ASTONJADRO

pISSN 2302-4240
eISSN 2655-2086

Volume 13, Issue 3, October 2024, pp.941-957
DOI: http://dx.doi.org/10.32832/astonjadro.v13i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

Analysis of the Influence of Order Variation Factors on the Costs and Time of Implementing Channel Diversion Infrastructure Construction Projects in Residential Areas

Ghazi Ghossan Hindami[1], Agus Suroso[2], Mawardi Amin[2]

[1]Master Civil Engineering, Mercubuana University, Jakarta, INDONESIA
[2]Doctor, Civil Engineering Department, Mercubuana University, Jakarta, INDONESIA

E-mail: tengku.alfian96@gmail.com

| Submitted: February 18, 2024 | Revised: February 20, 2024 | Accepted: April 03, 2024 |

| Published: September 22, 2024 |

ABSTRACT

Tangerang is one of the big cities that is developing in Indonesia. Along with the development of the city, one sector that is increasingly developing is the housing sector. In implementing construction projects, problems are often faced, one of which is the occurrence of changes. Almost all existing projects experience variation orders (VO). Variation orders always have cost and time implications. Whatever the variation, there will be risks to the work being done, both in terms of work delays and additional costs that must be borne. Research using the SEM PLS method was conducted to determine what factors cause variation orders and how they affect time and cost performance in channel diversion infrastructure projects in residential areas. Based on the results of responses from correspondents, the significant value that influences project performance is planning and design with indicators of errors in planning drawings. Based on the cost performance analysis results for the amount of costs resulting from variation orders on work, the total increase was IDR. 10.516.305.346 and for less work the total is IDR. 6.628.461.533 around 12.96% of the initial contract price and the results of the time performance analysis for the amount of time resulting from variation orders on the project work show a time extension of 5 months or 125%.

Keywords: variation order; time performance; cost performance; infrastructure; housing area.

INTRODUCTION

Tangerang is one of the big cities that is developing in Indonesia. Along with the development of the city, one sector that is increasingly developing is the housing sector. Housing growth is not only in several sub-districts, but in almost all sub-districts in Tangerang City. Most city residents choose to live in housing. According to Malik (2010), the definition of a project itself informs that a project has a final product (output) in the form of goods or services obtained from the transformation of a number of resources (input). The process of transforming input into output is carried out over a certain (limited) period of time with costs and quality that have been determined through a work agreement (contract).

This research is located in the Tangerang area where this project consists of housing construction of 734 house units and 14 shophouse units. The researcher focuses on channel infrastructure work in a housing project where the initial contract value of this work is IDR 16,150,000,000 with an implementation time of 18 weeks and a channel width of 8 meters and a channel length of 427 meters, where there is a variation order on the sheet pile work item to secondary pile, DPT and gabion.

One of the important assets for urban communities is land and buildings for residence as a basic need. High population growth causes the need for housing to increase rapidly. The increasing need for housing has resulted in higher land prices in urban areas. This condition is a great opportunity for business people, especially in the residential property sector. In one of the housing projects in the Tangerang area, there was a problem where the developer was unable to build housing units in the plot area and there was an electrical substation to supply electricity to several housing units in the housing area due to poor initial planning. will be a problem for handover to customers.

