

## Factors Affecting Variation Orders in the Construction Project of Antasari Place Jakarta Apartment

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### ABSTRACT

*A Variation Order is a modification of the contract content that has been agreed at the pre-implementation stage. Variation Order often occurs in a construction project and has the possibility to have a positive or negative impact on the project implementation time. In the implementation of the Antasari Place Jakarta apartment construction project, there are 22 site instructions as an order for Variation Order work. In identifying factors affecting the Variation Order in this study, a questionnaire that has been validated by experts was used. This study identified 21 factors from the aspects of construction, administration, parties involved, and others that affect the Variation Order on the Antasari Place Jakarta Apartment construction project, with the most dominant factor affecting the Variation Order is the addition of work scope. Ranking of the most dominant factors using the Relative Importance Index (RII) method and ranked three factors with the highest RII values, namely due to the addition of the scope of work with an RII score of 0.900, design changes from planning with an RII score of 0.680, and changes in the scope of work at the construction implementation stage with an RII score of 0.620. The Variation Order work in the Antasari Place Jakarta Apartment construction project has no impact on the final completion time of the project contract because the project implementation has not entered the critical trajectory of the implementation time and is carried out during slack time.*

**Keywords:** Variation Order; Time; Contract.

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### INTRODUCTION

Every construction work package undertaken within a project should have undergone an extensive series of stages prior to reaching the implementation phase. At a minimum, a project goes through feasibility study, clarification, design, procurement, execution, and subsequently proceeds to maintenance and pre-operational preparation stages. [1]. The extended phases and distinctive nature inherent in a project often give rise to challenges that necessitate the implementation of work modifications. These modifications manifest as additions or reductions in tasks, termed Variation Orders. Variation Orders entail alterations to the agreed-upon contract content established prior to the implementation phase. [2]. Within the realm of construction activities, Variation Orders are a frequent occurrence in construction projects [3]. Although a common aspect of construction projects, Variation Order tasks hold the potential to yield both positive and negative impacts for both contractors and owners.

The direct impacts of Variation Orders encompass changes in the cost of work items linked to alterations in work volume and materials, rework, increased labor costs, as well as the emergence of schedule conflicts. [4]. Potential factors influencing the project timeline originate from labor, materials, equipment, and working capital. [5]. Variation Order tasks, whether involving additional or reduced work, are also influenced by the aforementioned factors, thus changes in tasks within a project can impact the planned timeline and potentially lead to delays.

In the execution of the Antasari Place Jakarta project, there were 22 site instructions issued as directives for the implementation of Variation Order works. Variation Order tasks in the Antasari Place Jakarta Apartment project are influenced by specific factors that require analysis. Therefore, the research objectives are established as follows:

1. Identifying the factors causing the occurrence of Variation Orders in the construction project of Antasari Place Jakarta apartment.
2. Identifying the dominant factors contributing to the occurrence of Variation Orders in the construction project of Antasari Place Jakarta apartment.
3. Analyzing the impact of Variation Order works on the timeline of the construction project of Antasari Place Jakarta apartment.

The outcomes of this study aim to ascertain the factors influencing Variation Orders in the Construction Project of Antasari Place Apartments Jakarta, along with ranking the most dominant factors in their influence. Additionally, this study seeks to examine the impact of Variation Order works on the project's timeline.

This study also draws upon prior research, distinguishing itself by incorporating an analysis of the impact of Variation Order works on the project timeline. This is achieved through interviews with key informants responsible for issuing task assignment letters for Variation Order execution in the Antasari Place Jakarta Apartment construction project..

## **METHODS**

This study was conducted at the Antasari Place Jakarta Apartment construction project, a mixed-use building consisting of 2 towers, each with 33 floors and 5 basement levels. The research was carried out from March 1, 2023, to July 31, 2023. The research strategy employed for this study is a survey strategy. The survey method involves gathering data from specific locations, with researchers implementing procedures in data collection, such as utilizing questionnaires, tests, structured interviews, and similar methods. [6]. This research employs a data collection tool in the form of a questionnaire, which is a data gathering technique involving presenting a set of written questions or statements to respondents for their responses. [7]. The acquired data will be processed using the assistance of IBM SPSS Statistics 26, Microsoft Word 2019, and Microsoft Excel 2019 applications.

