

Factors for Delay in LRT Bridge Structure Work

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ABSTRACT

In order to increase economic growth through infrastructure development in Indonesia, the Government accelerates projects that are considered strategic and have high urgency to be realized in a short period of time. The construction of the Jabodebek LRT project has taken almost four years since 2015. The government has targeted the project to be completed in April 2019, but the realization has been delayed, which is only around 50%. For this reason, the researcher wants to discuss the factors that delay the construction work of the LRT bridge structure. The following results from data processing using RII analysis: 1. Weak planning and project scheduling by contractors, 2. Project time optimization, 3. Ineffective planning and scheduling, 4. Determination of duration, 5. Contractors who lack experience, 6. Weak communication and coordination by service users during construction, 7. Different surface conditions of subsoil, 8. Solid traffic, crowds and other disturbances in the field, 9. Low quality of project control and 10. Lack of control. It is expected that from the results of the above data analysis it can contribute to the construction world, especially the construction of the LRT project.

Key Words: LRT, Delay Time, Bridge Structure, RII

1. INTRODUCTION

The construction of the Jabodebek LRT project has taken almost four years since 2015. The government has targeted the project to be completed in April 2019, but the realization has been delayed, which is only around 50%. So far, the development of the phase I Jabodebek LRT project until January 2019 has reached 56.1%. The construction of Phase I of the Jabodebek LRT stretched from Cawang-Cibubur (76.21%), Cawang-Kuningan-Dukuh Atas (44.19%) and Cawang-Bekasi (51.06%). LRT Jabodebek itself has a track length of 44.3 KM.

2. SCHEDULING

Scheduling planning is intended so that the implementation of the work becomes efficient and effective so that there are no problems due to delayed work because it is not well planned. Effectiveness and efficiency in project implementation is influenced by factors Planning and scheduling. According to Haming and Nurnajamuddin [1] scheduling is the allocation of resources from time to time to support the implementation and completion of a specific work activity. Determining the allocation of company resources (human resources, capacity and production equipment or machinery, and time resources) is shown to realize the target of effective and efficient use of resources, while producing the right amount of output, on time, and right quality [2, 3]

2. DELAY

Delays can be considered as a result of not meeting the schedule plan that has been made, because the reality is not in accordance with the conditions when the schedule was made. Proboyo (1998) explains that the project planning and scheduling process thus needs to understand all the factors behind the project schedule [4]. Project delays can be seen in two things as mentioned above, namely the aspects that are affected and the factors that influence or cause. The factors that are affected that cause the project to be late are: Delay related to material, Delay related to labor, Delay related to equipment, Inappropriate planning, Weak control of project time, Subcontractor Delay, Weak coordination, Inadequate supervision, Inappropriate implementation method, Lack of technical personnel & Weak communication.

3. TIME

In order for the project to run smoothly and effectively, it is necessary to set the time or scheduling of the activities involved in it. In connection with this, the executor of a project usually creates a time schedule [5]. Timetable for activities is work sequences that contain, among others: the type of work to be carried out and the time when a job starts and ends. In the implementation of the project a time analysis must be carried out, because time analysis is the first step before conducting a resource analysis and cost analysis. What is meant by time analysis is studying the behavior of the activities during the implementation of the project [6]. The purpose of time analysis in project management is to reduce the level of uncertainty in the implementation time during the project implementation, thus the exact timing can be determined priority scale at each stage. Another benefit of this time analysis is that an efficient way of working can be done, so that the implementation time of the project is also efficient. [7]

4. LIGHT RAIL TRANSIT (LRT)

Light Rail Transit (LRT) is an example of the progress of land transportation in the field of railways and LRT is one of the alternative feeder modes for the MRT. In order to meet the progress of land transportation in the railroad sector in Indonesia, the railroad manufacturing company is planning to build a LRT prototype as an MRT feeder mode and an initial example for the actual LRT manufacturing. The main construction of the LRT is like a train in general, which is located in the underframe construction. Light Rail Transit (LRT) is one of the mass transportation that uses electricity as its driving force, has a large capacity and has its own lane [8].

