LEAN PROJECT MANAGEMENT TO MINIMIZE WASTE, CASE STUDY : INDARUNG VI PROJECT, PT SEMEN PADANG

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ABSTRACT

Nowadays, the infrastructure development is one of the important things in developing country strategy. Country development could be increased as long as the industry growth in each area in Indonesia; including province and city. The status of West Sumatera is still as the development province in industrial sector. Although the majority income in this area is mostly from agricultural sector, but it has an industry that has a good economic growth, named PT Semen Padang. PT Semen Padang wants to increase their capacity and income by develop Indarung VI. But the project activity performance of Indarung VI project was bad in July 2015, the variance of performance raise 20,94%. Project was needed to be evaluated, to minimize waste on the project activity. Project activity needs the concept of lean, named Lean Project Management (LPM). Two principles of LPM are project system and risk project management. The appliance of these concepts will minimize waste in the next project activity.

Keywords: lean, lean project management, project system, project performance, risk project management

1. INTRODUCTION

1.1. Sub Title for Introduction

Development is an important thing to make sure country is able to compete with the others countries. Infrastructure developing is a good choice based on government to develop their country. An economic capital income will be increased by country development, which means country development makes a better living for Indonesian. In the other side, industry facility in Indonesia is limited and not enough to compete with the competitor industry (from other country). It becomes the main issue and problem of Indonesia's industry. To respond those problems, some industries want to expand their business to get the higher profit per month. New construction development in industry is the one of the alternatives to expand their production capacity and expand their market.

PT Semen Padang is the one of cement industry in Padang, West Sumatera. PT Semen Padang has five current plants area named Indarung I, II, III, IV, and V and they want increase their capacity and income by develop Indarung VI, which has higher capacity of clinker and cement. The purposes of Indarung VI development are to distribute cement for Semen Indonesia Group for 2016 on right time, cost, quality, and work scope to increase the company performance (Technical Report of PT Semen Padang).

In general, Indarung VI construction activity is divided into three sub activities; mechanical construction, electrical and instrumental construction, and civil construction. Civil Construction 1 (CC-1) was the first construction project that will be held by PT Semen Padang in Project Indarung VI.

According to project activity performance in July 2015, the progress reached only 65.64%, but estimated plan was 86.58%. Means, the project progress was worse than the target in 20.94%. The 20,94% as the variance means the number of bad performance for non-value added activity (waste) in project activity.

Lean Project Management (LPM) is the method which identifies waste and risk to

find the solution in each problem before it happened. LPM has some principles, named project system, leading people, chartering, right solution, managing variation, managing risk, project plan, and execution. LPM will give continuous improvement in the project and next project that will be held by stakeholder.

2. THEORETICAL BACKGROUND

2.1 Construction

According to Trianto 2011 (in Sarah, 2012) construction is a set of project activity, included civil construction, mechanical construction, and electrical construction. Construction project is a set of activity that is started from planning, implementing, and controlling the activities of architect, civil, mechanical, electrical, and environment layout to build a building.

Construction project has three parties who have responsibility in project directly and indirectly; owner / user, designer and supervision, and contractor. The party who plans the project activity is owner. Each party has task, responsibility, and obligation. The good coordination between each party is the success key of project. (Wahyono, 2011).

2.2 Lean Project Management Principles

2.2.1 Percent Plan Complete

Percent Plan Complete (PPC) is the number of planned activities completed divided by the total number of planned activities, expressed as a percentage. PPC becomes the standard against which control is exercised at the crew level, being derivative from an extremely complex set of directives: project schedules, execution strategies, budget unit rates, etc. Assuming quality plans, higher PPC corresponds to doing more of the right work with given resources, i.e., to higher productivity and progress. (Ballard, 1994)

2.2.2 Lean Project Management Principles

Lean project management is the method to identify the waste (non-value-adding activity) and potensial risk in the process then it will help to estimate time, cost and sources along the project. LPM has seven principles, are (Mandagi and Dundu, 2014) :

1. Project system
   Project system is the method which concerns on identify the waste and find the right solution.
2. Leading people
   Leading people is the method which concerns on identify the stakeholder and control the roles, this method is suitable with project that has many stakeholders.
3. Chartering
   Chartering is the method to define vision and objective of project and give otority to the project leader.
4. Right solution
   Right solution is used to superintend the potential waste in the project process
5. Managing variation
   Managing variation is used to estimate the cost, schedule, and sources before the project processed.
6. Project risk management
   Risk management is used to identify risk events that will be happened which is caused by waste happened.
7. Project plan
   Project plan is the integration of lean project management principles
8. Execution
   This step is including project control, integrate cost and schedulle, and monitoring the time.