The population for this research involves employees working in relevant institutions associated with the implementation of the Antasari Place Jakarta Apartment construction, including employees from the owner's side, Construction Management consultants, main contractors, and some Direct Contractors affected by Variation Order works. To narrow down the population scope and obtain more accurate results, the research sample is determined to be employees from related parties whose highest educational qualification is at least a high school diploma or equivalent. Additionally, interviews targeting the leadership of the construction management team responsible for issuing Site Instruction documents as directives for Variation Order execution are conducted to understand the impact of Variation Order works on the project

timeline in the construction of Antasari Place Jakarta Apartments.

### **Research Stages**

To achieve the desired research objectives, the following outlines the explanation of the research stages employed in this study:

1. Preparation

The first stage is the preparation phase, involving the structuring of the activity framework to ensure the research can be carried out effectively and efficiently. Activities encompass surveying the research location, identifying and formulating research problems, and determining the necessary data for the study.

2. Literature Review

After formulating the research plan, the next step involves conducting a literature review by reading and studying reference books and journals related to the causes of Variation Orders in construction projects. This literature review activity is aimed at deepening understanding of the theoretical aspects underlying the preparation of this thesis.

3. Data Collection

The required data is categorized into two types: primary data and secondary data.

a. Primary Data

Primary data for this research includes validation sheets for questionnaires, ranking questionnaires for factors, and structured interviews with informants to understand the impact of Variation Orders on the project timeline. The research questionnaire is evaluated using a Likert scale ranging from 1 to 4, reflecting respondents' perceptions of the influence of factors affecting Variation Orders in the Antasari Place Jakarta Apartment construction project. The numbers 1 through 4 correspond to "Not Influential at All," "Slightly Influential," "Moderately Influential," and "Highly Influential," respectively.

b. Secondary Data

Secondary data in this study consists of Site Instruction documents as work orders and evidence of Variation Order tasks, as well as Master Schedule documents to observe the project's implementation timeline.

4. Data Verification

The collected data is thoroughly checked for completeness before proceeding to the subsequent analysis stage.

5. Data Analysis and Discussion

The previously processed data is analyzed in accordance with the issues to be addressed. IBM SPSS Statistics 26 software is employed to determine validity, research instrument reliability, and to rank the most dominant factors influencing Variation Orders. After conducting the analysis and obtaining valid, reliable, and ranked factors, a descriptive discussion is carried out to provide the researcher's responses and insights.

6. Conclusion and Recommendations

This stage involves summarizing the factors influencing Variation Orders in the construction project of Antasari Place Apartments Jakarta. It also concludes the most dominant influencing factor and outlines the impact on the project's timeline resulting from Variation Orders. Additionally, recommendations are provided for enhancing the management of Variation Orders in similar construction projects.

### **Data Collection Techniques**

Primary data collection is conducted based on literature and document studies, which will

subsequently be used to draft a questionnaire. This questionnaire will be validated by experts before being distributed to the predetermined sample respondents. On the other hand, secondary data is obtained from project-related data and documents.

In accordance with the literature study, the researcher identified the factors influencing Variation Orders in the construction project of Antasari Place Apartments Jakarta. These factors were compiled into a preliminary questionnaire (Table 1) before undergoing validation by experts.

Table 1: Factors Influencing Variation Orders Before Validation

Aspect	Code	Factors
Construction Aspect	A.1	Work scope addition
	A.2	Change in working method
	A.3	Significant discrepancies in volume between drawings, site conditions, and bill of quantity
	A.4	Design changes
	A.5	Imperfect design during planning
	A.6	Completed work alterations
	A.7	Work scope changes during construction implementation
	A.8	Safety considerations
	A.9	Actual site conditions differing from planned site conditions
Administration Aspect	B.1	Unclear contract clauses
	B.2	Material specification changes
	B.3	Incomplete contract
	B.4	Unclear technical specifications in Work Specifications, Bill of Quantity, and tender drawings
	B.5	Temporary contract suspension
	B.6	Owner's delays in approving drawings, contract design, and clarifications
Involved Parties Aspect	C.1	Internal constraints from the owner
	C.2	Project owner's request for space optimization
	C.3	Poor performance by third parties
	C.4	Unskilled labor force
Other Aspects	D.1	Material price escalation
	D.2	Work delays due to certain reasons
	D.3	Additional requirements due to functional changes
	D.4	Errors due to planning oversight in unforeseen events

### Data Analysis Method

In analyzing the instruments in the questionnaire, validity testing, reliability testing, and the Relative Importance Index (RII) are employed. Validity testing is a measure that indicates the level of reliability or validity of a measurement tool. A measurement tool with low validity implies it lacks accuracy [6]. Reliability testing is conducted to determine the consistency or stability of measurement results when the instrument is used again as a measurement tool for a respondent. [6]. The Relative Importance Index (RII) is employed in this study to determine the most influential factors affecting Variation Orders in the construction project of Antasari Place Apartments Jakarta. RII determines the most influential factors using a ranking system based on the weight of the values assigned by respondents after completing the questionnaire.

