

Project Performance in Infrastructure Development: Analysis of Time and Quality Control Against Budget Allocation

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ABSTRACT

Building construction projects often face major challenges related to time management and cost allocation. Cost overruns occur as a result of schedule delays or poor time planning. Managing time well can help reduce cost overruns and improve operational efficiency in construction projects. Project delays often cause additional costs or cost overruns, either due to the use of additional resources or due to the impact of delays on other factors. To determine the magnitude of the influence of Project Performance in Infrastructure Development, the variance extracted for time is 0.646, quality 0.867, budget 0.918, and infrastructure development 0.726, it can be concluded that too much budget is needed to meet rapid development. This cost overrun often has a significant impact on project success, both in terms of finance and the quality of the final result. This occurs due to project delays, which are caused by ineffective time management. In the construction industry, time and cost are two very important and interrelated factors.

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INTRODUCTION

According to (Siswanto, 2019), time and cost deviations frequently occur in construction projects. Therefore, control is needed as a method to accurately monitor and indicate the project's condition. Essentially, the project time and cost control process aims to ensure good performance at every stage of work implementation in accordance with the project planning guidelines. A form of project progress reporting is essential so that work productivity against the planned schedule and costs can be objectively recorded, documented in detail, and accounted for by each project participant. Project time or schedule control is the process of monitoring the status of project activities to determine project progress. Meanwhile, project cost control is the process of monitoring the status of project costs to determine project costs during the project. The primary benefit of both processes is providing a way to identify cost or schedule deviations from the initial plan so that appropriate and preventative measures can be taken to minimize potential risks.

The use of cost, time, and quality are key factors in successful project management. A

construction project is considered unsuccessful if it is not completed according to schedule or budget estimates. Cost overruns are considered a global challenge to project success. The key to any successful project is completion within the allotted timeframe, within the projected budget, and with high-quality projects, regardless of scope. There are six major factors responsible for cost overruns: variation orders, lack of a clear vision and good site management, delays between the procurement and design phases, force majeure, inexperienced design teams, and work suspensions. Conversely, the top six factors responsible for delays are variation orders, inexperienced design teams, shortages of construction materials in the market, delays in finishing work, work suspensions, and lack of proper supervision and site management.

Another impact arises when schedule overruns occur. This presents significant and frequent challenges in construction management, leading to delays, increased costs, and consequent impacts on project outcomes. There are risks associated with cost overruns on construction projects. A comparison between the private and public sectors clearly shows that the impact of factors contributing to cost overruns differs between the two sectors. Where working conditions permit, labor market availability significantly impacts construction duration and the risk of delays. A tight labor market increases delays by more than 50%, while a loose labor market makes large projects more resistant to delays. Twelve factors significantly contributing to schedule overruns were identified by analyzing the COVID-19 pandemic by scale (small, medium, and large), project type (public, private, and mixed public-private), and organization (contractor, subcontractor, owner, and consultant).

DATA ANALYSIS AND PROCESSING

Data analysis is conducted after the data collection process, with the next stage being the data analysis process. This analysis is conducted based on data obtained from questionnaires and observations. In general, a research method is defined as a scientific way to obtain data for a specific purpose and purpose. The entire research activity is designed to follow the flowchart described previously. The stages of this research methodology can be explained as follows:

The appropriate and ideal sample size for Structural Equation Model (SEM) analysis using AMOS software is 100–200 samples using the Maximum Likelihood (ML) estimation technique. The sample size is determined within a range of 5–10 times the number of parameters or indicators in a research model. The number of indicators in this research model is 16. Therefore, the sample size used is 10 times the number of indicators, i.e. $(16 \times 10) = 160$ samples. The data collection technique in this study was carried out by distributing questionnaires to respondents.

METHOD

Population and Sample

Population is a generalized area consisting of certain characteristics or qualities that have been determined by researchers to be studied. Population in scientific research also refers to the term to mention a group or group of objects that are the target of research. In this study, the population is employees who work in the production department at the Company, totaling 270 people. In this study, the Slovin formula is used because the population size can be known and the use of a value of 5% because of the high population value. Based on the determination

of the sample using the Slovin technique formula, the sample size (n) is obtained as many as 160 respondents.

DATA COLLECTION TECHNIQUE

Primary Data

Primary data is data obtained directly from the source, namely data obtained from respondents through questionnaires containing statements regarding matters relating to Leadership Style, Relationships between Employees, and Working Conditions.

Data Sekunder

Secondary data is data obtained from other parties, while the respondents, in this case the company being researched, are the respondents. Secondary data includes employee numbers, company overview, organizational structure, job descriptions, etc.

Secondary Data

Data analysis in this study was conducted in accordance with the type of data processing performed and compiled for research purposes. This study used a Likert scale. This scale is used to measure the attitudes, opinions, and perceptions of an individual or group of people regarding social phenomena. In this study, these have been specifically determined by the researcher, hereinafter referred to as research variables.