3. RESEARCH METHOD

Research methodology is a set of writing report steps, started from survey, literature study, problem identification, problem formulation, data collecting, data processing, result, analysis, mitigation, and conclusion.

Survey has been conducted in Project Indarung VI, PT Semen Padang. The problem formulation in research is how to apply earned value analysis to evaluate the

project activity progress and lean project management concept in order to minimize the waste in Indarung VI Project, PT Semen Padang.

Result and discussion includes the data processing and analysis. Data processing is a set of step which is necessary to be followed in the final project. The data processing and analysis is divided into three parts; percent plan complete, project system and risk project management.

The research methodology is figured in Figure 1.

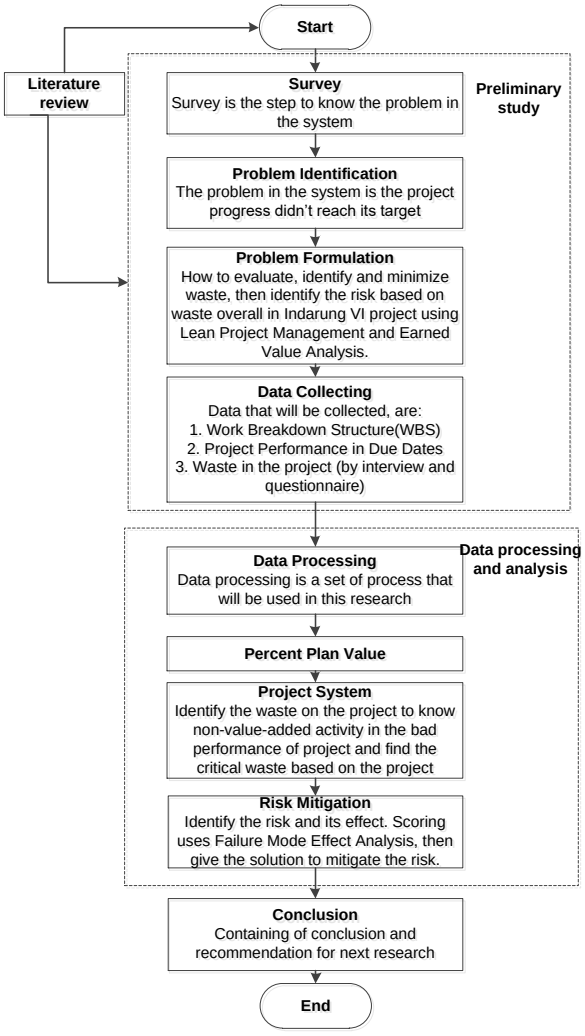

Figure 1. Research Methodology

4. RESULT AND DISCUSSION

4.1 Percent Plan Complete

Percent plan complete is the first waste identification has been conducted in project activity progress. The progress of project activity is shown in Table 1.

Table 1. Project Progress

Line	Work Break Down	Wieght	Schedule		ACTUAL	
			Current Month	Cum. Month	Current Month	Cum. Month
		(%)	(%)	(%)	(%)	(%)
1	Mobilization and Preparation	0,95%	0,061%	0,950%	0,000%	0,950%
2	STRUCTURING CYCLONE	28,46%	0,000%	28,460%	-0,132%	30,230%
3	KILN FEED	12,37%	0,000%	12,370%	0,290%	5,500%
4	Raw mill base	2,88%	0,000%	2,880%	0,000%	2,880%
5	CF SILO	36,90%	0,000%	36,902%	0,000%	32,821%
6	Kiln Base	4,65%	0,000%	4,647%	0,000%	4,377%
7	Drill Pole	13,77%	0,000%	13,772%	0,000%	13,565%
	TOTAL	100,00%	0,1%	100,00%	0,16%	90,32%

In 24th December 2015 was the deadline of project activity but it just reached the progress for 90,320%. Means the target was not reached by contractor. The PPC (percent plan complete) for this project:

$$PPC = \frac{\text{Project Progress}}{\text{Project Schedule}} = \frac{90{,}320\%}{100\%} = 0{,}903$$

The number of PPC is less than 1, it means the project activity progress had bad performance.

Based on the problem, it needs the implementation of project system and risk project management to minimize risk and waste in the next project activity.

4.2 Project System

Project system is the method which concerns on identify the waste and find the right solution. It means that project system focused on waste identification on Civil Construction-1 Project. Waste ranking was used to get the highest three rank, then identified the waste based on the rank. There were three respondents who responsible to rank the waste. They are Head Project Area of PT Waskita Karya and two civil engineers of PT Waskita Karya.