[6]

## RESULTS AND DISCUSSION

Based on document analysis through the data obtained from Site Instructions, 22 Variation Order work items were identified in the construction project of Antasari Place Apartments Jakarta.

Validation is conducted by experts regarding the factors influencing Variation Orders in the construction project of Antasari Place Apartments Jakarta. The validators, as determined by the author, are granted the authority to assess whether the factors presented by the author are considered influential or not on Variation Orders. Expert validators are also given the authority to add factors influencing Variation Orders during the validation process. Below is the profile of the validators who validated the questionnaire in this study, presented in Table 2.

Table 2. Expert Validator Profiles

Expert	Position	Institution	Work Experience
I	Engineering	Construction Management Consultant	<10 Years of Experience
II	Engineering	Construction Management Consultant	<10 Years of Experience
III	Lecturer	Academic Institution	< 10 Tahun Years of Experience

Validation took the form of modifying the factors as follows:

- Eliminating factor A.2 "Change in Working Method"
- Changing factor B.5 "Temporary Contract Suspension" to B.5 "Lack of Detailed Discussion during Clarification before Contract Formation"
- Eliminating factor B.6 "Owner's Delays in Approving Drawings, Contract Design, and Clarifications"
- Changing factor C.3 "Poor Performance by Third Parties" to C.3 "Delayed Appointment of Contractors Involving Other Works"
- Eliminating factor C.4 "Unskilled Labor Force"
- Changing factor D.4 "Errors Due to Planning Oversight in Unforeseen Events" to D.4 "Changes in Applicable Regulatory Standards"

These modifications were made during the validation process by experts to refine and tailor the questionnaire for optimal accuracy and relevance.

### Questionnaire Respondent Data

Following the distribution of questionnaires, respondent characteristics data were classified based on age, work experience, project department, and tenure. The data presentation is provided in the following tables.

Table 3: Respondent Characteristics Data Based on Age

Age (years)	Number of Respondents	Percentage
20-30	8	27%
31-40	14	46%
41-50	6	20%
> 50	2	7%
Total	30	100%

In the construction project of Antasari Place Apartments Jakarta, it is noted that 14 individuals (46%) of respondents fall within the age range of 31-40 years, 8 individuals (27%) within the age range of 20-30 years, 6 individuals (20%) within the age range of 41-50 years, and 2 individuals (7%) above 50 years of age.

Based on the obtained data, the majority of questionnaire respondents in the Antasari Place Jakarta Apartment construction project are employees aged 31-40 years.

Table 4: Respondent Characteristics Data Based on Work Experience

Work Experience	Number of Respondents	Percentage
Residential	1	3%
Building < 4 Floors	8	27%
Building 4-8 Floors	4	13%
Building > 8 Floors	17	57%
Total	30	100%

In the construction project of Antasari Place Apartments Jakarta, it is observed that 1 individual (3%) of respondents have experience in handling residential projects, 8 individuals (27%) have experience in handling buildings with < 4 floors, 4 individuals (13%) have experience in handling buildings with 4-8 floors, and 17 individuals (57%) have experience in handling buildings with > 8 floors or high-rise buildings.

Based on the obtained data, the majority of questionnaire respondents in the Antasari Place Jakarta Apartment construction project have experience in handling projects involving buildings with more than 8 floors (high-rise buildings).

Table 5: Respondent Characteristics Data Based on Project Department

Project Department	Number of Respondents	Percentage
Owner	4	13%
Construction Management Consultant	8	27%
Main Contractor	12	40%
Direct Contractor	6	20%
Total	30	100%

In the construction project of Antasari Place Apartments Jakarta, it is found that 4 individuals (13%) of respondents are personnel from the owner, 8 individuals (27%) are personnel from the Construction Management Consultant, 12 individuals (40%) are personnel from the Main Contractor, and 6 individuals (20%) are personnel from various Direct Contractors.

Based on the obtained data, the majority of questionnaire respondents in the Antasari Place Jakarta Apartment construction project are personnel from the Main Contractor, PT. Jagat Konstruksi Abdipersada.