5. RESEARCH METHOD

The research method is basically a scientific way to get data with specific purposes and uses. To achieve the required goals, a relevant method is needed to achieve the desired goals [9]. According to research methods [10] is basically a scientific way to get valid data with objectives that are discovery, proof and development of a knowledge so that the results can be used to understand, solve and anticipate problems. The flow in this study is:

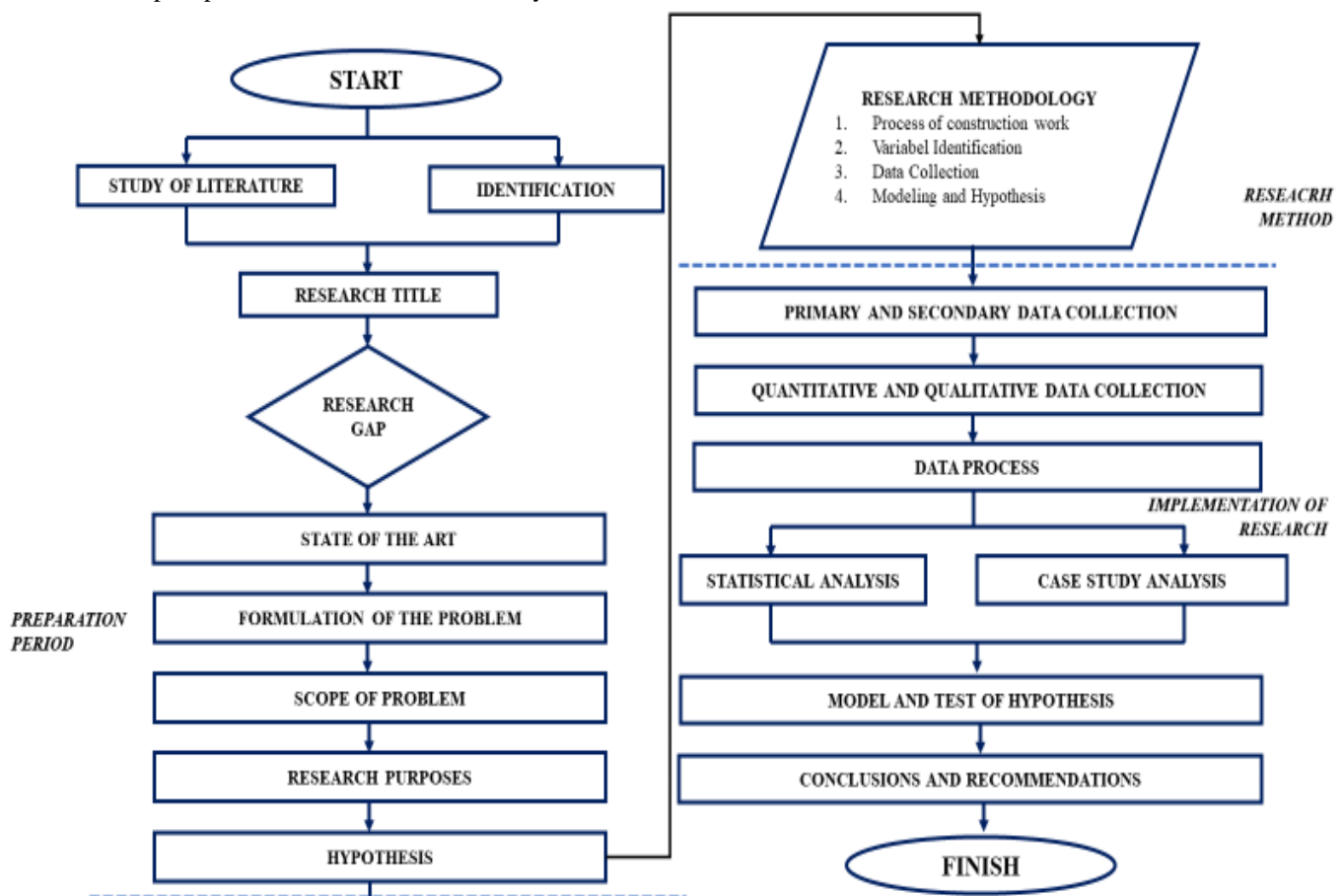


Figure 1. Research Flow

from the above research methods explain the research steps used. where in researching about scheduling delays requires primary data and secondary data in processing it.

6. IDENTIFICATION OF VARIABLES

This study has 3 independent variables and 2 dependent variable for processing and analyzing the results of factors for delay in LRT bridge structure work. variables can be in the form of theory or object of research. These variables are:

- Dependent Variabel : 1. Scheduling (X1)
2. Productivity (X2)
3. LRT Bottom Structure (X3)
- Independent Variabel : - Time (Y1)
- Quality (Y2)

Independent and dependent variables in the regression equation:

$$Y = a + b.X1 + c.X2 + d.X3 \tag{1}$$

Variable identification is obtained from the key success factors obtained from journals, books, e-books and other references respondents obtained from this study were 70 respondents. Determination of the number of respondents using the Slovin method. Where to use the target population, the target population is the number of respondents according to the project organizational structure. The following are influential factors:

Table 1. Factors for delay LRT bridge structure work

NO	MAIN FACTOR	SUBFACTOR	KEY SUCCESS FACTOR	
1	X1	SCHEDULING	Delays in Preparation Work and Shop Drawing Approval	Assaf et al. (1995)
2			Design Change or Design Error	Assaf et al. (1995)
3			Not Effective Planning and Scheduling	Assaf and Al-Hejji (2006)
4			Weak Project Planning and Scheduling by Contractors	Sweis, Hammad and Shboul (2007)
5			Delay in the Design Document Revision and Approval	Wei K.S. (2010)
6			Job Duration Analysis	Arditi et al (1986)
7			Labor Analysis	Mohammad A. Amar (2013)
8			Repeated Job Analysis	Arditi et al (1986)
9			Relationship between Activities	Sanjaya dan Syahrizal (2015)
10			Minimum Waiting Time	Talekar (2014)
11	X2	PRODUCTIVITY	Labor Reduction	Assaf and Al-Hejji (2006)
12			Contractors who lack experience	Tommy Y., Ivan W. and Karen C. (2006)
13			Ineffective Communication	Saleh, Abdelnaser and Abdul (2009)

14			Delay in sending materials such as steel, concrete etc.	Saleh, Abdelnaser and Abdul (2009)
15			Weak Communication and Poor Coordination by Service Users during Construction	Wei K.S. (2010)
16			Innovative ways of thinking	Verduyn (2002)
17			Unclear details	Assaf et al (2006)

[ADVANCED – TABLE.1]

NO	MAIN FACTOR		SUBFACTOR	KEY SUCCESS FACTOR
18	X2	PRODUCTIVITY	Working Method Approach	Zakaria et al (2017)
19			Work location	Kent et al (2000)
20			Performance Integrity	Cooke et al (2002)
21	X3	STRUCTURE UNDER LRT	Availability of Work Equipment as needed, such as TBM, Launching Girder, etc.	Mittal, Yash Kumar (2018)
22			Solid, crowded and other disturbances in the field	Mittal, Yash Kumar (2018)
23			Decreasing Groundwater Level	Sungmin (2009)
24			Changes in Land Load and Land Area	Sungmin (2009)
25			Different Underwater Layers	Sungmin (2009)
26	Y1	TIME	Previous Work Delay	Syahrizal et al, (2015)
27			Project Time Optimization	Talekar (2014)
28			Risk of Project Uncertainty	Egbu (1998)
29			Occupational Complexity	Egbu (1998)

30			Determination of Time Duration	Chang (2002)
31	Y2	COST	Lack of Knowledge about Materials	Prianto (2012)
32			Supplier Performance in Material Supply	Yoggeswaran et al (1998)
33			Low Quality of Project Control	Koushki et al (2005)

[ADVANCED – TABLE.1]

NO	MAIN FACTOR		SUBFACTOR	KEY SUCCESS FACTOR
34	Y2	COST	Lack of Work Preparation	Brodetskaia et al (2011)
35			Lack of Control	Love & Swinney (1996)

from table 1, we get the top 10 ranking of the factors that most influence the delay in the lower part of the Irt structure work using the RII method.

6.1 RII METHOD

Relative Importance Index (RII) is a terminology that was first published as stated in. RII is an analysis that allows a quantitative relative, where the higher the rating (rating) the higher the influence given by the variable under study. Having obtained the most dominant factors, eating will be sought to analyze the root causes of these factors. The analytical method used will depend on the results of the normality test data on the answers of all respondents received :

$$RII = \frac{\sum_{i=1}^{i=A} n_i \times i}{A \times N} \tag{2}$$

This method is carried out with the aim of obtaining an index of the level of influence of each factor on the performance of the project in tiling finishing work in high-rise buildings. The range of RII values produced is between 0 and 1.

Table 2. RII RANKING

Range of RII Values	Rating
0,834 – 1,000	Very Dominant
0,668 – 0,833	Dominant
0,501 – 0,667	Rather dominant
0,334 – 0,500	Less dominant
0,168 – 0,333	Not Dominant
0,000 – 0,167	Very Dominant

The following variables have been added :

RANK	MAIN FACTOR	SUBFACTOR	ITEM KSF	RECAPITULATION OF QUESTIONARY RESULTS					TOTAL	W	S	R	INDEX RII
				1	2	3	4	5					
1	I	X1-4	Weak Project Planning and Scheduling by Contractors	0	0	13	28	29	70	296	5	70	0,846
2	IV	Y1-2	Project Time Optimization	0	0	15	25	30	70	295	5	70	0,843
3	I	X1-3	Not Effective Planning and Scheduling	0	0	15	26	29	70	294	5	70	0,840
4	IV	Y1-5	Determination of Time Duration	0	0	16	25	29	70	293	5	70	0,837
5	II	X2-2	Contractors who lack experience	0	0	15	28	27	70	292	5	70	0,834

