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RESEARCH ARTICLE

THE APPLICATION OF STRUCTURAL EQUATION MODEL TO IMPROVE THE PERFORMANCE OF TIME IN CONSTRUCTION PROJECT

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ABSTRACT

The implementation of the Breeze Tower Apartment Project, South Tangerang, Indonesia, especially for Architecture work that was delayed due to the owner's shop drawing investigation was not compliance with the plan, only 77 percent of the total work was completed. Based on that, this research needs to be done to determine alternatives to improve the project time performance by analyzing the causes of the project delay so that losses caused by delays can be minimized. To find out the alternative solutions to improve project time performance towards the most dominant caused of delay where the research was conducted at the Breeze Tower Apartment Project, South Tangerang, Indonesia. Modeling for this research using the software SEM SMARTPLS 3.0. version. Based on the analysis of structural models or path analysis in SEM Smart PLS, it was found that the most dominant cause of delay was the value of the path coefficients between the independent variables and the dependent variable with a value of 0.548, namely design and documents. Based on the results of expert validation, alternative solutions in increasing project time performance against the most dominant caused of delay are designs mat should go through a number of discussion processes to finalize the design, and the design planner must have a comparable design publishing target and in accordance with the target of carrying out the work by proposing the changes to the new design that most relevant to the field conditions, and includes analysis on each alternative design change. This research is limited to reviewing the causes of project delays, especially in architecture work that affects the time performance of the Breeze Tower Apartment Project, South Tangerang, Indonesia. The substance of the study describes 4 factors including material, equipment, environment, human resources to review the most dominant causes of project delays. Quantitative analysis in this study uses SEM Smart PLS tools where the studies raised will focus on architecture work to obtain the alternative solutions to improve the project time performance towards the most dominant causes of delay where this research is carried out on the Breeze Tower Apartment Project, South Tangerang Indonesia.

KEYWORDS

The Performance of Time, Project, Cause of delay, SEM SMART PLS.

1. INTRODUCTION

In the implementation of a construction project, problems often arise which ultimately result in project delays. According to Kusjadmikahadi in Chandra and Putra (2017), project delays have been planned and listed in the contract document. To produce a project that can be completed in a timely manner, it requires wisdom in making decisions or trying to minimize delays by avoiding mistakes in project development work. Therefore, a study is needed to identify the indicators that cause project delays.

One of the buildings that are experiencing delays, especially in architectural work, is the Bintaro Plaza Residence 2 (Breeze Tower) Apartment Project, located in South Tangerang. It can be said to be late because based on the initial plan, the architectural work of the project should have been completed by the end of December 2018. However, due to the late inspection of the shop drawing by the owner until the end of December 2018, the architectural work of the project was only completed by 77 percent (weight = 43.4597%) of the total architectural work so that the delay in architectural work that occurs is 23 percent (weight = 13.1882%).

Table 1: Architectural Work Delay Weight Data

No.	Architectural Work	Plan. (%)	Real. (%)	Difference (%)	Ket
Architecture in Buildings					
1	Floor Coatings	4,9396	3,8566	1,083	Delay
2	Wall	12,5758	11,3978	1,178	Delay
3	Ceiling	5,6684	3,4753	2,1931	Delay
4	Doors and windows	13,9981	10,145	3,8531	Delay
5	Sanitair	6,1795	3,8638	2,3157	Delay
6	Stairs and Railing	2,3567	1,5447	0.812	Delay
7	Etc	10,6595	8,9637	1,6958	Delay
Outdoor Architecture					
1	Finishing Ramp	0.0892	0.0782	0.011	Delay
2	Parking jobs	0.1811	0.1346	0.0465	Delay
Total		56,6469	43.4597	**13,1882**	Delay

Source: Project data and author's compilation, 2019

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Based on the above explanation, research is needed to analyze the causes of architects' delay in the construction project so that losses caused by delays can be minimized. Therefore, the author will conduct research with the title "Identification of Indicators of Causes of Delays in Apartment Projects in Architectural Work" (Case Study: Bintaro Plaza Residence 2 Apartment Project (Breeze Tower), South Tangerang) using the Structural Equation Modeling (SEM) method to determine a dominant indicator of the causes of project delays. SEM itself is a method used to cover weaknesses in the regression method. A number of studies have been carried out using the PLS approach with smartPLS version 3.0 software.

1.2 Identification of Problems

Based on the background described above, the problems that can be identified are as follows:

a. Project implementation was delayed, not in accordance with the initial plan.

b. The owner's delay in shop drawing inspection.

c. Many design changes in architectural work cause delays in the implementation of architectural work.

