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Analysis of Work Implementation Monitoring and Evaluation of Delay (Case Study of Project at Regional Public Hospital X)

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Abstract— *In the implementation of a project, it is rare to find a project that runs exactly as planned. In general, it undergoes planned delays, both time and work progress, but some projects undergo acceleration from the initial planned schedule. Project delays are problems that arise from the implementation of construction that is not as planned. State losses due to additional costs and time are one of the impacts of project delays, which can be caused by a lack of understanding of human resources/experts in planning/evaluating existing plans for construction projects. Alternative method that can analyze project delay is the descriptive analysis approach. The aim of this study was to identify the factors that caused delays in one of the projects at the Regional Public Hospital in Indonesia. Analysis of this study used Root Cause Analysis. The findings indicated that the lack of understanding of human resources/experts in terms of planning/evaluating existing plans, lack of work experience, lack of training programs related to the field of work handled and low scheduling planning so then it led to the absence of lightning rod work, rainwater installation in the main building, downlights in the dressing room, grounding, central ac air ducts/airways, feeder cables were less than required and the water source that was originally planned to use PDAM water has turned into a deep well-drilled pump.*

Keywords— *Ishikawa Diagram, Project Delay, Root Cause Analysis, Tracking.*

I. INTRODUCTION

In the construction of a project, it requires good project planning, implementation and supervision in accordance with the work specifications contained in the Work Plan and Requirements (RKS) that have been determined. Making a work plan is one of the first steps of planning. Planning is created to achieve high effectiveness and efficiency of the resources that will be used during the implementation of the construction project. These resources must be well planned in order to obtain minimum implementation costs. A proper schedule with proper allocation of resources supports the success of a project. In the implementation of a project, it is very rare to find a project that runs exactly as planned. In general, it undergoes planned delays, both time and work progress, but there are also projects that experience acceleration from the initial planned schedule. Therefore, appropriate analytical methods are needed to monitor implementation and evaluate delays.

Tracking is a schedule tracking process that is comparing the planned schedule with the actual progress of the work that has been undertaken. According to Hatumale's research (2016), tracking can reduce the project time period so that it returns as planned and is able to reduce costs due to project delays.

II. LITERATURE REVIEW

Work Breakdown Structure (WBS) is a description of the work activities that must be undertaken in the completion of a project which is prepared as an initial step. The aim is to discover in detail the activities that are in the implementation of the project so that it can improve the accuracy of the estimated project completion period.

The arrangement of the activity sequence is the determination of the sequence of work activities to be carried out on the project in the field. This sequence of activities is needed to describe the relationship between the various activities that will be carried out in the field.

When a construction project is delayed, it implies that the implementation of the project work cannot be completed in accordance with the contract. If the project work cannot be carried out according to the contract, there will be additional time. If after the additional time the project implementation is not completed according to the agreed contract, then the owner will be given additional time to the implementing party to complete the project work.

The arrangement of a schedule plan on the construction project always refers to the estimates that existed during the development plan was undertaken. Problems can arise if there is a mismatch between the planned schedule and its implementation. The impact that often occurs is the delay in the implementation of project completion and is also accompanied by an increase in the cost of implementing the project (Widhiawati, 2009).

This project delay has an impact on project progress and delays in project implementation activities and project implementation activities. Delays in the implementation of this project include the causes of natural factors, resources, planning and so on.

According to Faris (2017), tracking is the process of tracking the schedule, which is comparing the planned schedule with the actual progress of the work that has been undertaken for each time period. Microsoft Project is one of the software used to monitor the implementation of work so

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that it is known that the time period of the work is not as planned.

III. METHOD

The first step of this study was data collection. The data collected were primary data and secondary data. Primary data was obtained through direct observation and interviews with contractors, related parties and construction management supervisory consultants on projects. Secondary data included of: Project Budget Plan, project S curve, weekly progress reports, project drawings and photos.

The second step was data processing, the order of details was as follows:

A. Validity and Reliability Test Primary Data

Validity and Reliability Test used SPSS software. The accuracy of testing a hypothesis regarding to this study variable was very dependent on the quality of the data used in the test. This research data will not be useful if the research instrument or measurement that will be used to collect the data does not have validity and reliability. Validity shows the extent to which a measuring instrument measures what it wants to measure. Meanwhile, reliability is an index that shows the extent to which a measuring instrument can be trusted or reliable (Haekal, 2016).