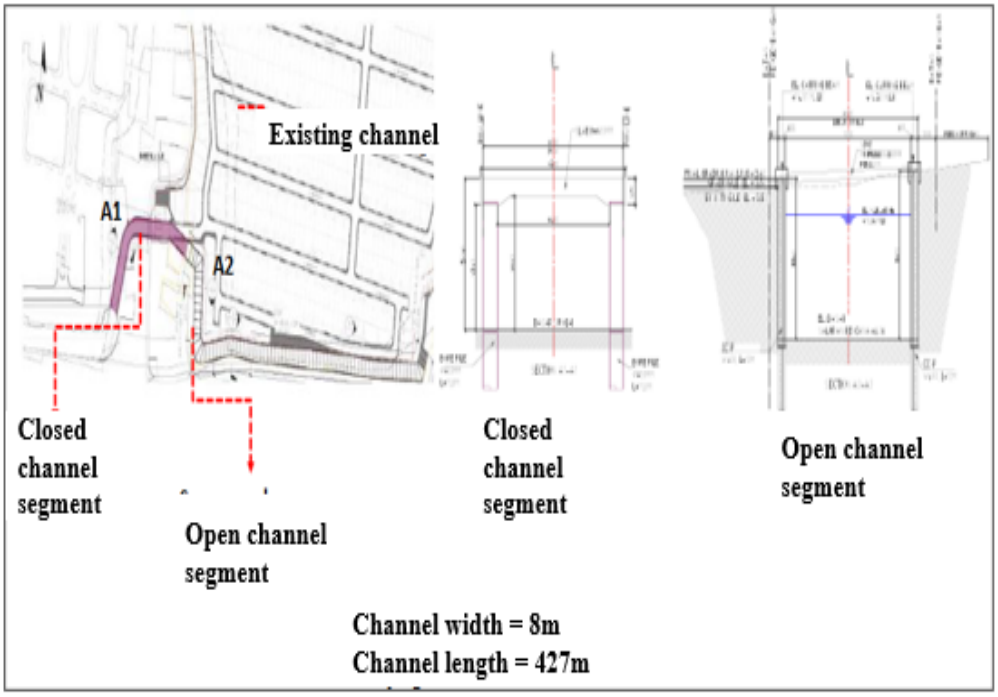


Figure 1. Overview of the Channel Diversion Project Source: Project Processed Data 2023

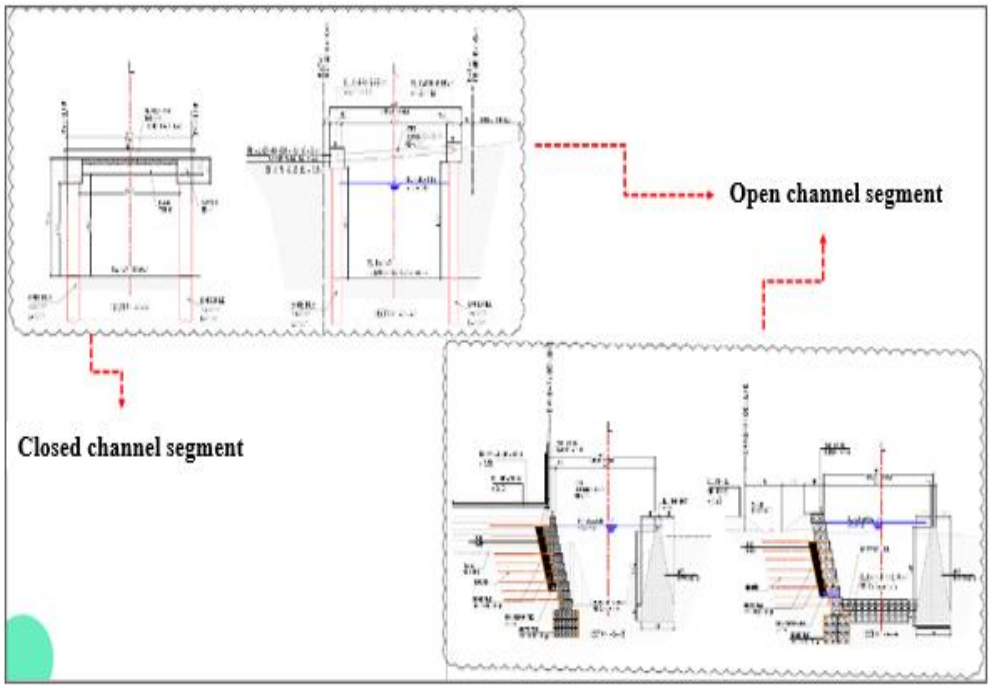


Figure 2. Overview of the Channel Diversion Project. Source: Project Processed Data 2023

ASTONJADRO

pISSN 2302-4240
eISSN 2655-2086

Volume 13, Issue 3, October 2024, pp.941-957
DOI: http://dx.doi.org/10.32832/astonjadro.v13i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

Figure 3. Overview of the Channel Diversion Project. Source: Project Processed Data 2023