1.3 Research Question

Based on the problems that exist in the background above, what will be examined in this study includes:

a. What indicators cause delays in architectural work on the Bintaro Plaza Residence 2 (Breeze Tower) apartment project?

b. What is the most dominant indicator that causes architectural work delays in the Bintaro Plaza Residence 2 (Breeze Tower) apartment project?

c. What is the alternative solution for the completion of the dominant indicator of the delay in architectural work in the Bintaro Plaza Residence 2 (Breeze Tower) apartment project?

1.4 Benefits of Research

The benefits of this research are:

a. For the author, it is very useful to add insight and knowledge about the delay in completing architectural construction project work.

b. For construction service providers, it can be a reference or example to avoid or prevent delays in completing project architectural work.

c. For students, this research can be a reference for conducting research on the delay in completing architectural work in a construction project.

1.5 Restricting the Problem

To limit the extent of this research discussion and to make it more focused and run well, it is necessary to make a problem boundary. The scope of the problems that will be discussed in this study are:

a. The object of the research study is the Bintaro Plaza Residence 2 (Breeze Tower) apartment project.
b. The performance reviewed is the time performance on the Bintaro Plaza Residence 2 (Breeze Tower) apartment project.
c. The work limitation reviewed is architectural work, which results in delays in architectural work on the Bintaro Plaza Residence 2 (Breeze Tower) apartment project.

2. LITERATURE REVIEW

2.1 Construction Project

In a construction project, both road construction work and other construction work, there are various activities carried out by people involved in the project itself. According to Palulun (2017), project activity can be defined as a temporary activity that takes place within a limited period of time, within the allocation of certain funding sources, and is intended to carry out tasks whose goals have been clearly outlined.

2.1 Project Delay

According to Bakhtiyar, et al (2012), delays will cause losses to related parties, especially owners and contractors, because they are generally accompanied by conflicts, demands for time and costs, as well as deviations in the quality of project completion.

The contractor will be subject to penalties in accordance with the contract, in addition, the contractor will also experience additional overhead costs during the project. From the owner's point of view, project delays will result in reduced income due to delays in operating the facilities.

2.2 Architectural Work in Breeze Tower Apartment Project

Based on S Curve data from PT Jaya Properti, Tbk (2018), a list of architectural works contained in the Bintaro Plaza Residence 2 (Breeze Tower) apartment project, namely:

2.2.1 Architectural work in buildings

- Floor cladding
- Wall
- Ceiling
- Doors and windows
- Water sanitation
- Stairs and Railing
- Etc

2.2.2 Architectural work outside the building

- Finishing Ramp
- Parking jobs

2.3 Causes of Project Delay

This research examines the causes of delay described by Palulun (2017) and is grouped into 8 indicators, namely:

2.3.1 Labor Indicators (labors), consisting of:

- Shortage of labor
- Labor discipline
- Workforce motivation

2.3.2 Material indicators, consisting of:

- Lack of material
- Material changes in form, function, and specifications
- Late delivery of goods
- Damage to materials in storage
- Delay in the special fabrication of materials
- Scarcity due to the specificity
- Inaccurate order time

2.3.3 Equipment indicators, consisting of:

- Equipment malfunction
- Lack of equipment
- The Insufficient ability of the foreman or operator
- Equipment productivity
- Equipment management error

2.3.4 Financial indicators (financing), consisting of:

- Availability of finance during implementation
- Delay in the payment process by the owner
- There is no incentive money for the contractor, if the completion time is ahead of schedule
- National economic situation
- The fluctuation of the rupiah exchange rate against the dollar

2.3.5 Indicators of change (change), consisting of:

- There was a design change by the owner
- Design mistakes made by planners
- Error in ground investigation
- Groundwater surface conditions in the field
- Geological problems on site

2.3.6 Scope indicators and contracts/contract documents, consisting of:

- The Conflict between contractors and consultants
- There is no cooperation between the contractor and the owner
- Owner delay in decision making
- Negotiations and agreements on contracts
- Job disputes between different parts of the project
- Poor organization of contractors and consultants

- Main contractor's control of subcontractors in the implementation of work

2.3.7 Indicators of Relations with the Government, consisting of:

- Obtained permission from the government
- Obtaining a workforce permit
- The convoluted bureaucracy of project operations

