International Journal of Research and Review
Vol.7; Issue: 10; October 2020
Website: www.ijrrjournal.com
Research Paper *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Analysis of the Factors Causing Delay in Completion of Light Rail Transit (LRT) Project on Cawang-East Bekasi

Saptono Kaelan[1], Bambang Purwoko Kusumo Bintoro[1], Rosalendro Eddy Nugroho[1]

[1]Mercu Buana University, Jakarta, Indonesia

Corresponding Author: Saptono Kaelan

ABSTRACT

The Provincial Government of DKI Jakarta has issued regulations on reducing the use of private vehicles, among others by regulating the use of vehicles that have odd and even license plates. Before the regulations were enacted, various facilities were prepared such as Trans Jakarta Bus, Commuter Line Train, Ojek (unofficial public transportation in the form of motorbikes) Online, Mass Rapid Transit (MRT) and Light Rail Transit (LRT) which is currently under construction. In the development phase of LRT is the basis of the research, because the application of design and build is used so that the construction is completed according to the time set, but until now has not been completed in its entirety, due to the constraints on the work site. This research aims to determine the factors causing the delay in completion that affects it, such as the work land, the construction of extra-high-voltage air duct cables, the construction of Jakarta - Cikampek overpass and the construction of high speed rail Jakarta - Bandung. This research is based on a sample of respondents from related parties such as contractors, consultants, owners as well as the public users of public transportation. The results of the data obtained were analyzed with a partial squared-smallest structural equation model (PLS-SEM). From the analysis shows that design and build and work land have a big influence on the success of the project.

Keywords: *Design and Build, Work Land, Cable, Toll Road, High Speed Rail.*

BACKGROUND

Increasing economic growth and community activities, especially in Jakarta and surrounding areas, greatly affect transportation needs, public transportation means are starting to be widely used by people for daily activities, because it is much safer, more convenient and cheap. To increase the transport capacity, the Provincial Government of DKI Jakarta build Light Rail Transit (LRT). Because the construction requires a large cost so that the implementation is planned in three stages, for now phase I is done, as well as the stages of the development plan as follows:

Phase I: Cawang- Harjamukti, Cawang-Kuningan-Dukuh Atas, Cawang-East Bekasi.

Phase II: Harjamukti-Bogor, Dukuh Atas-Palmerah-Senayan.

Phase III: Palmerah-Grogol.

Stage I Station Construction Site:

Cawang-Harjamukti Line: Harjamukti Station, Caracas Station, Taman Mini Station, Kampung Rambutan Station.

Cawang-Dukuh Atas Line: Cawang Station, Cikoko Station, Ciliwung Station, Pancoran Station, Kuningan Station, Rasuna Said Station, Setia Budi Station, Dukuh Atas Station.

Cawang-East BekasiLine: Jati Cempaka Station, Cikunir Station, Jati Bening Station, West Bekasi Station, Jati Mulya Station.

The construction of Light Rail Transit is expected to be completed soon, so

that it can be used by the public as a means of public transportation, but in the process of implementing Light Rail Transit, there are several things that greatly affect the physical progress of the work in the field, among them due to the presence of land that is not yet free, the presence of extra-high-voltage air duct cables (EHV), the start of the Jakarta-Cikampek toll road work that the trace on ramp crosses trace Light Rail Transit so that it affects each other, the construction of High Speed Rail Jakarta Bandung which is on the right side of Jakarta-Cikampek toll roadthen switch trace to the left side of Jakarta-Cikampek toll road, so that it crosses trace Light Rail Transit to get to the depot at Cawang Station.

These three major projects are in the same area so it affects each other greatly and this results in increasingly complex problems due to the priority of the project that must take precedence over the completion because it concerns government policy, so it will affect the risk, and if the risk increases it will affect the completion time.

LITERATURE STUDY

2.1 Design and Build

The construction of Light Rail Transit (LRT) using design and build method because the work is considered complex and requires technology and has a high risk at great cost. The understanding of integrated construction work design and build is all work related to the implementation of building construction or the creation of other physical forms, where the planning work is integrated with the implementation of construction (Regulation of Minister of Public Work and Housing No.19/PRT/M/2015, Article 1 Number 12).

In the Design and Build method of a project there must be at least a document requirement:

a) Design Concept Document

1) Technical geological map data of the job site.
2) Reference of soil investigation data (for Construction).
3) Determination of scope, design criteria, and work standards/codes.
4) Identification and allocation of project risk.
5) Identification and land needs.
6) Schematic images, typical pieces and more.

b) Supporting Documents:

1) Environmental Management Plan.
2) Environmental Monitoring Plan for those who need environmental impact analysis.
3) Environmental Management Efforts and Environmental Monitoring Efforts for those who do not need environmental impact analysis.

c) Proposed Document of Work Plan and Budget containing budget ceiling.

The availability of Construction Management Consultant as a representative of the owner to assist the owner in going through various phases in the delivery project including the needs and criteria of the program should be analyzed strictly and in depth and well documented. Contractors are required to translate the needs and criteria of the program as the basis of the proposed Design and Build proposal.

2.2 Work Land

The definition of Working Land in this study is based on the Great Dictionary of Indonesian Language (KBBI) is land, area, field, place, field or area, so that in general researchers call it a piece of land for construction work to be done.

The implementation of construction located on land sites that are still in dispute, cannot be done without regard to the property rights of residents.

And this can be seen and referred to the Law of the Republic of Indonesia Number 5 of 1960 on the Basic Rules of Agrarian Fundamentals Article 9 Paragraph 2 which reads: Every Indonesian citizen, both male and female has the same opportunity to obtain a right to land and to

benefit and result both for himself and his family.

