23	b. Installation *mounting engine*	22	3	7.3
24	c. Installation of cooling pipes	32	3	10.7
25	d. Installation of *exhaust*	28	3	9.3
26	e. Installation of g*ear box*	22	3	7.3
	Installation of *Electrical*			
27	a. Installation of *switch engine*	28	1	28
28	b. Installation of lighting	28	1	28
	Installation of *steering system*			
32	a. Making the steering wheel	24	1	24
33	b. Manufacture of steering shoes	16	1	16
34	c. Making steering bosses	16	1	16
35	d) Install steering gear	8	1	8
36	e. Installation of the steering wheel	8	1	8
37	f. Steering bost installation	8	1	8
38	g. Installation of hydraulic cradle	8	1	8
39	h. Installation of *helm pump*	8	1	8
40	i. Installation of machinery	8	1	8
41	j. Installation of hydraulic hoses	8	1	8
	Finishing			
42	a. Glass installation	8	2	4
43	b. Door installation	8	2	4
44	c. Finish installation	32	2	16
45	d. Caulking + painting	176	2	88

Table 3. Value *early start* and *latest finish* all activities.

Tack	Activity	Time Raw (Hours)	IS	LF	LF-EN
	Design	-	0	0	0
	Mold preparation	18.7	18,7	18,7	0
	Hull				
	a. W*axing process*	1.7	20,4	20,4	0
	b. G*el coating process*	5.3	25,7	25,7	0
	c. Lamination	4.8	30,5	30,5	0
	d. Release from print	4.0	35,5	34,5	0
	Hull Construction				
	a. Reinforcement manufacture	6.7	41,2	41,2	0
	b. Skate making	4.0	45,2	45,2	0
	Deck				
	a. *Wax*ing process	1.7	20,4	31,1	10,7
	b. *Gel coat*ing process	5.3	25,7	36,4	10,7
	c. Laminate	4.8	30,5	41,2	10,7
	d. Release from the mold	4.0	34,5	45,2	10,7
	Super structure				
	a. *Waxing Process*	1.7	20,37	31,12	10,75

b. *Gel coating Process*	5.3	25,7	36,45	10,75
c. Laminate	4.75	30,45	41,2	10,75
d. Release from the mold	4	34,45	45,2	10,75
Component				
-Pole manufacture	8	26,7	27,2	0,5
- Manufacture of blowers	8	34,7	35,2	0,5
- Door manufacture	4	38,7	39,2	0,5
- Window making	2.0	40,7	41,2	0,5
-Tank Manufacture	4.0	44,7	45,2	0,5
Assembly	28.0	73,2	73,2	0
Mechanical Installation				
a. Enter the machine	4	73,2	150,6	77,4
b. *Engine mounting installation*	7.3	84,5	157,9	73,4
c. Cooling pipe installation	10.7	95,2	168,6	73,4
d. *Exhaust Installation*	9.3	104,5	177,9	73,4
e. *Gear box Installation*	7.3	111,8	185,2	73,4
Electrical installation				
a. S*witch engine Installation*	28	101,2	157,2	56
b. Lighting installation	28	129,2	185,2	56
Propulsion installation				
a. S*tern tube Installation*	8	81,2	165,2	84
b. *Propeller Installation*	8	89,2	173,2	84
c. Alignment as propeller	12	101,2	185,2	84
Steering system installation				
a. Manufacturing of rudders	24	97,2	97,2	0
b. Manufacturing steering shoes	16	113,2	113,2	0
Rudder				
c. Steering wheel manufacture	16	129,2	129,2	0
d. Steering shoe installation	8	137,2	137,2	0
e. Steering wheel installation	8	145,2	145,2	0
f. Steering bracket installation	8	153,2	153,2	0
g. Hydraulic jack installation	8	161,2	161,2	0

h. *Pump helmet installation*	8	169,2	169,2	0
i. *Installation of Jantra*	8	177,2	177,2	0
j. Hydraulic hose *installation*	8	185,2	185,2	0
Finishing				
a. Glass installation	4	77,2	156	78,8
b. Door installation	4	81,2	160	78,8
c. Final installation	16	97,2	176	78,8
d. Caulking + Painting	88	273,2	273,2	0