2.3.8 Time and Control Indicators, consisting of:

- Preparation of work schedules and revisions by consultants while construction is underway
- Inspection and testing procedures in the project
- Practitioner control signs on work within the project site
- Lack of trained personnel and management to support the implementation of contributions
- Problems that occur during implementation
- Does not meet the initial planning of the project
- Shop drawing preparation and permit
- Awaiting permission for material control

2.4 Structural Equation Modeling (SEM) Method

2.4.1 Definition of Structural Equation Modeling (SEM)

According to Husein in Chandra (2017), SEM is a method used to cover weaknesses in the regression method. In addition, SEM is grouped into two categories, namely Covariance Based (CBSEM) and Variance Based SEM which is better known as Partial Least Square (PLS). Furthermore, PLS uses the PLS Algorithm method which causes the assumption of normality to not be a problem. Thus, the use of small amounts of data samples can still be analyzed using PLS.

In general, the use of PLS is assisted by using smartPLS. In Indonesia, a number of studies on construction delays caused by various indicators have been conducted using the smartPLS software. The method used is multivariate statistics using a questionnaire instrument. The analysis was performed using SEM smartPLS analysis technique.

2.4.2 Partial Least Square (PLS) Measurement Model

Convergent validity with the reflective indicator, it can be seen from the correlation between the indicator score and the construct score. Individual indicators are considered valid if they have a correlation value above 0.70. However, at the research stage of scale development, loading 0.50 to 0.60 is still acceptable. By looking at the results of the correlation output between the indicator and its construct (Ghozali, 2014).

Discriminant validity Reflective indicators can be seen in the cross-loading between the indicators and their constructs by means of the PLS Algorithm report selecting discriminant validity and then cross loading. The results of cross-loading must show that latent constructs predict indicators in their block better than indicators in other blocks (Ghozali, 2014).

Average Variance Extracted (AVE) is another method for assessing discriminant validity by comparing the square root for each construct with the correlation between constructs and other constructs. To get the AVE value in the PLS Algorithm report, select Average Variance Extracted (AVE) then select a matrix. To assess the validity of the constructs by looking at the AVE value, a good model is required if the AVE of each construct is greater than 0.5 (Ghozali, 2014).

In addition to the construct validity, a construct reliability test was also carried out as measured by two criteria, namely composite reliability and Cronbach's alpha above 0.70. In the PLS Algorithm report select Composite reliability and Cronbach's alpha and then select the matrix (Ghozali, 2014).

Testing of the structural model is done by looking at the R-square which is a goodness fit model test. The amount of R-square value can interpret construct variability. Can be seen in the PLS Algorithm report select R-square (Ghozali, 2014). The next test is to see the significance of the influence between constructs by looking at the highest parameter coefficient value with t statistical significance value (t table = 1.96) with a significance level used α = 0.05 for measurement paths (Priyatno, 2013). In the Algorithm Bootstrapping report select path coefficients (Ghozali, 2014).

The amount of data for the sample <30 pieces, see the t-test table. While the amount of data ≥ 30 see the z test table (Singgih Santoso inhttps://www.spssindonesia.com, 2015) provided that when viewing the table the α value is divided by 2 due to a 2-sided test (Priyatno, 2013).

2.5 The Function of Structural Equation Modeling (SEM)

The functions of SEM include:

- Allows more flexible assumptions
- The use of affirmation factor analysis to reduce measurement error by having multiple indicators in one latent variable
- The attractiveness of the graphical modeling interface to make it easier for users to read the output of the analysis results

2.6 Variables in SEM

Latent variable, in SEM the key variable of concern is the latent variable. Latent variables are abstract concepts, for example: people's behavior, attitudes, feelings, and motivation. This latent variable can only be observed indirectly and imperfectly through its effect on the observed variable. SEM only has 2 types of latent variables, namely exogenous and endogenous (Wijanto, 2014)

Unobserved variables are variables that are observed or can be measured empirically and are often referred to as indicators. Unobserved variable is the effect or size of the latent variable. In the survey method using a questionnaire, each question on the questionnaire represents an observable variable (Wijanto, 2015)

3. METHODOLOGY

3.1 Research Samples and Instruments

3.1.1 Research Sample

The population in this study were employees who worked at PT Tatamulia Nusantara Indah as the main contractor in the Bintaro Plaza Residence 2 Apartment Development Project (Breeze Tower), which numbered around 40 people. Because of the large population, the authors will determine a sample that is considered to represent a smaller number of populations. The author uses the Slovin formula to determine the number of samples in this study, the Slovin formula is used for research with a very large population (Umar in Petra, 2014). The following is the Slovin formula:

$$n = \frac{N}{1 + Ne^2}$$

n = sample size
N = population size
e = percentage of inaccuracy or sample error rate

Sample size calculation:
The population in this study were employees who worked at PT Tatamulia Nusantara Indah as the main contractor in the Bintaro Plaza Residence 2 (Breeze Tower) Apartment Development Project, which numbered around 40 people, and the percentage of inaccuracy used was 10%.

$$n = \frac{40}{1 + (40(10/100)^2)} = 28{,}57 = 30$$

So, the sample taken is 30 people.