Therefore, the task force has approached with the residents affected by the trace of the light rail transit track. In order to immediately hand over his property to the government in order to benefit the general public as set out in the Agrarian Principal Law Article 2 Paragraph 1 which reads: On the basis of the provisions in article 33 paragraph 3 of the Constitution and things as referred to in article 1, the earth water and space, including the natural wealth contained therein is at the highest level controlled by the State, as the organization of power of all the people.

According to Pasaribu (2015), the word "controlled" here does not mean owned, but is the understanding that authorizes the State as the organization of power of the Indonesian nation at the highest level to:

a. Regulate and administer the provision, use, supply and maintenance of earth, water, space and natural wealth.
b. Determine and regulate the rights and obligations that can be had over the earth, water, space and natural wealth contained therein generated from the relationship of interests of the person and the agrarian element.
c. Determine and regulate the relationships between people and legal actions related to the earth, water, space and the richness of nature contained therein.

Then the principle of prioritizing national and State interests based on the unity of the nation rather than the interests of individuals and factions, can be seen in Article 3 of the Agrarian Principal Law, even though the right of Ulayat (common land according to customary law) is still recognized its existence in the System of National Agrarian Law, but because of its implementation based on this principle, then for the benefit of development, indigenous law peoples are not allowed to refuse the use of land for development on the basis of their rights. So the State has the right to open land massively, for example for the benefit of transmigration, new agricultural areas and other reasons that are in the national interest.

2.3Work Environment

What is meant by the Working Environment by researchers is a condition or situation where at some work sites there is an Extra-high-voltage air duct cable on it, where the cable is very close to the construction site, as well as if the construction has been finished then the free space between the railway and the Train Car is getting closer to the cable.

Directorate General of Electricity Of the Ministry of Energy and Mineral Resources issued Regulation of the Minister Number 18/2015 replacing the previous regulation, namely Regulation of the Minister of Energy and Mineral Resources Number 01.P/47/M.PE/1992 on free space and minimum free space in (EHV). The free space in question is an area with a certain distance or radius measured from the tread of the (EHV) pole that must be free from any building. In the attachment of the rule, the safe distance must be met based on the type and voltage capacity of the (EHV). In addition to regulating the safe distance from (EHV) poles or towers, this rule also regulates the height of buildings that are still considered safe from conductors or high voltage electrical transmission cables.

In order to maintain safe conditions in working in accordance with the Guidelines for the implementation of Occupational Safety and Health Management System in Indonesia in the Regulation of the Minister of Manpower Number: PER.05/MEN/1996, then this (EHV) cable must be raised first according to the required height before the start of the activity below, while the free space that needs to be considered is as in the following table:

According M. Ahmad (2015) based on data in Ministry of Energy and Mineral Resources-Republic of Indonesia, many people do not know that he could be threatened with health problems because it

is close to (EHV). Because on extra high voltage cables contain electrical induction. Electrical induction is a physical phenomenon in which if an object that was previously neutral or (not electrically charged) becomes electrically charged due to the influence of electrical force or from other charged objects nearby because the material under this (EHV) cable is a metal that can receive electrical induction from the cable.

Table 2.1: Free Space on State Electricity Company Cables

Voltage	Construction	Free Space
High Voltage Air Line (HV) 55 kV	Steel Poles	4 meter
High Voltage Air Line(HV) 66 kV	Concrete Pillar	4 meter
High Voltage Air Line(HV) 66 kV	Tower	7 meter
High Voltage Air Line(HV) 150 kV	Steel Poles	7 meter
High Voltage Air Line(HV) 150 kV	Steel Poles	6 meter
High Voltage Air Line(HV) 150 kV	Concrete Pillar	5 meter
High Voltage Air Line(HV) 150 kV	Tower	10 meter
Extra High Voltage Air Line(EHV) 275 kV	Double Circuit	13 meter
Extra High Voltage Air Line(EHV) 500kV	Single Circuit	22 meter
Extra High Voltage Air Line(EHV) 500 kV	Double Circuit	17 meter
High Voltage Direct Current (HVDC)250kV		14 meter
High Voltage Direct Current (HVDC)500kV		18 meter

Source: Regulation of The Minister of Energy and Mineral Resources number 01.P/47/M.PE/1992

2.4 Elevated Toll Road

The Jakarta-Cikampek elevated toll road was proposed by Jasa Marga because from the initial study it was to increase capacity and travel time, because the current level of congestion felt by the community is already very saturated for the existing toll road path of Jakarta-Cikampek. Construction of the Jakarta-Cikampek elevated toll road starting in early 2017 is scheduled to be operational in 2018, and prioritized for small/light vehicles with the aim of exiting Jakarta towards Cikampek. The existing Jakarta-Cikampek toll road has 3 lanes with a capacity of 75,000 vehicles/day. While the glide toll has two lanes with a capacity of about 50,000 vehicles/day.

With the Jakarta-Cikampek elevated toll road, it is expected that the traffic burden on the Jakarta-Cikampek existing toll road can be reduced. This will have a positive impact on the economy and activities of existing toll access users because it can save travel time. Construction of Jakarta-Cikampek elevated toll road starts from Jatibening KM 09+00 as on ramp up to KM 45+500 with trace across the median of Jakarta - Cikampek toll road. This Meeting on Ramp Toll Road with Light Rail Transit is what influenced both projects.