According to the interview, it was found that the top three wastes on Civil Construction-1 Project. The wastes were waiting, rework,

and movement. Then the waste had been identified according to the references, interview with head project area of Civil Construction 1 project, and expert opinion.
Waiting has 21 failure modes, rework has 6 failure modes, and movement has 14 failure modes. In order to check the relevant failure modes with the project activity, it needs the expert justification to determine the relevant or un-relevant failure modes. The selected experts are; owner (PT Semen Padang), supervision and consultant (PT Partono Pondas), and contractor (PT Waskita Karya).

The fishbone diagram of each waste is figured in Figure 2, 3 and 4.

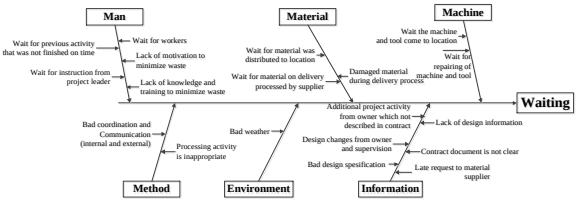

Figure 2. Fishbone Diagram of Waiting

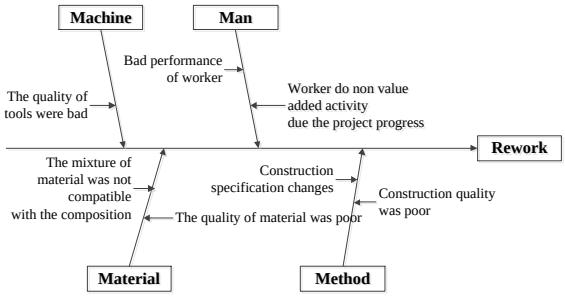

Figure 3. Fishbone Diagram of Rework

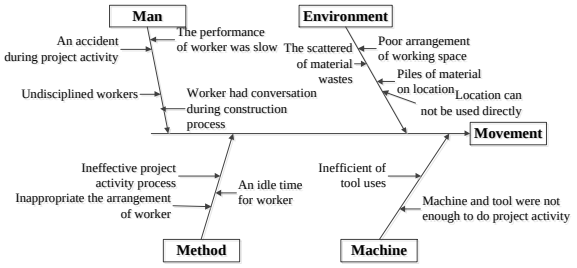

Figure 4. Fishbone Diagram of Movement

4.3 Risk Project Management

Risk project management is risk identification method of current wastes and potential wastes. Risk project management on this case use FMEA as the method to identify risk events and give the recommendation to each failure. According to Beauregard et al. (2009), the 10 steps of FMEA are:

1. Step 1: Review the process or product
2. Step 2: Brainstorm potential failure modes
3. Step 3: List potential effects of each failure mode
4. Step 4: Assign a severity ranking for each effect
5. Step 5: Assign an occurrence ranking for each failure mode or effect
6. Step 6: Assign a detection ranking for each failure mode or effect
7. Step 7: Calculate the risk priority number for each effect
8. Step 8: Prioritize the failure modes for action
9. Step 9: Take action to eliminate or reduce the high-risk failure modes
10. Step 10: Calculate the resulting RPN as the failure modes are reduced or eliminated.

The first and second processed has been done in project system. The third step finds the effect of the failure towards the failure mode. According to the interview with the experts in CC-1 project, there are three most effect of the failure towards the failure mode. It can cause the effect for project duration, project cost, and effect for worker (man power)/hazard effect.

Table 2. Severity Scale

Scale	Explanation	Financial Effect	Time/lateness on project activity	Man power effect
5	Extreme	Increase more than 5% of budget	More than 5% of schedule	May endanger machine or operator, cause the death or serious physical or psychological
4	High	Increase more than 2,5% and less than 5% of budget	More than 2,5% and less than 5% of schedule	Injuri or permanent loss of bodily function
3	Moderate	Increase more than 1% and less than 2,5% of budget	More than 1% and less than 2,5% of schedule	An event, occurance, or situation involving the clinical care of a patient in medical facility
2	Low	Increase more than 0,5% and less than 1 % of budget	More than 0,5% and less than 1% of schedule	Failure can be overcome may cause minor injurity
1	None	Increase less than 0,5% of budget	Less than 0,5% of schedule	No injurity

Severity, occurrence, and detection scale is the representative of the previous research and the expert opinion. The expert opinion has been identified from the Production

Control and Risk Management staff from PT Semen Padang.

Table 3. Occurrence Scale

Scale	Explanation	Probability of Failure
5	Very High	Failure is almost inevitable
4	High	Repeated failures
3	Moderate	Occasional failures
2	Low	Relatively few failures
1	Remote	Failure is unlikely

Table 4. Detection Scale

Scale	Explanation	Likelihood of detection
5	Almost imposible	The probability of detect the risk is very low (based on controlling)
4	Remote	The probability of detect the risk is low (based on controlling)
3	Moderate	The probability of detect the risk is enough yet (based on controlling)
2	Very high	The probability of detect the risk is high (based on controlling)
1	Almost certain	The controlling can detect or prevent the risk

Risk priority number is calculated from the number of occurrence, severity, and detection. The calculation of RPN is done for three experts with different perspective. The outcome of RPN is used to find the highest risk priority and find their respond.