3.1.2 Research Instrument

A research instrument is a tool selected and used by the researcher in collecting data so that these activities become systematic and easy. For data collection in research using a questionnaire or interview.

3.1.3 Initial Expert Validation

The initial expert validation was carried out by conducting interviews with the Project Manager and Ass. Site Manager regarding the analysis of the causes for the delay in the architectural work of the Plaza Bintaro Residence 2 (Breeze Tower) apartment project, South Tangerang

Table 2: Early Stage Expert Data

Expert	Position	Experience	Education
1	Project Manager	12 years old	S1
2	Ass. Site Manager	2.5 years	S1
3	Jr. QS Engineering	4 years	S1

Source: Author's Process, 2018

3.2 Respondents Questionnaire

In this stage, the researcher conducted a respondent questionnaire by

taking respondent data from the Project Manager, Ass. Site Manager, Jr. QS Engineering, and all employees involved in the analysis of the causes of delays in architectural work on the Bintaro Plaza Residence 2 (Breeze Tower) apartment project.

In conducting this research using certain variables called latent variables or factors, where these variables are not measured directly but are measured through certain indicators or dimensions to be studied, generally in the form of a list of questions or questionnaires. In the question items, there are several alternative answers available with an ordinal scale (Likert scale), namely using a five-level scale according to the alternative answers (Danang Sunyoto in Rudi, 2018).

4. Result and Discussion

4.1 Results of Phase I Expert Validation

The first stage of the questionnaire data collection aims to answer finding indicators of the causes of delays in the Bintaro Plaza Residence 2 (Breeze Tower) apartment construction project. The first stage questionnaire is presented in tabular form with the points provided. Experts are asked to answer the questions in bullet points and fill in the additional fields provided.

From the results of data processing on the results of expert validation, there were 10 constructs of delay with 3 indicators each through the interview and project data analysis stages. The results of expert validation are presented in table 4.

4.2 Results of Respondents' Questionnaires

At this stage, data collection was carried out by giving or distributing questionnaires to 30 respondents.

Table 3: Construct Indicators

Variable	Indicator		Source
Related material (MAT) - X1	X1.1	Late delivery of materials	Field
	X1.2	Limited availability of materials in the market (import)	Field
	X1.3	Changes in specifications and material types	Field
Related machines (MAC) - X2	X2.1	Late delivery of materials and tools	Field
	X2.2	Availability of equipment	Field
	X2.3	Lack of equipment	Field
Environmental Related (LOC) - X3	X3.1	Job location difficulty level	Field
	X3.2	Location on a narrow perimeter area	Field
	X3.3	Project locations that are difficult to reach	Field
Related to HR (MAN) - X4	X4.1	Lack of labor availability	Field
	X4.2	Lack of technical/ skilled manpower	Field
	X4.3	Labor productivity	Field
Financial Related (MON) - X5	X5.1	Financial difficulties of the project owner	Field
	X5.2	Contract claims, such as an extension of time with expense claims	Field
	X5.3	Delay in the payment process by the owner	Field
Related design and documents (DDF) - X6	X6.1	Frequency of design changes	Field
	X6.2	Late design decisions	Field
	X6.3	There is a design change	Field
Related managerial (CSM) - X7	X7.1	Additional work	Field
	X7.2	Unrealistic contract duration	Field
	X7.3	Owner intervention	Field
Related to the relationship with the government (GOV) - X8	X8.1	Delays in obtaining permits from the government	Field
	X8.2	Delays in obtaining labor permits	Field
	X8.3	Increase in fuel	Field
Related to unexpected events (UNP) - X9	X9.1	There are cracks in the screed	Field
	X9.2	Main work delay	Field
	X9.3	Work accident	Field
Lateness (DEL) - Y	Y.1	Main work delay	Field
	Y.2	Delays in material procurement	Field
	Y.3	Image approval delay	Field

Source: Author's Process, 2019

4.2 Data analysis technique

The data obtained from the respondent's questionnaire were processed using the SEM smartPLS method. The following are the results obtained through the PLS Algorithm:

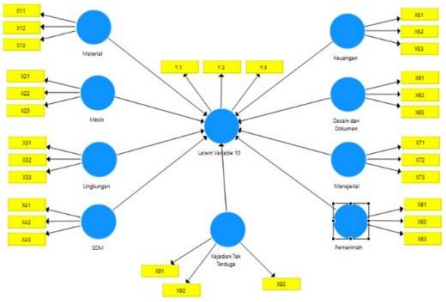

Figure 1: PLS Algorithm Results

(Source: Author's Process, 2019)

4.3 Validity test

4.3.1 Convergent Validity Test

Convergent validity (convergent validity) is the value of the loading factor on a latent variable with its indicators. The following are the results of data quality testing with the convergent validity test.

Table 4: Outer Loadings Values

Indicator	Loading Value	Result
X1.1	, 761	Valid
X1.2	, 881	Valid
X1.3	, 836	Valid
X2.1	, 958	Valid
X2.2	, 607	Valid
X2.3	, 943	Valid
X3.1	, 906	Valid
X3.2	, 769	Valid
X3.2	, 935	Valid
X4.1	, 680	Valid
X4.2	, 891	Valid
X4.3	, 864	Valid
X5.1	, 939	Valid
X5.2	, 738	Valid
X5.3	, 942	Valid
X6.1	, 660	Valid
X6.2	, 873	Valid
X6.3	, 903	Valid
X7.1	, 943	Valid
X7.2	, 956	Valid
X7.3	, 856	Valid
X8.1	, 890	Valid
X8.2	, 820	Valid
X8.3	, 917	Valid
X9.1	, 877	Valid
X9.2	, 852	Valid
X9.3	, 900	Valid
Y.1	, 916	Valid
Y.2	, 971	Valid
Y.3	, 894	Valid

Source: Author's Process, 2019

Based on the table above, it can be concluded that all indicators are valid because the loading value is greater than 0.5 (Ghozali, 2014). This means that the correlation between indicators and constructs or variables has a high reflection measure so that all indicators used in this study can be declared valid as measuring variables.

4.3.2 Discriminant Validity Test

The discriminant validity test is indicated by the cross loading value. Based on the results of cross-loading, where if the correlation value of the indicator is higher to the construct itself than the correlation of the indicator to other constructs, it can be concluded that the latent construct predicts the indicators on each indicator are better than the other indicators.

Based on the table above, it can be interpreted that it is known that each indicator has a cross loading (the measured variable) that is greater than the cross loading value of the other variables. Where if the correlation value of the indicator is higher to its own construct than the correlation of the indicator to other constructs, it can be concluded that the latent construct predicts the indicators on each indicator better than the other indicators. The cross loading value of each indicator X1.1, X1.2, X1.3 which is an indicator of the material cross loading value of 0.761, 0.881, 0.836 while X2.1, X2.2, X2.3 which are indicators that the machine has cross loading values of 0.958, 0.607, 0.943. X3.1, X3.2, X3.3 which are indicators of the environment have cross loading values of 0.906, 0.769, 0.935. Indicators X4.1, X4.2, X4.3 are indicators of HR having cross loading values of 0.800, 0.891, 0.864. Indicators X5.1, X5.2, X5.3 are indicators of finance that have a cross loading value of 0.939, 0.738, 0.942. Indicators X6.1, X6.2, X6.3 are indicators of the design and the document has a cross loading value of 0.660, 0.873, 0.903. Indicators X7.1, X7.2, X7.3 are managerial indicators that have a cross loading value of 0.943, 0.956, 0.856. Indicators X8.1, X8.2, X8.3 are indicators of the government having a cross loading value of 0.890, 0.820, 0.917. Indicators X9.1, X9.2, X9.3 are indicators of unexpected events that have cross loading values of 0.877, 0.852, 0.900. Indicators Y.1, Y.2, Y.3 are indicators of delay which have cross loading values of 0.916, 0.971, 0.894.