2.5 High Speed Rail Jakarta-Bandung

According to the Minister of State-Owned Enterprises (SOEs) Rini Soemarno the construction of Jakarta-Bandung high speed rail is one of the National Strategic Projects, and the main goal is to build new cities and also to unravel the concentrations in major cities such as Jakarta and Bandung and can also form a new economy so that we can level the income so that our people are more prosperous and will also lift the tourism sector, in addition to opening up jobs. The construction of the Jakarta-Bandung high speed rail is a comprehensive vision of President Jokowi, with an open economy such as the ASEAN Economic Community. The construction of Jakarta-Bandung high speed rail starts from Cawang which is on the left side of the Jakarta-Cikampek existing toll road and then switches to the right. This trace crossing point is a problem, as it affects each other between the two projects, after which to Karawang and onwards to Bandung.

2.6 Project Success

The definition of project success or project success is anything that is expected to be achieved, anticipates all project requirements and has sufficient resources to meet all needs (Tuman, 1986). In another chapter (PMBOK 6th:33) explains that,

traditionally, the measurement of project success is only measured by the time, cost, scope and quality of the project. Recently, however, practitioners and engineers have included the achievement of project targets as a new indicator for measuring project success.

2.7 Research Hypothesis

Based on the results of previous research, it can be understood if there is an influence relationship between the factors of several variables that can affect the overall delay. The factors that influence it depend on the context and relevance of the researchers.

The formulation of the research hypothesis is based on the theory that is the basis for thinking in this study as follows:

H1: There is a significant relationship between design and build on project success.

H2: There is a significant relationship between working land and project success.

H3: There is a significant relationship between the work environment and the success of the project

H4: There is a significant relationship between laying toll roads and project success.

H5: There is a significant relationship between high speed rail and project success.

H6: There is a significant relationship between design and build on working land.

H7: There is a significant relationship between design and build on elevated toll roads.

H8: There is a significant relationship between working land and elevated toll roads.

RESEARCH METHODOLOGY

This study analyzes the factors that cause delays in completing the work of the Light Rail Transit project on the Cawang - East Bekasi section which is reviewed based on methods and measurements and data analysis which can be classified as survey research, because the main data source is based on questionnaires given to respondents, so this research is a quantitative research.

3.1 Types of Research

In this study, the analysis was carried out by describing the results of the analysis of the respondent's description in accordance with what was filled in the questionnaire, which could be categorized statistically based on the background of the respondent, such as: gender, age of the respondent, education, work experience and position.

3.2 Research Variables

The independent variables in this study are design and build, work area, work environment, the Jakarta-Cikampek elevated toll road, the Jakarta-Bandung high speed rail.

The independent variable (X) in this study is as follows:

a. Design and Build(X-1)
b. Work Land (X-2)
c. Work Environment (X-3)
d. Elevated Toll Road (X-4)
e. High Speed Rail (X-5)

The dependent variable (Y) determined in this study is the success of the project, which is stated by the following parameters:

a. Time (Y1)
b. Quality (Y2)
c. Cost (Y3)
d. Job Complexity (Y4)

3.3 Population and Research Sample

The population in this study, the authors used data from parties involved in the construction process of the Light Rail Transit (LRT) project such as contractors, consultants, owners, and the public using public transportation, totaling 65 people. Sampling was carried out using proportional stratification techniques according to the population distribution of each stakeholder, based on the Slovin formula to determine the number of research samples needed, with a 95% confidence level or a 5% margin of error.

3.4 Data Analysis Techniques

This study uses Structural Equation Modeling - Partial Least Square (PLS-SEM) as an analysis tool. The software used in this study uses SmartPLS 3.0. Design and Build, Workplace, Work Environment, Fly Toll Road, High Speed Rail and Project Success are treated as latent variables with each indicator.

PLS analysis is carried out in three stages, namely:

a. Evaluation of Measurement (outer model).
b. Evaluation of Structural (inner model).
c. Hypothesis Testing.

3.5 Research Framework

In this study, the authors analyzed the variables Design and Build, Work Land, Work Environment, Elevated Toll Road, High Speed Rail and Project Success that caused delays in completing work using quantitative research and in non-experimental types that were regulated such as in design and framework research. think below:

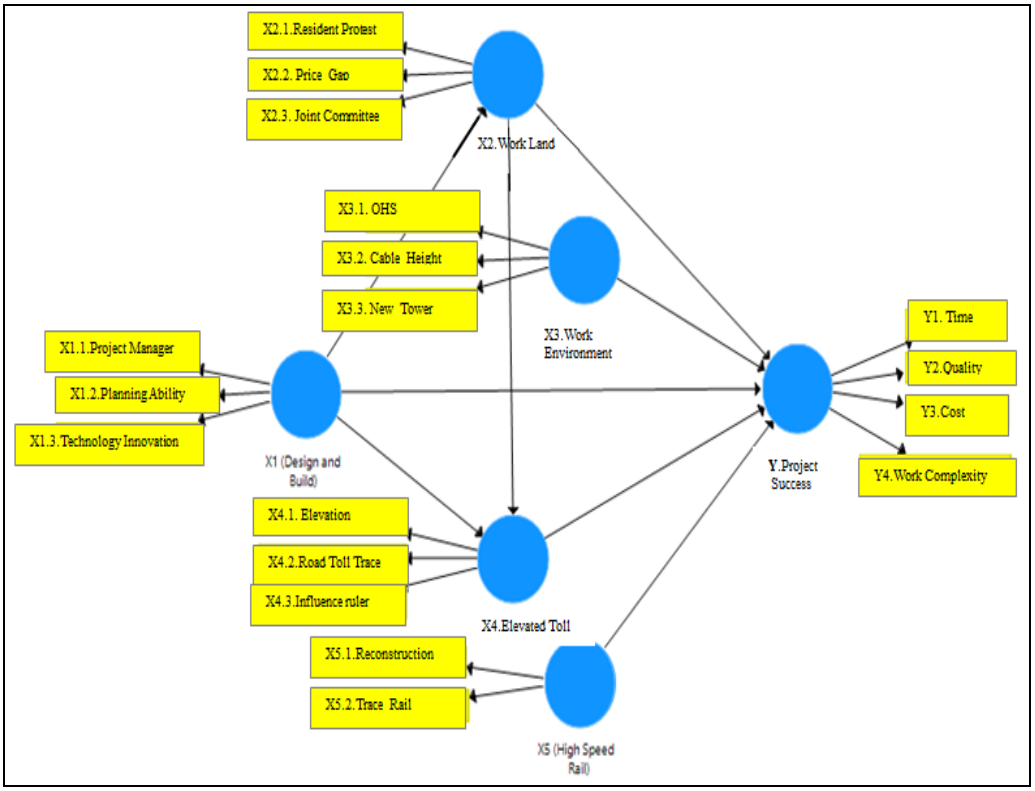

Fig.1. Research Framework and Research Design

RESEARCH RESULTS

4.1 Description of the Research Object

Respondents who returned the questionnaire were 53 out of 65 questionnaires distributed. Of all respondents in this study, respondents aged <30 years were 6 respondents or 11.32%, aged 30-40 years there were 20 respondents or 20%,%, aged 41-50 years there were 9 respondents or 16.98%, and aged> 50 years there are 18 respondents or 33.96%. Respondents who have 5 - 10 years of work experience are 14 respondents or 26.42%, 11-20 years of experience there are 19 respondents or 35.85% and experience> 20 years there are 20 respondents or 37.74%. Respondents with high school education were 3 respondents or 5.66%, with D3 education there were 8 respondents or 15.09%, with S1 education there were 25 respondents or 47.17% and S2 education there were 17 respondents or 32.08%.

4.2 Evaluation of Measurement Model (Outer Model)

4.2.1Validation Test

a. Convergent validity

To find out how much the contribution of the indicator in explaining the construct variables can be seen by calculating the loading factor. The required factor loading value is at least 0.7 and if the factor loading value is smaller than the value of 0.7, it must be removed from the test model to then re-estimate the model.

1. Loading Factor

Table 4.1. The Calculation Results of Outer Loading

Indicator	DnB	WL	WE	ETR	HSR	PS
Project Manager	0,921					
Planning Ability	0,864					
Technology Innovation	0,740					
Residents Protested		0,862				
Price Gap		0,838				
Joint Committee		0,813				
The Occupational Safety and Health Management System			0,788			
Cable Height			0,939			
New Tower			0,902			
Elevation				0,902		
Road Toll Trace				0,807		
The influence of the ruler				0,761		
Reconstruction					0,898	
Trace Rail					0,912	
Time						0,863
Quality						0,906
Cost						0,853
Work Complexity						0,882

2. Average Variance Extracted (AVE)

Table 4.2. Average Variance Extracted (AVE) Value

Variable	AVE
Design and Build (D n B)	0,711
Work Land (WL)	0,695
Work Environment (WE)	0,784
Elevated Toll Road (ETR)	0,680
High Speed Rail (HSR)	0,819
Project Success (PS)	0,768

The next examination is convergent validity by looking at the results of the convergent validity value using the AVE value. For the minimum requirement, the AVE value is 0.5. The AVE value calculated from all constructs can be seen in the following table

b. Discriminant Validity

To test discriminant validity, it is done by checking cross loading and Fornell-Lacker Criterion. In cross loading, the value of the correlation coefficient of the indicator on its association construct is compared with the correlation coefficient with other constructs. The results of the discriminant validity test with cross loading can be seen in the following table:

Table 4.3. Fornell-Larcker Criteria Value

Indicator	Variable					
	D n B	WL	WE	ETR	HSR	PS
Design and Build (D n B)	0,845					
Work Land (WL)	0,428	0,838				
Work Environment (WE)	-0,263	-0,457	0,879			
Elevated Toll Road (ETR)	0,501	0,817	-0,433	0,825		
High Speed Rail (HSR)	0,046	0,288	-0,257	0,227	0,905	
Project Success (PS)	0,671	0,807	-0,348	0,798	0,34	0,876

4.2.2 Reliability Test

Reliability testing by comparing the Cronbach Alpha value and the Composite Reliability value of each variable with a minimum value of 0.7. The results of Cronbach's Alpha and Composite Reliability are as follows:

Table 4.4. Reliability Test and Cronbach's Alpha

Variable	Cronbach's Alpha	Composite Reliability	Conclusion
Design and Build	0,809	0,882	Reliable
Work Land	0,790	0,876	Reliable
Work Environment	0,879	0,910	Reliable
Elevated Toll Road	0,766	0,865	Reliable
High Speed Rail	0,779	0,900	Reliable
Project Success	0,899	0,930	Reliable

4.3 Evaluation of Structural (inner model)

a. Size of Influence f^2

The size of the influence which is indicated by the value (f^2) is done to measure how much influence each variable has at the structural level. If the value (f^2) is equal to 0.02, then it has a small effect, equal to 0.15, then it has a medium effect and is equal to 0.35, then it has a big effect, here are the measurement results:

Table 4.5. Level of Influence of f^2

Correlation	F *Square*	Conclusion
Design and Build>Project Success	0.806	Big
Work Land>Project Success	0.850	Big
Work Environment >Project Success	0.091	Small
Elevated Toll Road>Project Success	0.047	Small
High Speed Rail> Project Success	0.162	Moderate
Design and Build>Work Land	0.242	Moderate
Design and Build >Elevated Toll Road	0.091	Small
Work Land>Elevated Toll Road	1,589	Big

b. Predictive Relevance (Q^2)

Predictive Relevance (Q^2) calculation for the following three sample test models:

Table 4.6. R^2 and Q^2 Predictive Relevance

Correlation	R-*Square*	1 – R-Square	Q-*Square*
Work Land	0,183	0,817	0,029
Elevated Toll Road	0,711	0,289	
Project Success	0,876	0,124	

According to the estimation results of the model, the Q^2 (Q-square predictive relevance) value obtained in the test sample area is 0.029, which means that the value is greater than 0 (zero), so that the measurement model is concluded to have a predictive relevance value.

c. Goodnes of Fit (GoF) Test

Used to validate the combined performance of the measurement model (outer model) and the structural model (inner model) whose values range from 0 - 1 with interpretations of 0 - 0.25 (Small GoF), 0.25 - 0.36 (Medium GoF) and above 0.36 (Big GoF). The formula for calculating the value of

GoF = $\sqrt{\text{AVE x } R^2}$ … .... Tenenhaus (2004).

Table 4.7. Goodnes of Fit (GoF) Value

Correlation	AVE	R^2	GoF	Conclusion
Work Land	0,695	0,183	0,357	Moderate
Elevated Toll Road	0,68	0,711	0,695	Big
Project Success	0,768	0,876	0,82	Big

4.4. Measurement model equations

The results of the analysis of this measurement model with PLS are shown in the figure below, which can explain the results of the R square and t-statistic values.

From the image of the measurement model above, the equation obtained from this measurement model is as follows:

PS = 0.367 X1 + 0.594 X2 + 0.122 X3 + 0.143 X4 + 0.150 X5, R^2 = 0.876
WL = 0.428 X1, R^2 = 0.183
ETR = 0.180 X1 + 0.750 X2, R^2 = 0.711

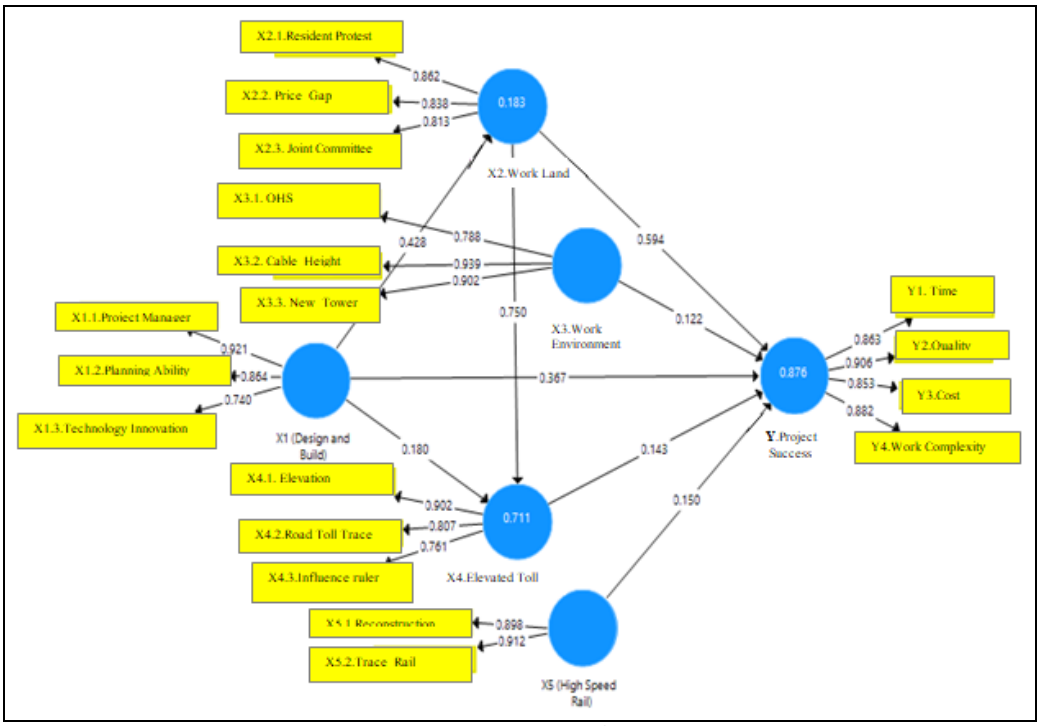

Fig. 4.1. Standardized Measurement of Sample Test Model

4.4 Hypothesis Test

This hypothesis testing is to determine whether the research hypothesis is accepted or rejected. The hypothesis receives a value greater than 0.1 and a P value greater than 0.05. The results of the partial hypothesis test using Sem-PLS show that the acceptable hypothesis because the significance value is hypothesis 1, 2, 3 and hypothesis 5, namely the effect of Design and Build, Workplace, Work Environment and High Speed Rail for Project Success.

After obtaining an analysis of the five models above, it can be further analyzed by measuring the direct relationship between the variable and other variables so that significant effects can be identified. This measurement is carried out to determine how much influence these variables have, so that from this it can be seen the factors that cause delays in completing work.