B. Tracking

Tracking / tracking was used by the Microsoft Project application in analyzing project work monitoring from the first week of delays to the last week of the project of Main Building.

C. Ishikawa Diagram

Cause-and-effect diagrams/ Ishikawa Diagrams illustrate lines and symbols that show the relationship between the effects and causes of a problem. This diagram is used to determine the consequences of a problem for further corrective action to be taken. The results of the problem brainstorming are grouped into several main cause themes which are symbolized by fish bones that are connected to the fish head. The smallest fishbone is the most specific cause that builds on the larger cause (larger bone).

D. Descriptive Analysis

Descriptive Analysis of Root Cause Analysis (RCA) was used to present a complete picture for exploration and clarification, which was formed by describing an event that occurred in the field. The RCA method was used to get a deeper root cause of project delays from the results of the Ishikawa Diagram analysis (Dian Rahmawati, 2016).

IV. RESULTS AND DISCUSSION

It discusses the results of data collection and processing that has been carried out, as well as analysis which is then used as material to create corrective steps from the research results. The aim of this study was to discover the causes of project delays so that it can provide alternative solutions for delays. The following (Table I) shows the results of the variables that have been valid and reliable.

TABLE I. Variables of Validity and Reliability Test

Category	Sub-Category/ Variable	Code	Source
Human Resources	It is too much overtime	X1	Fayek, 2003
	Insufficient Skill	X2	Fayek, 2003
	The lack of work experience	X3	Sambasivan and Soon, 2006
	Lack of training programs related to the field of work that being handled	X4	Sambasivan and Soon, 2006
Scope and Document of Work/Contract	Low work productivity	X5	Budiman Proboyo, 1999
	The change of design during the implementation	X6	Budiman Proboyo, 1999
	Changes to the completed work (rework)	X7	Budiman Proboyo, 1999
	Misunderstanding of the rules of work creation	X8	Fayek, 2003
	Changes in the scope of work at the time of implementation	X9	Fayek, 2003
	The lack of document control	X10	Fayek, 2003
Planning and Scheduling of Construction	The lack of understanding of the contents of the contract	X11	Fayek, 2003
	The lack of scheduling on planning	X12	Fayek, 2003
	Unrealistic schedule	X13	Budiman Proboyo, 1999
	Work plan changes	X14	Budiman Proboyo, 1999
	Slow understanding on the new method	X15	Fayek, 2003
Organization, Coordination and Communication	The lack of commitment to the commitment of QA/QC	X16	Fayek, 2003
	The lack of communication and work coordination	X17	Budiman Proboyo, 1999
	Poor technical and managerial qualifications and inappropriate in their fields of personnel in the contractor's work organization	X18	Budiman Proboyo, 1999
Equipment and Material	Low tool productivity	X19	Budiman Proboyo, 1999
	The lack of material	X20	Sambasivan and Soon, 2006
	Inefficient use of equipment	X21	Sambasivan and Soon, 2006
External	Unexpected weather condition	X22	Budiman Proboyo, 1999
	Natural disasters (floods, landslides, earthquakes, etc.)	X23	Budiman Proboyo, 1999
	The occurrence of damage / damage due to negligence or the actions of a third party	X24	Budiman Proboyo, 1999

After the variables are asserted to be valid and reliable, then the top 5 questionnaire results are taken that have the most influence on project delays. The results of the questionnaire are the percentage of respondents who answered the same question instrument compared to the total number of respondents. The following are the top 5 variables that have the most influence on project delays as shown in (Table II) below.

After getting the top 5 variables that cause to the project delays, then they are used in further descriptive analysis.

Next is analysis tracking using the help of the Ms. Projects. The data required is the duration of each project and the cost

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of the work taken from the initial project plan, while for percent completed it is taken from the amount of progress each week from each job taken from the project progress report. The analysis begins during the week period when there is a decline in the progress of work realization from the plan progress, which starts on the 49th week of August 19, 2019 until the end date of the project on December 20, 2019 in the Work Progress Report in (Fig. 1).