Table 5: Cross Loadings Values

	X6	X9	Y	X5	X3	X7	X1	X2	X8	X4	Ket
X1.1	0,119	0,295	0,483	0,108	0,182	0,210	**0,761**	0,339	0,132	0,103	Valid
X1.2	0,117	0,334	0,419	0,350	0,249	-0,252	**0,881**	0,377	0,185	0,308	Valid
X1.3	0,115	0,327	0,486	0,168	0,065	-0,261	**0,836**	0,352	0,015	0,089	Valid
X2.1	0,491	0,030	0,471	0,611	0,653	0,267	0,354	**0,958**	0,664	0,469	Valid
X2.2	-0,127	-0,019	0,192	0,332	0,314	-0,105	0,472	**0,607**	0,339	0,345	Valid
X2.3	0,604	0,121	0,590	0,659	0,689	0,395	0,386	**0,943**	0,713	0,520	Valid
X3.1	0,520	0,366	0,467	0,767	**0,906**	0,251	0,304	0,692	0,817	0,691	Valid
X3.2	0,454	0,313	0,389	0,701	**0,769**	0,432	0,065	0,490	0,739	0,503	Valid
X3.3	0,467	0,277	0,262	0,815	**0,935**	0,388	0,085	0,584	0,886	0,691	Valid
X4.1	0,314	0,292	0,239	0,770	0,754	0,058	0,024	0,439	0,680	**0,800**	Valid
X4.2	0,389	0,034	0,328	0,609	0,579	0,084	0,128	0,470	0,634	**0,891**	Valid
X4.3	0,297	0,219	0,361	0,520	0,511	0,245	0,279	0,405	0,495	**0,864**	Valid
X5.1	0,460	0,197	0,372	**0,939**	0,830	0,097	0,302	0,693	0,857	0,699	Valid
X5.2	0,192	0,203	0,299	**0,738**	0,613	0,144	0,149	0,334	0,680	0,551	Valid
X5.3	0,452	0,242	0,367	**0,942**	0,838	0,117	0,183	0,668	0,877	0,703	Valid
X6.1	**0,660**	0,260	0,342	0,487	0,477	0,337	-0,046	0,287	0,389	0,335	Valid
X6.2	**0,873**	0,413	0,556	0,414	0,586	0,435	0,108	0,406	0,454	0,355	Valid
X6.3	**0,903**	0,490	0,804	0,277	0,394	0,343	0,199	0,493	0,301	0,334	Valid
X7.1	0,462	0,120	0,238	0,083	0,325	**0,943**	-0,209	0,227	0,240	0,123	Valid
X7.2	0,380	0,092	0,226	0,157	0,392	**0,956**	-0,121	0,309	0,331	0,212	Valid
X7.3	0,368	0,267	0,216	0,130	0,389	**0,856**	0,025	0,298	0,307	0,132	Valid

Table 5: Cross Loading Value (Continue)											
	X6	X9	Y	X5	X3	X7	X1	X2	X8	X4	Ket
X8.1	0,432	0,271	0,304	0,833	0,914	0,274	0,074	0,532	**0,890**	0,675	Valid
X8.2	0,325	0,209	0,259	0,725	0,769	0,318	0,069	0,467	**0,820**	0,619	Valid
X8.3	0,387	0,078	0,390	0,855	0,785	0,258	0,176	0,807	**0,917**	0,687	Valid
X9.1	0,322	**0,877**	0,472	0,130	0,271	0,091	0,324	-0,031	0,070	0,079	Valid
X9.2	0,495	**0,852**	0,635	0,251	0,396	0,189	0,377	0,121	0,211	0,249	Valid
X9.3	0,457	**0,900**	0,596	0,238	0,308	0,154	0,309	0,079	0,217	0,194	Valid
Y.1	0,746	0,591	**0,916**	0,353	0,397	0,237	0,448	0,495	0,325	0,398	Valid
Y.2	0,687	0,677	**0,971**	0,438	0,499	0,260	0,580	0,535	0,433	0,430	Valid
Y.3	0,641	0,558	**0,894**	0,303	0,358	0,186	0,544	0,469	0,265	0,231	Valid

Sumber: Hasil Olahan Penulis, 2019

4.3.3 AVE test

Apart from being visible from the outer loading value, it can also be seen from the AVE value of the latent variables with the following results:

Table 6: AVE Value	
Variable	***AVE***
Design and Documents	, 672
Unexpected event	, 768
Lateness	, 860
Finance	, 772
Environment	, 762
Managerial	, 845
Material	, 685
Machine	, 725
Government	, 768
HR	, 668

Sourcer: Author's Process, 2019

Based on the table above, it can be concluded that all variables have an AVE value> 0.5 and are declared valid (Ghozali, 2014). Overall, the results of the AVE constructs of all indicators used in this study can be declared valid as a measure of the variable.

4.4 Reliability Test

4.4.1 Composite Reliability Test

The measurement of data reliability in this study uses composite reliability. A study has good composite reliability if the composite reliability value is> 0.7 (Ghozali, 2014). The following is the result of the data reliability test with the composite reliability test.