RANK	MAIN FACTOR	SUBFACTOR	ITEM KSF	RECAPITULATION OF QUESTIONARY RESULTS					TOTAL	W	S	R	INDEX RII
				1	2	3	4	5					
6	II	X2-5	Weak Communication and Poor Coordination by Service Users during Construction	0	0	17	26	27	70	290	5	70	0,829
7	III	X3-5	Different Underwater Layers	0	0	19	26	25	70	286	5	70	0,817
8	III	X3-2	Solid, crowded and other disturbances in the field	0	0	20	26	24	70	284	5	70	0,811
9	V	Y2-3	Low Quality of Project Control	0	0	22	25	23	70	281	5	70	0,803
10	V	Y2-5	Lack of Control	0	1	21	25	23	70	280	5	70	0,800
11	I	X1-1	Delays in Preparation Work and Shop Drawing Approval	0	3	23	24	20	70	271	5	70	0,774
12	IV	Y1-1	Previous Work Delay	0	2	25	24	19	70	270	5	70	0,771
13	II	X2-6	Innovative ways of thinking	0	2	25	25	18	70	269	5	70	0,769
14	II	X2-8	Working Method Approach	0	2	26	27	15	70	265	5	70	0,757
15	III	X3-4	Changes in Land Load and Land Area	0	4	26	24	16	70	262	5	70	0,749
16	V	Y2-4	Lack of Work Preparation	0	5	25	24	16	70	261	5	70	0,746
17	I	X1-6	Job Duration Analysis	0	3	28	25	14	70	260	5	70	0,743
18	II	X2-4	Delay in sending materials such as steel, concrete etc.	0	3	27	27	13	70	260	5	70	0,743
19	II	X2-10	Performance Integrity	0	5	25	26	14	70	259	5	70	0,740

20	IV	Y1-3	Risk of Project Uncertainty	0	6	25	24	15	70	258	5	70	0,737
21	IV	Y1-4	Occupational Complexity	0	6	25	24	15	70	258	5	70	0,737
22	I	X1-7	Labor Analysis	0	7	23	27	13	70	256	5	70	0,731
23	I	X1-9	Relationship between Activities	0	4	30	23	13	70	255	5	70	0,729
24	II	X2-3	Ineffective Communication	0	6	26	28	10	70	252	5	70	0,720
25	II	X2-1	Labor Reduction	0	8	25	27	10	70	249	5	70	0,711
26	I	X1-2	Design Change or Design Error	0	8	25	28	9	70	248	5	70	0,709
27	I	X1-8	Repeated Job Analysis	0	8	26	26	10	70	248	5	70	0,709
28	V	Y2-1	Lack of Knowledge about Materials	0	6	29	26	9	70	248	5	70	0,709

RANK	MAIN FACTOR	SUBFACTOR	ITEM KSF	RECAPITULATION OF QUESTIONARY RESULTS					TOTAL	W	S	R	INDEX RII
				1	2	3	4	5					
29	I	X1-5	Delay in the Design Document Revision and Approval	1	6	28	27	8	70	245	5	70	0,700
30	I	X1-10	Minimum Waiting Time	3	6	25	27	9	70	243	5	70	0,694
31	V	Y2-2	Supplier Performance in Material Supply	1	7	29	24	9	70	243	5	70	0,694
32	III	X3-3	Decreasing Groundwater Level	2	7	29	22	10	70	241	5	70	0,689
33	III	X3-1	Availability of Work Equipment as needed, such as TBM, Launching Girder, etc.	1	9	27	25	8	70	240	5	70	0,686
34	II	X2-7	Unclear details	2	7	29	24	8	70	239	5	70	0,683
35	II	X2-9	Work location	2	7	32	22	7	70	235	5	70	0,671

7. CONCLUSION

From this RII analysis, 10 factors that have the most influence on the delay in LRT structure work are obtained :

1. Weak Project Planning and Scheduling by Contractors
2. Project Time Optimization
3. Not Effective Planning and Scheduling
4. Determination of Time Duration
5. Contractors who lack experience
6. Weak Communication and Poor Coordination by Service Users during Construction
7. Different Underwater Layers
8. Solid, crowded and other disturbances in the field

9. Low Quality of Project Control
10. Lack of Control

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