TABLE II. 5 The Most Influential Variables on Delay

No	Name of Variable	Description
X3	Lack of work experience	Influential
X4	Lack of training programs related to the work area that handled	Influential
X7	Changes to completed work (rework)	Influential
X12	The lack of scheduling on planning	Influential
X18	Poor technical and managerial qualifications and inappropriate in their fields of personnel in the contractor's work organization	Very Influential

Dealing with the analysis using the tracking method, from the first week found that there was a delay until the last week, it was found that the duration was longer than the initial plan, which was 62 weeks to 66 weeks and the cost in the 66th reporting week was greater than the tracking analysis, which was a difference of around Rp. 637,831,262.25 (Table III).

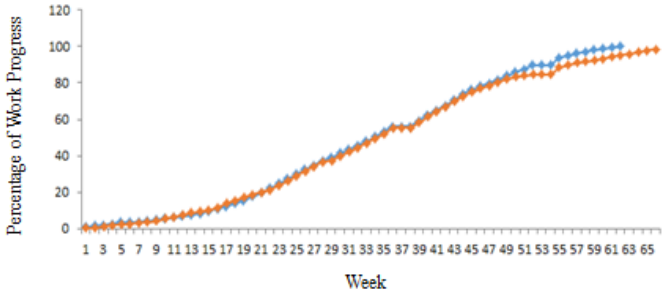

Fig. 1. Work Progress Report

TABLE III. Recapitulation of Analysis Result of Initial Contract Value, Final Contract Value and Tracking

No	Period (Week to)	Percentage of Plan Progress (%)	Real Progress Percentage (%)	Initial Contract Value (Rupiah)	Final Contract Value/ MC 100 (Rupiah)	Tracking (Rupiah)
1	49	83.97	83.38	83,575,369,294.22	88,707,730,874.52	91,832,880,988.16
2	50	85.81	84.63	85,406,721,914.22	90,038,666,006.73	92,683,674,583.04
3	51	87.69	85.46	87,273,905,346.35	90,923,828,300.90	93,732,344,954.88
4	52	89.71	86.21	89,291,379,129.36	91,722,814,939.02	94,914,981,396.48
5	53	89.71	86.21	89,291,379,129.36	93,076,091,907.99	94,914,981,396.48
6	54	89.71	86.21	89,291,379,129.36	94,429,368,876.96	94,914,981,396.48
7	55	93.89	90.03	93,449,743,937.16	95,782,645,845.92	96,180,025,425.92
8	56	95.08	91.27	94,635,146,638.48	97,100,814,214.28	97,201,044,848.64
9	57	96.20	92.37	95,745,901,814.52	98,267,909,210.31	98,237,541,253.12
10	58	97.31	93.18	96,856,656,990.56	99,136,049,152.67	99,394,414,182.40
11	59	98.03	93.78	97,567,301,431.15	99,770,131,757.62	100,346,678,476.80
12	60	98.75	94.89	98,282,922,373.42	100,952,121,311.49	101,503,551,406.08
13	61	99.29	95.71	98,819,389,255.04	101,822,389,047.82	102,417,846,763.52
14	62	100.00	96.57	99,530,033,695.63	102,737,340,457.66	103,130,165,411.84
15	63		97.36		103,577,819,078.32	104,047,071,723.52
16	64		98.29		104,567,243,277.33	104,819,998,064.64
17	65		99.31		105,652,418,205.28	105,255,628,963.84
18	66		100.00		106,389,698,818.09	105,751,867,555.84