Table 3.1 Likert Scale Measurement Table

No.	Description		Scale
1	Strongly Agree	SS	4
2	Agree	S	3
3	Disagree	TS	2
4	Strongly Disagree	STS	1

Data Processing Techniques

Descriptive statistics are used to provide information about the characteristics of research variables and respondent demographics. Descriptive statistics relate to the description of data and its characteristics. Using descriptive statistics, we can identify data classification, central tendency, and dispersion, as well as present data in various graphical formats.

Data analysis

In this study, the data analysis tool used is SEM (Structural Equation Modeling) which is operated using AMOS 24 software. This analysis is used to test the influence of Leadership Style, Relationships Between Employees, and Working Conditions on Employee Performance significantly.

HASIL DAN PEMBAHASAN

CFA Test

Validity testing using Confirmatory Factor Analysis (CFA), or construct (indicator) validity testing, aims to measure whether a construct (indicator) is capable of reflecting its latent variable. Validity testing using confirmatory factor analysis is conducted to test the unidimensionality of the dimensions that form each latent variable.

An indicator can be declared valid if it is truly capable of measuring a particular construct. This is indicated by the Critical Ratio (CR) of the regression weight being greater than 2.0 and the p-value being less than 0.05 (Ghozali, 2014).

Table 4.1 Confirmatory Factor Analysis (CFA) Validity Test Results

			Estimate	S.E.	C.R.	P	Label
GK1	<---	GK	1				
GK2	<---	GK	0,62	0,107	5,785	0,000	par_1
GK3	<---	GK	0,638	0,107	5,938	0,000	par_2
GK4	<---	GK	0,804	0,135	5,935	0,000	par_3
GK5	<---	GK	0,974	0,119	8,19	0,000	par_4
GK6	<---	GK	0,956	0,15	6,366	0,000	par_5
HAK1	<---	HAK	1				
HAK2	<---	HAK	1,046	0,149	7,014	0,000	par_6
HAK3	<---	HAK	1,384	0,324	4,269	0,000	par_7
HAK4	<---	HAK	1,376	0,295	4,667	0,000	par_8
KK1	<---	KK	1				
KK2	<---	KK	1,034	0,118	8,736	0,000	par_9
KK3	<---	KK	0,782	0,126	6,199	0,000	par_10
KK4	<---	KK	0,695	0,106	6,535	0,000	par_11
KKN1	<---	KKN	1				
KKN2	<---	KKN	1,332	0,235	5,674	0,000	par_12
KKN3	<---	KKN	1,08	0,223	4,841	0,000	par_13
KKN4	<---	KKN	1,163	0,219	5,322	0,000	par_14
KKN5	<---	KKN	1,114	0,217	5,141	0,000	par_15
KKN6	<---	KKN	1,455	0,254	5,722	0,000	par_16

Source: OutputAMOS

From Table 4.1, the construct variables X and Y have a significant regression weight with a value above 2.0 with a p value smaller than 0.05. Thus, it can be stated that all indicators that form the construct variables X and Y can be declared valid.

AVE test

Validity Test with Average Variance Extracted (AVE) Test, which is a confirmatory test by looking at the average of the variance extracted between indicators of a latent variable. It meets the requirements if $AVE > 0.5$.

Table 4.2 Results of the Validity Test of Average Variance Extracted (AVE)

Variable	NilaiAverageVarianceExtracted(AVE)
Time (GK)	0.646
Quality (HAK)	0.867
Budget (KK)	0.918
Infrastructure Development (KKN)	0.726

Source: OutputAMOS

In table 4.2, the AVE results in this study are all > 0.5 . Thus, it can be stated that all indicators that form the variable construct can be declared valid.

Discriminant Validity

Discriminant validity measures the extent to which a construct is truly distinct from other constructs. A high discriminant validity value provides evidence that a construct is unique and capable of capturing the phenomenon it is intended to measure. Discriminant validity is tested by comparing the square root of the Average Variance Extracted (AVE), or $\sqrt{\text{AVE}}$, with the correlation values between constructs.

Table 4.3 Results of Validity Test with Discriminant Validity Test

Correlation between indicators and the square root of AVE				
	GK	HAK	KK	KKN
GK	0.646			
HAK	0.618	0.867		
KK	0.525	0.395	0.918	
KKN	0.383	0.186	0.505	0.726

Source: Output AMOS

In table 4.3, the results of the Discriminant Validity Test show that the square root value of AVE is higher than the Correlation Value between Latent Variables, this shows that the indicator (construct) is truly different from other indicators (constructs).

Construct Reliability Test

Construct Reliability is a measure of the internal consistency of the indicators of a formed variable that shows the degree to which each indicator indicates a general formed variable. A research instrument is declared reliable if the acceptable limit value of the reliability level is construct reliability > 0.7 . While reliability of $0.6 - 0.7$ is still acceptable (Ghozali, 2014). Based on the results obtained, the reliability coefficient value of all variables gets a value above 0.7 , it is stated that the research instrument is reliable.