Table 4.8. Path Coefficient, t-count and Partial Hyphotesis

Variable	Path Coefficient	t-count	Significance	Conclusion
(X1).Design and Build ----> (Y) Project Success	0.367	6.109	0.000	H1 accepted
(X2) Work Land -----> (Y) Project Success	0.594	5.148	0.000	H2 accepted
(X3) Work Environment ---> (Y) Project Success	0.122	2.122	0.034	H3 accepted
(X4) Elevated Toll Road---> (Y) Project Success	0.143	1.403	0.161	H4 rejected
(X5) High Speed Rail -----> (Y) Project Success	0.150	2.892	0.004	H5 accepted

Table 4.9. Path Coefficient, t-count and other variable

Variable	Path Coefficient	t-count	Significance	Conclusion
(X1) Design and Build --> (X2) Work Land	0.428	4.437	0.000	Significance
(X1) Design and Build ---> (X4) Elevated Toll Road	0.180	2.239	0.026	Significance
(X2) Work Land ----> (X4) Elevated Toll Road	0.750	12.596	0.000	Significance

4.4.2. Mediation Hypothesis Test

The mediation test is another hypothesis test conducted to see the significance of the relationship between variables, namely the predictor variable on the criterion variable. The test results show that the estimation of the measurement model is able to prove the significant effect of Design and Build as a variable between the Workplace and Work Environment and Elevated Toll Roads and High Speed Rail and Project Success.

Table 4.10: The Result of the Measurement of the Mediation Variable

Variable	Path coefficient	t-count	Significance	Conclusion
(X1) Design and Build---> (X2) Work Land ---> (X4) Elevated Toll Road	0.321	3.980	0.000	Significance
(X1) Design and Build--->(X2) Work Land ------> (Y) Project Success	0.254	3.460	0.001	Significance
(X1)Design and Build--->(X4)Elevated Toll Road---->(Y)Project Success	0.026	1.135	0.257	Not Significance
(X2) Work Land ----->(X4) Elevated Toll Road -----> (Y) Project Success	0.107	1.350	0.177	Not Significance
(X1) Design and Build---->(X2)Work Land----->(X4) Elevated Toll Road ------> (Y) Project Success	0.046	1.253	0.211	Not Significance

4.4.3. Simultaneous Hypothesis Test

To determine the effect of independent variables simultaneously on the dependent variable, this hypothesis is used by comparing the calculated F value with the F table value, the formula used is as follows:

$$F \text{ count} = \frac{(n-k-1)R^2}{(K(1-R^2))}$$

Information:
n = number of samples
k = number of independent variables
R^2 = r square

While the F table is obtained from the table using the DF1 and DF2 instruments with the following formulations:
DF1 = number of independent variables
DF2 = n - k - 1
By using the formula above, we get F count and F table as follows:

Based on the table above, it can be concluded that the simultaneous hypothesis between the Design and Build variables, Work Land, Work Environment, Elevated Toll Road and High Speed Rail can have a significant effect on the Project Success variables.

Table 4.11. Test Model of Simultaneous Hyphotesis

Variable	F count	F table	Conclusion
Design and Build, Work Land, Work Environment, Elevated Toll and High Speed Rail Application > Project Success	13,52	2,41	H accepted

DISCUSSION AND RESEARCH IMPLICATIONS

From the results of hypothesis testing on the interaction model for all sample data, it can be concluded that in this interaction model, working land has the most significant influence on the success of the project because this involves citizen protests, price differences and the existence of a joint committee, as well as the effect of working land on development of elevated toll road.

Citizen protests are a very influencing factor because not all residents are willing to accept the price set by the committee, they demand losses that cannot be calculated materially, so that the value of the price given is not comparable to what they expect while they are in their residence.

The elevated toll road construction work on the on ramp intersects with the construction of the Light Rail Transit, so that the elevation problem greatly affects the Long span construction, because the elevation on the ramp on the Elevated Toll Road is not quite right, resulting in a design change in the Long span Light Rail Transit, resulting in changes in construction and its working method.

The existence of an Extra-high-voltage air duct cable that passes above the pier head causes an electrical induction in metal materials, because the free space is reduced and this will also affect the future when the Light Rail Transit has operated, so this air cable must be raised to adjust for occupational safety and health factors.

The construction work of the High Speed Rail that crosses the Light Rail Transit construction at the Cawang location will dismantle the three piers or four spans of the U-Shaped Girder that have been completed for the underground tunnel passage to the depot, and when the equipment and readiness are complete for

tunneling then construction of the pier head is done because of the limited area.

The Design and Build concept used is right to support a project success if led by a reliable Project Manager and plays an important role in carrying out their duties because of the high complexity of the work, as it is known that the Light Rail Transit (LRT), High Speed Rail and Highway Toll projects is a National Strategic Project with project priorities which completion must take precedence because it involves government policy, and this will affect the risk, and if the risk increases it will affect the completion time

CONCLUSIONS AND SUGGESTIONS

5.1 Conclusion

Based on the analysis and discussion of the data that has been carried out, it can be concluded that the factors causing the delay in completing the Light Rail Transit (LRT) project on the Cawang - East Bekasi section are as follows:

a. By using the Design and Build method, work completion can be completed on schedule because it has a big influence on the success of the project
b. The factors that cause delays in completing the Light Rail Transit (LRT) project on the Cawang - East Bekasi section are due to conditions in the field or work area that are not ready. In the Design and Build method, the principle of Clean and Clear is a benchmark, because this will affect the completion time, as long as there are still obstacles at the work location, it will affect the process to start construction work.