Table 4. Critical Path

No	Activity	Activity No	***Man Hours Standard***	**Number of Normal HR (People)**	**Standard Time (Hours)**
1	Mold preparation	1	56	3	18.7
	Hull				
2	a. *Waxing Process*	2	5	3	1.7
3	b. G*el coating process*	3	16	3	5.3
4	c. Lamination	4	19	4	4.8
5	d. Release from print	5	16	4	4
	Construction *Hull*				
6	a. Making reinforcement	6	40	6	6.7
7	b. Skate making	7	16	4	4
8	*Assembly*	21	168	3	28
	Installation *steering system*				
9	a. Making the steering wheel	32	24	1	24
10	b. Manufacture of steering shoes	33	16	1	16
11	c. Making a steering wheel boss	34	16	1	16
12	d) Install steering gear	35	8	1	8
13	e. Installation of the steering wheel	36	8	1	8
14	f. Steering boost installation	37	8	1	8
15	g. Installation of hydraulic cradle	38	8	1	8
16	h. Installation *helm pump*	39	8	1	8
17	i. Installation of machinery	40	8	1	8
18	j. Installation of hydraulic hoses	41	8	1	8
	Finishing				
19	Caulking + painting	45	176	2	88

3.4. Determination of The Initial Value Stream in the Making of The Sumbawa 2.5 GT Finishing Boat

The initial conditions for the process of making the Sumbawa 3.5 GT Fishing Boat are described in *value* *stream* the beginning of the construction of fishing boats. *Value stream* the beginning starts from the preparation of the mold planned by the PPC section, followed by manufacture *hull* by the production department, process *Assembly*, *Steering System*, and the last process *Finishing*. Based on filming *big picture mapping*, obtained information that the first process is mold preparation. This process takes 56 hours. After the mold preparation is complete, proceed with the manufacture*r hull*. Making *hull* covers *waxing*, *gel coating*, lamination, and proceed with removal *hull* from mold. Next is construction *hull*, starting with making reinforcement followed by making skates in the hull making process which takes 112 hours. After the hull manufacturing process is complete, proceed with *Assembly*.

Process *assembly* starting with assembly *hull*, *deck*, construction, *superstructure* and components. This process takes 168 hours. After process *assembly* complete, proceed with the installation *steering system*. This process includes the manufacture of rudders, the manufacture of rudders, the manufacture of rudders, the installation of rudders, the installation of rudders, the installation of rudders, the installation of hydraulic rudders, the installation of *helm pump*, installation of jantra, and installation of hydraulic hoses.

On installation *steering system* takes 112 hours. After this process is complete, proceed with the last process, namely process *finishing* which includes caulking and painting. On process *finishing* takes 224 hours. Based on the detailed time for each stage of the process, *lead time* The process of making the Sumbawa 3.5 GT fishing boat can be determined by adding up the time needed for all these processes. The process of making one unit of the Sumbawa 3.5 GT fishing boat on *value stream* initial is 678 hours or 84 days.

3.5. Determination of The Initial Value Stream in the Making of The Sumbawa 2.5 GT Finishing Boat

From several activities that are on the critical path, it is obtained that the installation *steering system* is an activity that has the largest total percentage of waiting, namely 39.47%. After identification *waste* waiting through interviews and filling out questionnaires to the five expert employees involved in critical path activities to find out the causes *waste* wait through *Cause Effect Diagram*.

In identification analysis *waste* waiting on the critical path is known that *waste* waiting for the previous work station occurs due to previous activities that have not been completed, uneven workload, equipment damage in previous activities. *Waste* waiting because there are no production process procedures because the PPC division has not yet created a production procedure system, and workers are confused in carrying out their duties. *Wa*ste wait because the number of experts is limited because there are no additional experts, not all workers master the work techniques, experts are doing other work. *Waste* waiting due to the limited number of machines caused by the machine being used for other project processes, the lack of budget for procuring new machines, and the imbalance between production capacity and existing projects.