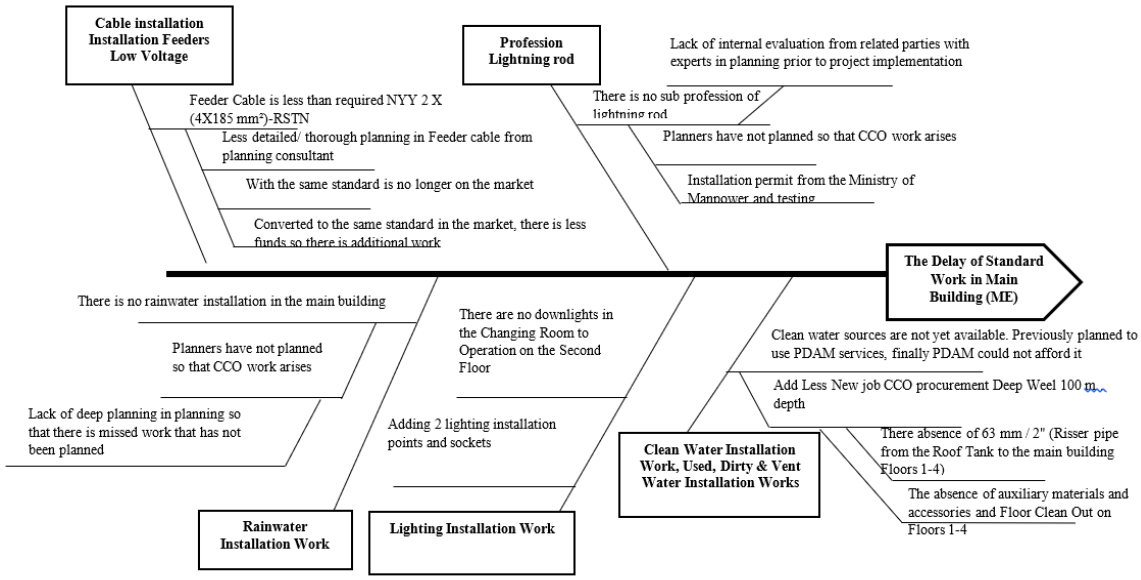

Fig. 2. Ishikawa Diagram on Standard Work of Main Building (Mechanical Electrical)

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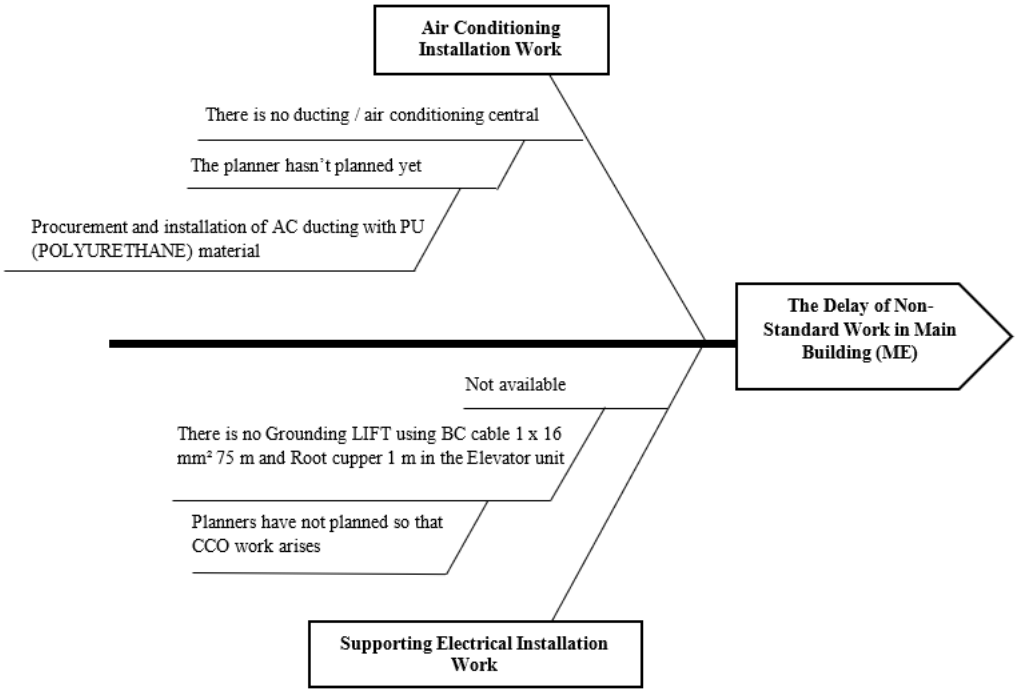

Fig. 3. Ishikawa Diagram of Non-Standard Work of Main Building (Mechanical Electrical)

From the Ishikawa diagrams (Fig. 2 and Fig. 3), careful attention was paid to determining the root cause or main cause of the emergence of project delays and found in several sub-sections of Mechanical Electrical work. The following are the names of jobs and indicators of causes that affect the delay in the project (Table IV).