5.2 Suggestion

Based on the results of the research that has been done, there are several suggestions that can be applied in the future as follows:

a. The application of the design and build method for the building division and the transportation division is very different, because the building division works at one location point so that the negative impact can be immediately recognized, namely only around the work location, while in the transportation division the negative impact is along the trace it traverses, both those that are above the surface or below the surface, for example the existence of regional drinking water companies(PDAM) pipes, GAS, underground cables or air cables, or residents' lands or houses that are traversed by traces, for that the main thing that must be done is to form a team investigation and survey teams to collect data on the trace path.
b. Immediately coordinate with related agencies whose facilities are affected by the construction of the project, so that they can be immediately transferred to a safer location.
c. The government needs to make a land mapping and regulations if the land for the public interest is controlled by residents, to immediately release it in a short time, and be given a better compensation than the previous value.
d. Implementation of construction work so that it always works according to the rules in terms of the Occupational Safety and Health Management System .

REFERENCES

1. A. S.Akintoye, and M. J. MacLeod,1997 "*Risk Analysis and Management in Construction", International Journal of Project Management*, vol. 15(1), pp. 31-38.
2. Bimo.D.H, 2018.*"Penilaian Risiko Pelaksanaan Proyek Light Rail Transit (LRT) Jabodebek".*KNTS.Vol 12, Universitas Trisakti.
3. *Bridge Management System*,1993. *Manual Pengawasan Pelaksanaan Jembatan*, a Project Jointly Funded by Indonesia and Australia.
4. Chin, W. W., and Newsted, P. R. (1999). *Structural Equation Modeling analysis with Small Samples Using Partial Least Squares*. In Rick Hoyle (Ed.), Statistical Strategies for Small Sample Research, Sage Publications, pp. 307-341.
5. C.S.Pawar, S.S.Jain, J.R.Patil.2015 *"Risk Management in Infrastructure Projects in India".* Vol. 2.

6. Dana Aditiasari.*"Rumah dekat SUTET Berbahaya! Ini Jarak Amannya",* https://finance.detik.com>berita-ekonomi-bisnis [Accessed 4 th September 2015.
7. Dedi Nugroho.*" Pengaruh Perubahan Konfigurasi Saluran Jaringan SUTET 500 kV Terhadap Medan Magnet".Media Elektrika 2009.*Vol 2. [1]: 9-17.
8. Departemen Pekerjaan Umum Direktorat Jenderal Bina Marga. 2009. Geometri Jalan Bebas Hambatan untuk Jalan Tol No. 007/BM/2009. Jakarta: Departemen Pekerjaan Umum Direktorat Jenderal Bina Marga.
9. De Wit, A. (1998). *Measurement of project success. Project Management*, Vol. 6, pp. 164-171.
10. F. Yucelgazi. I.Yitmen. 2018*"Risk Assessment for Large-Scale Transport Infrastructure Projects".* WMCAUS. Departement of Civil Engineering, Gazimagusa, Kibris, Mersin 10 Turkey.
11. F.Kurniawan,2018. *"Studi Kasus Keterlambatan Proyek Konstruksi di Propinsi Jawa Timur Berdasarkan Kontrak Kerja"*. Vol.2, No.2. Teknik Sipil, Universitas Narotama, Surabaya.
12. F.Pangkey, G.Y.Malingkas. 2012 *"Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja (SMK3) pada Proyek Konstruksi di Indonesia".* Vol.2, No.2, Universitas Sam Ratulangi.
13. F.Wantouw, R.J.M. Mandagi.2014 *"Manajemen Risiko Proyek Pembangunan Saluran Udara Tegangan Tinggi (SUTT) 150 kV Lopana-Teling".* Vol.4, No.4 Teknik Sipil, Universitas Sam Ratulangi.
14. Faisal Fahmi.2018*"Aanlisis Faktor Utama Yang Mempengaruhi Waktu Pelaksanaan Proyek Pembangunan Infrastruktur LRT (Light Rail Transi) Jabodebek".* Repository ITS.
15. Gede B. Suprayoga, 2014"*Procurement Policy for Road Construction"*
16. Gene Rowe. George Wright. 1999. *The Delphi technique as a forecasting tool: issues and analysis.* International Journal of Forecasting. Volume 15, Issue 4, October 1999, Pages 353-375.
17. Ghozali. Imam. 2014. Structural Equation Modeling. Metode Alternatif dengan Partial Least Square (PLS). Edisi 4. Semarang: Badan Penerbit Universitas Diponegoro.
18. Gulam Mohi Ud Din Rather 2018. *"Risk Management in Infrastructure Projects in India".*Vol 7. Maha Rishi University Locknow UP.
19. H.Hendrawan.2018 *"Faktor yang Mempengaruhi Keberhasilan Penerapan Teknologi Bidang Jalan dengan Kontrak Rancang Bangun".*Vol.24, No.1.
20. Keputusan Presiden No. 55 Tahun 1993 tentang Pengadaan tanah bagi pelaksanaan pembangunan untuk kepentingan umum.
21. Kerzner, H. (2000). *Project Management a Systems to planning, Scheduling, and controlling. Handbook of Practice Management* (Vol. 1). https://doi.org/10.1258/096214400 320575598
22. Letezia Tobing ,*Langkah Hukum Bila Tak Sepakat Besaran Ganti Rugi Pembebasan Tanah,* https://images.hukumonline.com/frontend [Accessed 02th October 2017].
23. Lim C.S. dan Mohamed, M. Z. (1999). *Criteria of project success, International Journal of Project Management,* Vol 17, No.4, pp 243-248.
24. LRT Jabodebek: id.wikipedia.org/ wiki/ LRT_Jabodebek,[accessed 21th Juli 2019].
25. L.R. Yang, C.F. Huang, K.S. Wu, *The association among project manager's leadership style, teamwork and project success, International Journal of Project Management*. 29 (3) (2011) 258–267.
26. Mawardi Amin. 2017. *"Development of Cost Estimation Model for Residential Building. International Journal of Civil and Structural Engineering Research* "ISSN 2348- 7607 (Online) Vol. 5, Issue 1, pp: (1-4), Month: April-Available at: www.researchpublish.com.
27. Meyer dan Miller, 2001. *Urban Transportation Planning Singapore*, McGraw-Hill International.
28. Molenaar, KR dan Songer, AD 1998, *Model for Public Sector Design and Build Project Selection*, Journal Construction Engineering Management.
29. Mladen Radujkovića,2017.*"Project Management Success Factors"*, Creative Construction Conference, Primosten, Croatia.
30. Pasaribu, C Theresia*." Asas-Asas Hukum Agraria"*http://www.hukumproperti.com/20