According to FMEA step is to prioritize the highest score of RPN calculation in failure mode. According to interview with PCRM (Planning Control and Risk Management) Staff at PT Semen Padang, the highest RPN; it is when the score is greater than equal to 27. It is caused by the mid score for RPN is 27, when the severity, occurrence, and detection are equal to 3. If the RPN is greater than 27 but its occurrence or severity or detection less than 3, it is still counted to high RPN, it means it has another potential risk in one or two indicators of RPN calculation.

The priority failure mode according to RPN score is shown in Table below:

Table 5. The Priority Failure Mode According to RPN's score

Risk Code	Indicators	Failure Mode	Expert		
			1	2	3
R02	Material	Wait for material on delivery processed by supplier			√
R03		Damaged material during delivery process			√
R04	Man	Wait for the workers		√	√
R30		The performance of worker is slow			√
R10	Machine	Wait for the repairing of machine and tool		√	
R27		The quality of tools were poor	√	√	
R12	Information	Additional project activity from owner which is not described in contract agreement		√	√
R13		Design changes from owner and supervision	√	√	√
R20	Environment	Bad weather	√	√	√
R37		Poor arrangement of working space		√	√
R40		Location can not be used directly		√	

Then the risk responds is depended on the interview with PCRM Staff, Indarung VI Project, PT Semen Padang. PCRM focus on risk management and planning control at this project. Risk respond is used to respond the risk when it happened. The risk respond for failure mode will be shown on table below.

Table 6. Risk Respond

Risk code	Indicator	Failure Mode	Failure Effect	Risk Respond
R02	Material	Wait for material on delivery processed by supplier	1. Break the sequence each activity project 2. Add operational processing time 3. Too much wasting material 4. Delayed to start project activity	1. Push the supplier to fast track the material delivery process 2. Make a group of material base on type and weight on delivery process
R03		Damaged material during delivery process		
R04	Man	Wait for the workers	1. Add operational processing time 2. Break the sequence each activity project 3. Accumulation of activity on the same time 4. Delayed to start project activity 5. Too much wasting time	1. Give the warning letter to sub-contractor 2. Give the take out threat to the correlate activity 3. Command the contractor to add some workers
R10	Machine	Wait for the repairing of machine and tool	1. Add operational processing 2. Break the sequence each activity project 3. Delayed to start project activity 4. Too much wasting time	1. Push the supplier to fast track the material and tool repairing 2. Help the contractor to supply un enough tool and machine (in the tolerance
R12	Informati-on	Additional project activity from owner which is not described in contract agreement	1. Break the sequence each activity project 2. Add operational processing time 3. Add project operational cost 4. Accumulation of activity on the same time	1. Command the contractor to add some workers 2. Make the clear sequence project activity 3. Inspection to location 4. Make the clear design spesification

Table 6. Risk Respond (Con' t)

Risk code	Indicator	Failure Mode	Failure Effect	Risk Respond
R13	Informati-on	Design changes from owner and supervision	1. Break the sequence each activity project 2. Too much wasting materia 3. Add operational processing 4. Add project operational cost 5. Delayed to start project activity	5. Renew the contract agreement (redendum) 6. Inspection to location 7. Give the fund faster
R20	Environ-ment	Bad weather	1. Break the sequence each activity project 2. Add operational processing time 3. Delayed to start project activity 4. Too much wasting time	1. Command the contractor to add some workers
R27	Machine	The quality of tools were poor	1. Break the sequence each activity project 2. Too much wasting material 3. Add operational processing time 4. Delayed to start project activity 5. Too much wasting time	1. Push the supplier to fast track the material and tool repairing 2. Help the contractor to supply un enough tool and machine
R37	Environ-ment	Poor arrangement of working space	1. Add operational processing time 2. Break the sequence each activity project	1. Command an inspector to control each construction location 2. Command the contractor to add some workers
R40		Location can not be used directly	3. Accumulation of material which gives bad effect for other project activity 4. Delayed to start project activity	3. Make a group of material based on the type 4. Place the material near to the location

5. CONCLUSION

The waste that has been identified is 40 wastes which based on waiting, rework, and movement. Risk respond is used to minimize risk that will be happened on project.

The suggestion is the recommendation of FMEA can be implemented on the Civil Construction 1 Project to minimize the risk priority number on the next project activity in civil construction project.

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