Table 6: Respondent Characteristics Data Based on Tenure in Related Company

Tenure in Related Company	Number of Respondents	Percentage
< 3 Years	5	17%
3 – 6 Years	7	23%
7 – 10 Years	5	17%
> 10 Years	13	43%
Total	30	100%

In the construction project of Antasari Place Apartments Jakarta, it is noted that 5 individuals (17%) of respondents have worked for less than 3 years in the related company, 8 individuals (27%) have worked in the range of 3-6 years, 5 individuals (17%) have worked in the range of 7-10 years, and 13 individuals (43%) have worked for more than 10 years in the related company.

Based on the obtained data, the majority of questionnaire respondents in the Antasari Place Jakarta Apartment construction project have worked in the related company for more than 10 years.

### Validity Test

Next, the questionnaire assessment data by respondents undergoes validity testing using the Validity Test with the assistance of IBM SPSS Statistics 26. With a total of 30 respondents, the required Pearson Correlation Coefficient (critical value  $r$ ) to determine instrument validity is 0.361. The results of the instrument's validity testing in this study can be seen in Table 7 below.

Table 7: Questionnaire Validity Test Results

Code	Pearson Correlation
A.1	.386*
A.2	.447*
A.3	.389*
A.4	.429*
A.5	.550**
A.6	.509**
A.7	.477**
A.8	.391*
A.9	.631**
B.1	.530**
B.2	.609**
B.3	.414*
B.4	.390*
B.5	.646**
C.1	.556**
C.2	.444*
C.3	.575**
D.1	.657**
D.2	.673**
D.3	.483**
D.4	.652**

Based on the results of the table above, the calculated Pearson Correlation Coefficient (r-value) representing the validity of the factors in the questionnaire is greater than the critical value  $r = 0.361$ . This test result indicates that the factors influencing Variation Orders in this study have validity values that are sufficient to be considered valid as assessment data in the questionnaire.

### Reability Test

A reliability test was also conducted on the questionnaire instrument in this study. In determining the level of reliability, the following table was used:

Tabel 8: Reliability Levels

Cronbach's Alpha	Reability Levels
0,20 - 0,40	Somewhat Reliable
0,40 - 0,60	Quite Reliable
0,60 - 0,80	Reliable
0,80 - 1,00	Very Reliable

Riset Statistik Parametrik [8]

Below is the table presenting the results of the Reliability Test conducted on the questionnaire data in this study.

Table 9: Reliability Test Results

Code	Cronbach's Alpha if Item Deleted
A.1	.859
A.2	.856
A.3	.858
A.4	.855
A.5	.851
A.6	.853
A.7	.854
A.8	.858
A.9	.848
B.1	.852
B.2	.849
B.3	.857
B.4	.856
B.5	.847
C.1	.851
C.2	.855
C.3	.850
D.1	.846
D.2	.845
D.3	.853
D.4	.846

Table 10: Cronbach's Alpha Values from Reliability Test

Cronbach's Alpha	N of Items
.859	21



The reliability testing conducted on the questionnaire data with a total of 21 items yielded a value of 0.859 for Cronbach's Alpha. This result indicates that the level of reliability of the questionnaire data in this study is sufficiently reliable for use.

### Relative Importance Index (RII)

The questionnaire responses were analyzed based on their RII values using Microsoft Excel. Below are the rankings of factors based on their RII values.

Table 11: Relative Importance Index (RII) Values of Questionnaire Factors

Code	RII	Rank
A.1	0,900	1
A.2	0,580	7
A.3	0,680	2
A.4	0,553	9
A.5	0,407	19
A.6	0,620	3
A.7	0,487	12
A.8	0,453	14
A.9	0,413	18
B.1	0,527	10
B.2	0,587	6
B.3	0,460	13
B.4	0,607	5
B.5	0,447	15
C.1	0,433	17
C.2	0,613	4
C.3	0,560	8
D.1	0,440	16
D.2	0,327	21
D.3	.853	11
D.4	.846	10

Based on the ranking based on the Relative Importance Index value of each factor, a table will be compiled according to the ranking based on the Relative Importance Index value. The following is a table showing the 10 most dominant factors influencing the Variation Order in the Antasari Place Jakarta apartment construction project.