13/11/06/asas-asas-hukum-agraria/ [Accessed 22 th September 2015].
31. Ovie Lativatul Khofiyah,2019" *Pengaruh Pembebasan Tanah terhadap Keterlambatan Proyek Pembangunan Jalan Tol Studi Kasus: Jalan Tol Cinere-Jagorawi Seksi II B*" Media Komunikasi Teknik Sipil, Volume 25, No. 2, 2019, 191-198.
32. Peraturan Presiden No. 76 tahun 2006 tentang Perubahan atas Peraturan Presiden No. 36 tahun 2005 tentang Pengadaan tanah dalam pelaksanaan pembangunan untuk kepentingan umum.
33. Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia Nomer 19/PRT/M/2015 Tentang: *"Standar dan Pedoman Pengadaan Pekerjaan Konstruksi Terintegrasi Rancang dan Bangun (Design and Build)."*
34. Prof.DR.Sugiyono.2018*"Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, dan Research and Development/ R&D),*cetakan ke 27, Bandung : Alfabeta.
35. *Project Management Body of Knowledge* (PMBOK® Guide),6th.
36. R. Adhiputra, Syahrizal, AP.Rambe." *Analisis Faktor Penyebab Keterlambatan Proyek Konstruksi Jalan Tol".*Departemen Teknik Sipil, Universitas Sumatera Utara (USU).
37. Rowlinson, S. (1988). *An analysis of factors affecting project performance in industrial buildings with particular reference to design build contracts (with particular reference to Design Build contracts)* by Stephen M. Rowlinson Hong Kong, 1988 Thesis submitted in fulfillm.
38. Ruang bebas dan jarak bebas minimum pada Saluran Udara Tegangan Tinggi (SUTT) dan Saluran Udara Tegangan Ekstra Tinggi (SUTET), SNI. 04-6918-2002
39. Sarwono Hardjomuljadi.2014 *"Analisis "Extension of Time" dan Dampaknya pada Kontrak Konstruksi*" (FIDIC Conditions of Contract MDB Harmonised Edition).Vol 5, No. 2. Jurnal Konstruksia.
40. Sarwono Hardjomuljadi.2016. *"Variation Order, The Causal or The Resolver of Claims and Disputes in The Construction Projects".*Vol 11, No. 14. International Journal of Applied Engineering Research ISSN 0973-4562.
41. Sarwono Hardjomuljadi, dkk. 2015, Yellow Book: "*Persyaratan Kontrak untuk Instalasi dan Rancang Bangun"*.
42. Sarwono.H. 2011*"Project Risk Management in Hydropower Plant Projects: a Case Study from the State- Owned Electricity Company of Indonesia."*
43. Shankar, N. R., Raju, M. M. K., Srikanth, G., & Bindu, P. H. (2011). *Time, Cost and Quality Trade-off Analysis in Construction of Projects*. Contemporary Engineering Sciences, 4(6), 289-299.
44. SMK3 - Sistem Manajemen Kesehatan & Keselamatan Kerja,Dasar Hukum :Peraturan Pemerintah No. 50 Tahun 2012.
45. Suhartono.2008 *"Kasus SUTET di Indonesia: Kajian dari Aspek Epidemiologi"*. Vol 36. No 4: 145-155, Buletin Penelitian Kesehatan.
46. Sudaryono. 2017. Metodologi Penelitian. Edisi 1. Jakarta: Rajawali Pers.
47. Syaiful Azhari Siregar.*"Analisi Sistem Manajemen Keselamatan Kesehatan Kerja (SMK3) pada Proyek Kereta." (Studi Kasus: Pembangunan Fly over Jalur Kerta Api Medan-Kualanamu).*
48. Toni Alam." Identifikasi Faktor-Faktor Risiko Proyek Rancang Bangun (Design and Build) Pada Pt. Xyz Yang Berpengaruh Terhadap Kinerja Waktu."
49. Undang-undang Republik Indonesia No.5 Tahun 1960 Tentang: *"Peraturan Dasar Pokok-Pokok Agraria"*.
50. Undang-Undang Republik Indonesia Nomor 2 Tahun 2012.
51. W.B. Sudirman, Sarwono.H. *"Project Risk Management in Hydropower Plant Projects: a Case Study from the State- Owned Electricity Company of Indonesia.'*
52. W. Baker and H. Reid, *Identifying and Managing Risk*, Frenchs Forest, N.S.W.:Pearson Education, 2005.

How to cite this article: Kaelan S, Bintoro BPK, Nugroho RE. Analysis of the factors causing delay in completion of Light Rail Transit (LRT) project on Cawang-East Bekasi. International Journal of Research and Review. 2020; 7(10): 356-368.

******