Table 7: Value of Composite Reliability	
Variable	***Composite Reliability***
Design and Documents	, 858
Unexpected event	, 908
Lateness	, 949
Finance	, 909
Environment	, 905
Managerial	, 942
Material	, 866
Machine	, 884
Government	, 908
HR	, 856

Source: Author's Process, 2019

Based on the table above, it can be concluded that all variables have a composite reliability value> 0.7, which overall the results of the outer model construct have met the requirements.

4.4.2 Cronbach's Alpha test

In addition to using the composite reliability value, you can also use the Cronbach's Alpha value with the following results.

Table 8: Cronbach's Alpha Value	
Variable	***Cronbach's Alpha***
Design and Documents	, 766
Unexpected event	, 850
Lateness	, 918
Finance	, 846
Environment	, 840
Managerial	, 907
Material	, 768
Machine	, 816
Government	, 851
HR	, 748

Sumber: Author's Process, 2019

4.5 Evaluation of Structural Relationship

The relationships between the structures are evaluated to determine the explanatory power of the model and the significance of the individual paths of the model.

Table 9: R-square value	
	R-square
Lateness	, 850

Source: Author's Process, 2019

Based on the table above, the R-square value of 0.850 can be concluded that the variable delay (Y) can be explained by the material (X1), machine (X2), environment (X3), HR (X4), financial (X5), design and documents (X6), managerial (X7), government (X8), unexpected events (X9) by 85%. While the remaining 15% is influenced by other variables not examined in this study.

4.6 Hypothesis Test Analysis

This hypothesis testing is used to determine the quality developed in the model, namely the effect of exogenous variables on endogenous variables.

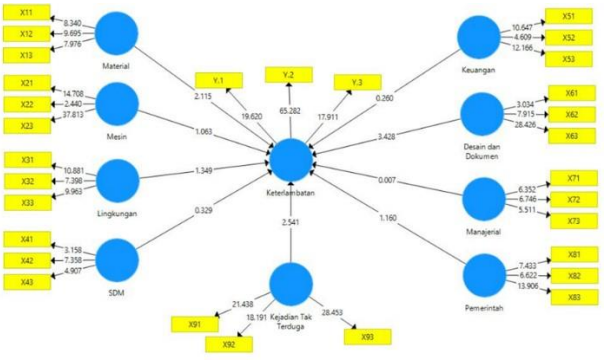

Figure 2: Bootstrapping Results

(Source: Author's Process, 2019)

4.7 Testing Path Coefficients

Testing path coefficients are used to test whether there is an effect of the independent latent variable on the dependent latent variable. The significance test can be found through the T-statistic which is greater than the critical value (t table = 1.96).

By using PLS and with bootstrapping calculations to test the hypothesis, the following values are obtained.

Table 10: Testing Path Coefficients	
	T-statistic
Material ➔ Lateness	2,115
Machine➔ Lateness	1,063
Environment➔ Lateness	1,349
HR ➔ Lateness	0.329
Finance➔ Lateness	0.260
Design and Documents ➔ Lateness	3,428
Managerial➔ Lateness	0.007
Government➔ Lateness	1,160
Unexpected event➔ Lateness	2,541

Source: Author's Process, 2019

Based on the table above, the results of the hypothesis test on the effect of the independent variable on the dependent variable are as follows:

a. Material,
   In the test results listed in the table, it can be seen that the material T-statistic value for delay is 2.115. The test results indicate that the T-statistic value> 1.96. This means that the material has an effect on delays.
b. Machine,
   In the test results listed in the table, it can be seen that the T-statistic value of the machine for delay is 1.063. The test results showed the T-statistic value <1.96. This means that the engine has no effect on delays.
c. Environment,
   In the test results listed in the table, it can be seen that the environmental T-statistic value for delay is 1.349. The test results indicate that the T-statistic value <1.96. This means that the environment has no effect on delays.
d. Human Resource,
   In the test results listed in the table, it can be seen that the HR T-statistic value for delay is 0.329. The test results indicate that the T-statistic value <1.96. This means that HR has no effect on delays.
e. Finance,
   In the test results listed in the table, it can be seen that the financial T-statistic value of delay is 0.260. The test results indicate that the T-statistic value <1.96. This means that finance has no effect on delays.
f. Design and documents,
   In the test results listed in the table, it can be seen that the T-statistic value of the design and documents for delay is 3,428. The test results indicate that the T-statistic value> 1.96. This means that the design and documents have an effect on delays.
g. Managerial,
   In the test results listed in the table, it can be seen that the managerial T-statistic value for delay is 0.007. The test results indicate that the T-statistic value <1.96. This means that managerial has no effect on delays.
h. The government,
   In the test results listed in the table, it can be seen that the government's T-statistic value for delay is 1.160. The test results indicate that the T-statistic value <1.96. This means that the government has no effect on delays.
i. Unexpected events,
   In the test results listed in the table, it can be seen that the T-statistic value of unexpected events to delay is 2.541. The test results indicate that the T-statistic value> 1.96. This means that unexpected events effect on delays.