Table 12: Top 10 Most Dominant Factors Influencing Variation Order

Code	Factors	Rank
A.1	Addition of work scope	1
A.3	Design changes from the initial plan	2
A.6	Changes in work scope during the construction phase	3
C.2	Owner's request for space function optimization	4
B.4	Lack of clear technical specifications in the Scope of Work (RKS), Bill of Quantity, and tender drawings	5
B.2	Changes in material specifications	6
A.2	Significant differences in volume between drawings, site conditions, and the bill of quantity	7

Code	Factors	Rank
C.3	Delay in appointing the executing party for work packages involving other tasks	8
A.4	Imperfect design during the planning phase	9
B.1	Lack of clarity in contractual clauses	10

### Summary of Interview

After conducting interviews with the informants, the interview summaries are presented in Table 11.

Table 11: Summary of Interview Results with Informants

No.	Interview Questions and Answers
1	<p><b>Is there any Variation Order work on the Antasari Place Apartment construction project in Jakarta?</b>  <i>Yes, there is.</i></p>
2	<p><b>If so, how many Variation Order works have emerged, and are their workloads significant?</b>  <i>So far, there have been 22 site instructions on the Antasari Place Jakarta project. One major contributing factor to variation orders in this project is the addition of scope of work delegated to the main contractor due to the absence of a specialized contractor, referred to as the Direct Contractor in this project. The significance of the added scope of work to the main contractor is not evaluated by the CM team, as the volume calculations are conducted by the quantity surveyor.</i></p>
3	<p><b>What are the causes of Variation Orders in the construction project of Antasari Place Apartments in Jakarta?</b>  <i>The emergence of Variation Orders in this project is influenced by various underlying factors, and these factors are discussed before implementing the Variation Order work. In simple terms, the final outcome of the discussions involving these factors on this project results in design changes.</i></p>
4	<p><b>Out of the many Variation Order works, are there any that have the potential to cause delays in the contract completion time? Conversely, are there any works that are expedited due to Variation Orders?</b>  <i>So far, Variation Order works performed on this project have not occurred during critical project execution timelines, thus they do not pose a potential for delaying contract completion. The existing Variation Orders are not targeted to expedite existing work. All Variation Order works carried out so far are within the project's slack time schedule. However, Variation Order works have the potential to cause delays in contract completion time if they are executed during critical project timelines.</i></p>
5	<p><b>If they have the potential to cause delays, what solutions will be implemented?</b>  <i>Before issuing a site instruction, the CM team will assess the impact of the Variation Order work on the project execution timeline. If the assessment concludes that the Variation Order work has the potential to cause delays, the execution of the Variation Order work must be accompanied by an acceleration of other work that might</i></p>

No.	Interview Questions and Answers
	<i>experience delays to ensure that the project completion time does not deviate from the agreed contract.</i>
6	<p><b>Are there any factors that need to be considered to ensure that Variation Order work does not have a negative impact on the project's execution timeline?</b></p> <p><i>All factors that influence the occurrence of Variation Orders will vary and need to be evaluated on a case-by-case basis. Therefore, the factors to be considered depend on the context of the Variation Order's occurrence and when the Variation Order instruction is issued.</i></p>

Through the conducted interviews, it was found that the 22 site instructions on the Antasari Place Apartment construction project in Jakarta did not result in delays in the project's contract completion time. The areas worked on were aligned with the project schedule during the research period and were not part of the critical path of the project's execution timeline. These activities were being carried out within the time tolerance, which refers to the amount of time an activity can be delayed without affecting the project's contract completion time, commonly known as slack time.

The interviewees concluded that the potential for Variation Order works to cause delays depends on the specific cases and the timing of their execution. Variation Order works in the Antasari Place Apartment project also have the potential to increase, given the complexity and uniqueness of the project's execution.

## CONCLUSION

Based on the analysis results, the author concludes that the validated factors influencing Variation Orders in the Antasari Place Apartment construction project in Jakarta amount to 21 factors across 4 aspects.

Through the Relative Importance Index (RII) method, the author identifies the 5 most dominant factors affecting Variation Orders in the project in the following order of dominance:

1. Addition of work scope
2. Design changes from the initial plan
3. Changes in work scope during the construction phase
4. Owner's request for space function optimization
5. Lack of clear technical specifications in the Scope of Work (RKS), Bill of Quantity, and tender drawings

Based on the interview results, Variation Order works that occurred during the research period did not affect the project completion time of the Antasari Place Apartment construction project. These Variation Order works were carried out outside the critical path of the project and fell within the project's slack time. The interviewee's statement from the interview results indicates that Variation Orders in the Antasari Place Apartment project could potentially lead to delays, depending on the reasons and timing of their execution.

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