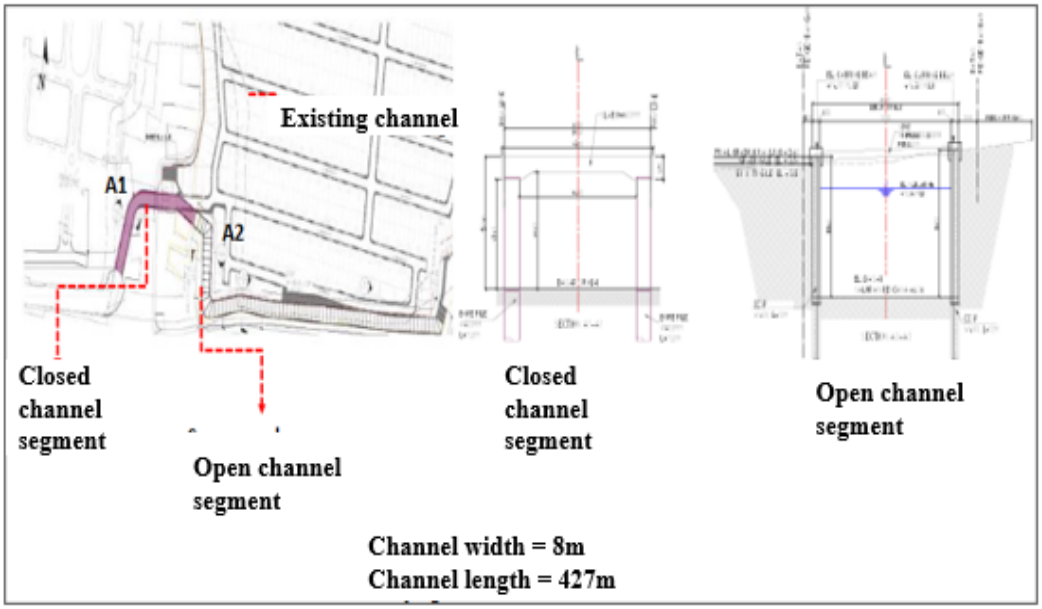


Figure 4. Overview of the Channel Diversion Project. Source: Project Processed Data 2023

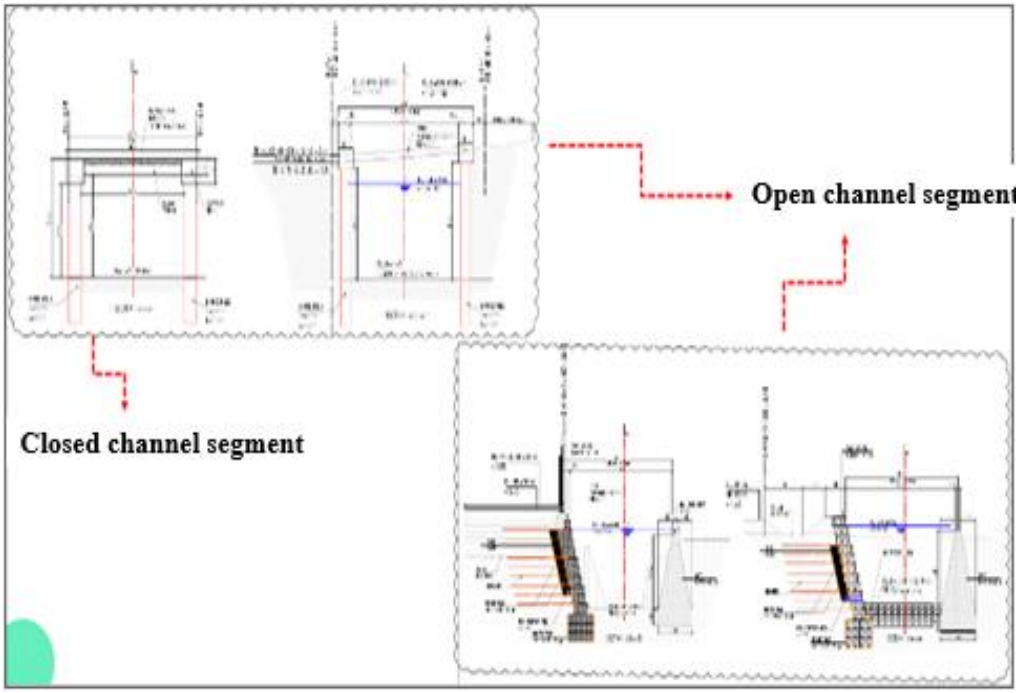


Figure 5. Overview of the Channel Diversion Project. Source: Project Processed Data 2023