4.8 Dominant Influence

The magnitude of the dominant influence can be seen from the value of the path coefficients between the independent variables and the dependent variable. The greater the value of the path coefficients, the more influential the construct will be (Ghozali, 2014).

Table 11: Testing Path Coefficients	
	Path coefficients
Material ➔ Lateness	0.308
Machine➔ Lateness	0.228
Environment➔ Lateness	-0,638
HR ➔ Lateness	0.075
Finance➔ Lateness	-0.133
Design and Documents ➔ Lateness	**0.548**
Managerial➔ Lateness	0.001
Government➔ Lateness	0.509
Unexpected event➔ Lateness	0.407

Source: Author's Process, 2019

Based on the table above, it can be concluded that the most dominant variables are design and documents at 0.548. This means that design variables and documents need to be considered and cause delays in architectural work in the Bintaro Plaza Residence 2 (Breeze Tower) apartment building project, South Tangerang.

4.9 Determining Alternative Solutions

To get an alternative solution to the dominant indicator of the delay in architectural work in the Bintaro Plaza Residence (Breeze Tower) apartment project, the researcher validates the expert where the expert is asked to answer questions in the points provided. In addition, experts are also asked to fill in additional columns for indicators and solutions if there are additional indicators and solutions. The expert in this study is the same as the initial expert validation. After the results of expert validation are obtained, the tabulation results are made to make it easier to process. From the results of data processing on the results of the final validation of the expert, there are 4 alternative solutions for the dominant indicators of delay. The results of expert validation are presented in the following table:

Table 12: The results of the final stage expert validation		
The dominant indicators of delay	Response	Alternative Solutions
Design and Documents	Agree with the results of the research analysis	1. The design must go through a number of discussion processes in order to finalize the design. 2. Designers must have a design publication target that is comparable and in accordance with the target of the work implementation. 3. Propose design changes that are most relevant to field conditions. Include an analysis of any design change alternatives.

5. CONCLUSION

Based on the results of the research and discussion, the following conclusions were obtained:

1. Indicators that cause delays in architectural work in the Bintaro Plaza Residence 2 (Breeze Tower) apartment project, South Tangerang are as follows:

Table 13: Indicators of the delay in implementing the Breeze Tower apartment project	
Construct	**Indicator**
Material - MAT (X1)	1. X1.1 - Delay in delivery of goods 2. X1.2 - Limited availability of materials in the market (import) 3. X1.3 - Changes in specifications and material types
Design and Documents - DDF (X6)	1. X6.1 - Frequency of design changes 2. X6.2 - Late design decisions 3. X6.3 - Design changes
Unforeseen Events - UNP (X9)	1. X9.1 - The screed is cracked 2. X9.2 - Delay in carrying out main work 3. X9.3 - Occupational accidents

Source: Author's Process, 2019

2. The most dominant indicator that causes delays in architectural work on the Bintaro Plaza Residence 2 (Breeze Tower) apartment project, South Tangerang is as follows:

Table 13: Dominant indicators of the delay in implementing the Breeze Tower apartment project

Construct	Indicator
Design and Documents - DDF (X6)	1. X6.1 - Frequency of design changes 2. X6.2 - Late design decisions 3. X6.3 - Design changes

Source: Author's Process, 2019

3. Alternative solutions to the dominant factors, namely design and documents, the causes of the delay in the implementation of the Bintaro Plaza Residence 2 South Tangerang apartment project, namely:

   a. Ideally, before further processing, the design work executor has gone through a number of discussion processes to finalize the building design. This is done so that at the time of field execution there will be only a few insignificant changes to the completion time of the work.

   b. Designers should have a design publication target that is comparable and in accordance with the implementation target and should not be rushed so that implementation is not hampered. This is done to minimize the potential for work implementation mismatches against the design.

   c. Propose design changes that are most relevant to field conditions.

   d. Include an analysis of each alternative design change proposal.

   e. PT Tatamulia Nusantara Indah continues to do reminding in the form of a letter to the owner to find out the progress of the design change.

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