TABLE IV. Name of work and indicator of causes that affect project delays

Name of Work	Indicators Of Causes
Variable low voltage installation feeder cable installation work	Feeder Cable is less than required NYY 2 X (4X185 mm²)
Lighting Installation Work	There are no downlights in the dressing room leading to the operating room on the second floor and the addition of 2 lighting installation points and sockets.
Used, dirty and vent water installation work	It was previously planned to use PDAM services, so then PDAM was unable to provide CCO work for the procurement of deep wells (Deep Weel) with a depth of 100 m and procurement work for 63 mm / 2" (Risser pipe from the Roof Tank to the main building Floors 1-4)
Lightning Rod Work	Lightning Rod Work is not available yet
Rainwater installation work	There is no rainwater installation in the main building
Supporting electrical installation work	There is no grounding LIFT using BC cable 1 x 16 mm² 75 m and Root cupper 1 m
Air conditioning installation work	There is no ducting / air conditioning central

The following is the relationship between the results of the validity and reliability tests, questionnaires, tracking and root cause analysis which causes delays in the Mechanical and Electrical sub-works (Table V).

V. CONCLUSION

Dealing with the results of the analysis, it could be concluded that the root cause of the delay in the project of Regional Public Hospital was due to a lack of understanding of human resources/experts in planning/evaluating existing plans. Lack of work experience, lack of training programs related to the field of work handled and lack of scheduling on planning, so then it caused this sub-field of work to experience delays in its implementation. As the result, it emerged several additional works including: no lightning rod work, feeder cable less than required NYY 2 X the water source which was originally planned to use PDAM water turned into a deep well-drilled pump, no rainwater installation in the main building, no downlights in the dressing room to the operating room on the second floor and the addition of 2 mounting points for lamps and sockets, no grounding and no central AC ducting/airway.

Alternative solutions that can be used to anticipate the occurrence of delays are to increase human resources or increase the competence of planners in project planning and first parties/experts related to the government in evaluating existing plans.

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TABLE V. Relationship between Validity and Reliability Test Results, Questionnaires, Tracking and Root Cause Analysis

No.	Name of Work	Cause of Delay	Main Problem	Category	Variable
1	Variable low voltage installation feeder cable installation work	Feeder Cable is less than required NYY 2 X (4X185 mm²)-RSTN	Due to lack of understanding of Human Resources in planning/evaluating existing plans.	Human Resources	X3. Lack of work experience X4. Lack of training programs related to the field of work being handled
				Plan and Schedule of Construction	X12. Low scheduling planning
				Organization, Coordination and Communication	X18. Poor technical managerial qualifications and inappropriate in their field of personnel in the contractor's work organization
2	Lighting Installation work	There are no downlights in the dressing room leading to the operating room on the second floor and the addition of 2 lighting installation points and sockets.	Due to lack of understanding of Human Resources in planning/evaluating existing plans.	Human Resources	X3. Lack of work experience X4. Lack of training programs related to the field of work being handled
				Plan and Schedule of Construction	X12. Lack of Planning and Scheduling
3	Used, dirty and vent water installation work	It was previously planned to use PDAM services, so then PDAM was unable to provide CCO work for the procurement of deep wells (Deep Weel) with a depth of 100 m and procurement work for 63 mm / 2" (Risser pipe from the Roof Tank to the main building Floors 1-4)	Due to lack of understanding of human resources in planning/evaluating existing plans.	Scope and Documents of Work/ Contract	X7. Changes to completed work (rework)
				Plan and Schedule of Construction	X12. Lack of Planning and Scheduling
4	Lightning rod work	Lightning Rod Profession is not available yet	Due to lack of understanding of human resources in planning/evaluating existing plans	Human Resources	X3. Lack of work experience X4. Lack of training programs related to the field of work being handled
				Plan and Schedule of Construction	X12. Lack of Planning and Scheduling
5	Rainwater installation work	There is no rainwater installation in the main building	Due to lack of understanding of human resources in planning/evaluating existing plans	Human Resources	X3. Lack of work experience X4. Lack of training programs related to the field of work being handled
				Plan and Schedule of Construction	X12. Lack of Planning and Scheduling
6	Supporting electrical installation work	There is no grounding LIFT using BC cable 1 x 16 mm² 75 m and Root cupper 1 m	Due to lack of understanding of human resources in planning/evaluating existing plans	Human Resources	X3. Lack of work experience X4. Lack of training programs related to the field of work being handled
				Plan and Schedule of Construction	X12. Lack of Planning and Scheduling
7	Air conditioning installation work	There is no ducting / air conditioning central	Due to lack of understanding of human resources in planning/evaluating existing plans.	Human Resources	X3. Lack of work experience X4. Lack of training programs related to the field of work being handled
				Plan and Schedule of Construction	X12. Lack of Planning and Scheduling

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