Confirmatory Factor Analysis

The SEM analysis in this study was conducted using a two-stage approach (Two-Step Approach). The first stage involved respecifying a full model as a Confirmatory Factor Analysis (CFA) model to obtain an acceptable CFA model for each exogenous and endogenous construct. A CFA model is acceptable if it has good data fit, model validity, and reliability.

The second stage of the Two-Step Approach is to combine the accepted CFA models of the exogenous and endogenous constructs into a single overall model (full model). This is then estimated and analyzed to assess overall model fit and evaluate its structural model, resulting in an acceptable full model. Confirmatory factor analysis is designed to test the unidimensionality of a theoretical construct. This analysis is often referred to as testing the validity of a theoretical construct. The latent variables used in this study are formed based on theoretical concepts with several indicators or manifest variables.

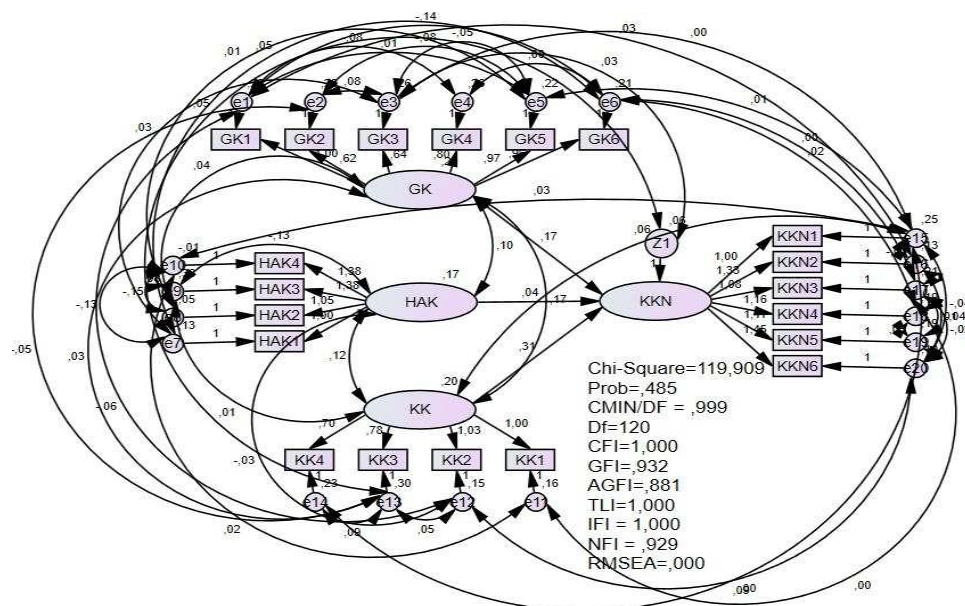


Figure 4.1 Structural Equation Model Output

Based on Figure 4.1, the output of the AMOS program for the goodness-of-fit test of the structural model produces the following goodness-of-fit indices:

Table 4.4 Goodness of Fit Confirmatory Factor Analysis

Goodness of fit indeks	Cutoff Value	Hasil	Keterangan
ChiSquare	X ² tabel d f (0.05,381) = 428	119,9	Fit
Probability	≥0.05	0.485	Fit
RMSEA	≤0.08	0.000	Fit
GFI	≥0.90	0.932	Fit
AGFI	≥0.90	0,881	Marginal
CMIN/DF	≤2.00	0,999	Fit
TLI	≥0.90	1,000	Fit

CFI	≥ 0.95	1,000	Fit
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Sumber : Output AMOS

Based on Table 4.4 Goodness Of Fit Confirmatory Factor Analysis above, the values of Chi-Square, probability, DF, GFI, AGFI, TLI, CFI, RMSEA are known. Chi-Square has a value of 119.9, so the theoretical model and sample model are said to be appropriate because the smaller Chi-Square indicates that the input covariance matrix between predictions and actual observations is not significantly different. The probability value is 0.485 and df is positive at 0.999. This means that the hypothesized model has fit the observation data. The model's suitability is also supported by the value of GFI = 0.932, AGFI = 0.881, TLI = 1.000, CFI = 1.000 and the RMSEA value of 0.000.

CONCLUSION AND SUGGESTIONS

Conclusion

Based on the data analysis, the author concludes several things based on the author's calculations, as follows:

1. To determine the magnitude of the influence of Project Performance on Infrastructure Development, the test results show that the magnitude of Time and Quality Control on Budget Allocation has a very significant relationship.
2. To determine the magnitude of the influence of Project Performance on Infrastructure Development, the variance extracted for time is 0.646, quality 0.867, budget 0.918, and infrastructure development 0.726. It can be concluded that too much budget is needed to meet rapid development.

Suggestion

The researcher would like to offer suggestions for students who wish to conduct further research. The following are recommended:

1. Field observations should be conducted over a period of one month or four weeks to obtain complete results.
2. Variables should be identified by problem indicators and suitability factors in each question. The AVE value should be lower after the construct test.

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