Following are the steps for detecting and weighing waste during the construction of fishing vessels:

1. State the grade or weight of each selected waste.

All skilled workers involved in the construction of fishing vessels, in this case workers in the Fabrication and Finishing section, fill in a score or weight for each disposal. In table 3.4 below, there are guidelines for entering scores or weights.

Tabel 3.4 score in waste weighting

Score	Information
0	No waste
1	very little waste
2	Little Waste
3	lots of waste
4	very much waste

Source : [12]

2. The rating or overall mass of each litter.

Then, each work station adds up the score or weight of each waste provided by skilled employees at each station. The following is the calculation of the combined weight of each waste during finishing activities:

- Wait = 3 + 2 +2 +3 = 10

3. Calculates the combined weight and average weight of all waste.

The weight of each waste at each work station is added up to get the overall weight. Total weight and average value of waste classified as “waiting” :

Total weight = 5 + 3 + 5 + 3 +……..3 + 2 + 10
= 76

4. Calculate the proportion of the total weight of each waste in each work station.

By dividing the weight of the waste at the work stations by the total weight at all work stations, the total weight of the waste can be obtained as a percentage.

$$\text{Percentage } waste\ for \text{ waiting} = \frac{5}{76} x\ 100\%$$

$$= 6.58\%$$

Table 5 presents a summary of the proportion of the total weight of each waste at each work station.

Table 5. Recapitulation of the percentage of waiting waste

Activity	*Waste* Wait	Percentage *Waste* Wait
Mold preparation	5	6.58%
Hull		
a. *Waxing Process*	3	3.95%
b. *Gel coating Process*	5	6.58%
c. Lamination	3	3.95%
d. Release from print	5	6.58%
Construction *Hull*		
a. Making reinforcement	3	3.95%
b. Skate making	3	3.95%
Assembly	9	11.84%
Installation *steering system*		
a. Making the steering wheel	3	3.95%
b. Manufacture of steering shoes	4	5.26%
c. Making a steering wheel boss	3	3.95%
d) Install steering gear	2	2.63%
e. Installation of the steering wheel	4	5.26%
f. Steering bost installation	4	5.26%
g. Installation of hydraulic cradle	3	3.95%
h. Installation *helm pump*	2	2.63%
i. Installation of machinery	3	3.95%
j. Installation of hydraulic hoses	2	2.63%
Finishing		
Caulking + painting	10	13.16%
Total Weight	76	100.00%

3.6. Recommendations for Improvements to Waste Waiting

Cause of occurrence *waste* waiting to use *Cause Effect Diagram* shown in figure 2.

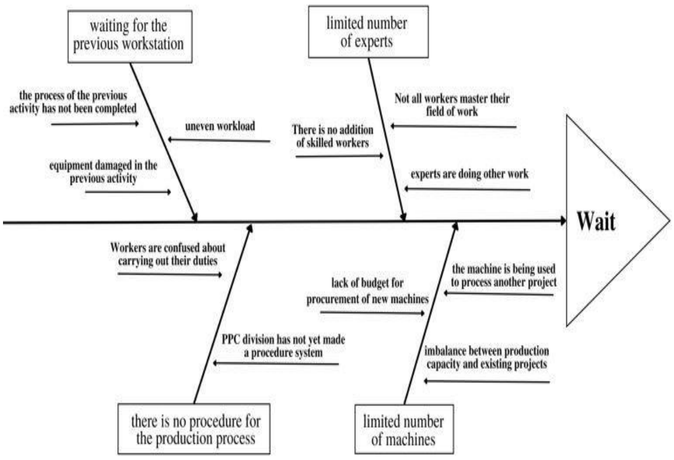

Figure 2. *Cause effect diagram waste* wait

Based on identification analysis *waste* wait through *Cause Effect Diagram* in table 3.1 there are several improvements that must be made so that the project can run optimally.

1. *Waste* waiting for the previous workstation
   a. The process of the previous activity has not been completed. while waiting for the previous work to be completed, they can do work that can be done in parallel so that the workforce can still work.
   b. Unequal workload. There must be an even distribution of workload in each activity so that the next activity is not hampered. And can do the addition of human resources in accordance with production needs.
   c. There was damage to the equipment in the previous activity. *Maintenance* production equipment is carried out periodically to anticipate further equipment damage.

2. *Waste* waiting because there is no procedure for the production process
   a. The PPC division has not yet made a system of production procedures. the PPC section must make Production Operational Standards (SOP) and planning *master* schedule per project
   b. Workers are confused in carrying out their duties. The production department must create an organizational structure per project so that if workers are confused in carrying out their duties, they can ask the person in charge of each project.

*3. Was*te wait because the number of experts is limited

a. Not all workers master the work technique. Should be done *management Training* to expert staff according to their respective fields.

b. There are no additional experts. Adding competent experts according to their fields.

c. The workforce is doing other work. *Job description* experts must be clear, so that experts have responsibility for the project being worked on.

4. Waste waiting because the number of machines is limited

a. The machine is being used to process another project. made *schedule* machine usage per project.

b. Lack of budget for the procurement of new machines. Empowerment of production machines so they can be used again.

c. Unbalance between production capacity and existing projects. Production machine facilities must be added as needed.

3.7. Preparation of the Proposed Value Stream

Creating a suggested value stream based on the overall time spent on each component—18.7 hours for molding, 26.5 hours for hull, 28 hours for assembly, 112 hours for steering system, and 88 hours for finishing—was completed. Based on the detailed time for each stage of the process, *lead time* The process of making the Sumbawa 3.5 GT fishing boat can be determined by adding up the time needed for all these processes.

The process of making one unit of fishing boat 3.5 GT on *value stream* proposal is 273.2 hours or 34 days. *Lead time* it's smaller in comparison *lead time* before that was 678 hours or 84 days. Difference 404.8 hours or 51 days from *value stream* proposal. To be clear *value stream* The proposal can be seen in Figure 3.

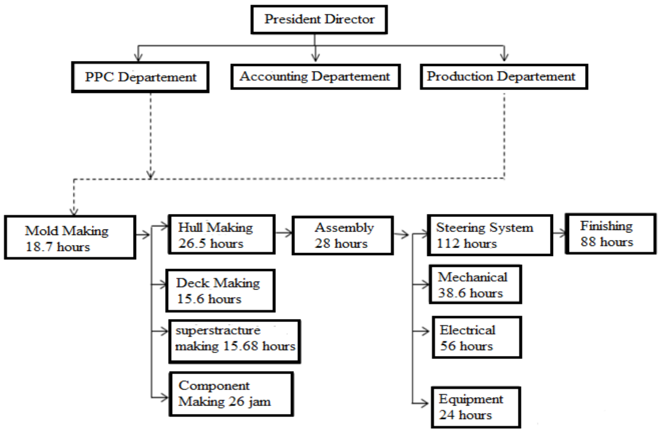

Figure 3. *Proposed value streams*

4. Conclusion

The conclusions in this study are: Based on identification analysis *waste* wait through *Cause Effect Diagram* there are several improvements that must be made so that the project can run optimally.

a. *Waste* waiting for the previous workstation

b. *Waste* waiting because there is no procedure for the production process

c. *Was*te wait because the number of experts is limited

d. *Waste* waiting because the number of machines is limited

The recommended value stream creation is based on the total time spent on each component, which is calculated from 18.7 hours to prepare the mold, 26.5 hours to build the hull, 28 hours to assemble, 112 hours to manufacture the rudder system, and 88 hours to complete. The lead time for the construction of the Sumbawa 3.5 GT fishing boat can be calculated by adding up the time required for each of these procedures based on the time specifications for each stage of the process. The process of making one unit of the Sumbawa 3.5 GT fishing boat on *value stream* the beginning is 273.2 hours or 34 days. Compared to the previous lead time of 678 hours or 84 days, the anticipated lead time is shorter. The difference from the anticipated value stream is 404.8 hours, or 51 days. Figure 4 for the original value stream and Figure 4.5 for the suggested value stream provide further information.

5. Acknowledgement

Thank you to PT.X for facilitating the process of completing this study.

References

Sitasi dan referensi yang digunakan dalam artikel ini adalah style IEEE. Penulis diharapkan untuk menggunakan *reference tools* (Mendeley, Zotero, dll.).

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