Figure 6. Overview of the Channel Diversion Project. Source: Project Processed Data 2023

RESEARCH METHODS

A project is a temporary activity that has a predetermined start and completion time (and is usually always limited by time, and often also limited by funding sources), to achieve specific goals and results and generally to produce a change that is useful or beneficial. has added value. Projects are always temporary or temporary in nature and are in sharp contrast to businesses in general. A house is defined as a building that functions as a habitable residence, a means of building a family, a reflection of the dignity of its occupants and the assets of its owner. (According to Law No. 1 of 2011 concerning Housing and Settlement Areas)

pISSN 2302-4240
eISSN 2655-2086

Volume 13, Issue 3, October 2024, pp.941-957
DOI: http://dx.doi.org/10.32832/astonjadro.v13i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

Infrastructure is the physical facilities developed or required by public agencies for government functions in the provision of water, electric power, waste disposal, transportation and similar services to facilitate social and economic objectives. According to the American Public Works Association (Stone, 1974 in Kodoatie, R.J., 2005)

Changes in work activities (variation orders) are changes that occur during contract implementation, where these changes are caused by time extensions, additions or reductions in the contract value as a result of design revisions & certain conditions, according to (Galih Gumelar, 2014)

Project management

Project management is the process of planning, organizing, leading, and controlling company resources to achieve predetermined short-term goals. Project management grew because of the drive to find a management approach that suits the demands and nature of project activities, activities that are dynamic and different from routine operational activities. (Hafnidar A. 2016). Project management is the application of knowledge, skills, tools and techniques in project activities to meet project needs (PMBOK, 2004). Project management is carried out through application and integration of the stages of the project management process, namely initiating, planning, executing, monitoring and controlling and finally closing the entire project process. In its implementation, every project is always limited by constraints that influence each other and are usually referred to as the project constraint triangle, namely scope, time and cost.

Where the balance of these three constraints will determine the quality of a project. Changes in one or more of these factors will affect at least one other factor (PMBOK Guide, 2004). Project scope is the total number of activities or work that must be done to produce the product desired by the project. For example, the product of a construction engineering project can be the installation of a multi-storey building, while a manufacturing engineering project produces a new type of motor vehicle. In this connection, documents containing project scope limitations containing quantity, quality, specifications and criteria are very important. Even though it is not possible to write down the many components of the project scope in an official document, efforts need to be made so that in its implementation later important problems do not open up opportunities for different interpretations to arise between interested parties, especially between the owner and the contractor. Efforts are also made to ensure that there are no substantial additions or reductions to the scope of the project. All of this is part of the project scope management function.

Construction Management

Management in construction is a tool to make activities on the project effective and efficient. The parameters used here are a function of time and cost of each construction project activity. So, to organize/arrange these activities someone must first understand and comprehend the problem from start to finish, in other words we must enter into the construction as a whole. In every construction project, there are resources that will be processed, during this process management is needed so that this process runs effectively and efficiently, and satisfactory results are obtained. Resources are various forces to enable a desired result to be achieved. These resources consist of 6M+I+S+T, namely Money (money), Material (materials), Machine (equipment), Man-power (human power), Market (market), and Method (method) and Information (information), Space (space) and Time (time).

The goal of construction management is to organize construction work so that the work takes place effectively and efficiently. The construction itself is an alphabetical arrangement, meaning that the construction is arranged A – B – C – D, not like C – B – D – A. In other words, the foundation of a building is always at the bottom and the roof frame of the building is located above the ring balk. If we are considering the arrangement of a construction, then we need: 1. Feasibility study. Whether or not a construction is worth building, concerns the impact on the environment, how close it is to public facilities. This is where construction management comes into play. 2. Design engineering This is where residential and building construction management functions, relating to the provision of facilities, sewage systems, clean water systems, piping and so on. 3. Procurement Once the design is complete, costs and materials and resources are required. 4. Construction implementation Management is required to organize and regulate each activity with effective and efficient use of

resources. Monitor every work that has been done and monitor conflicts between resources that occur. 5. Utilization 6. Maintenance Maintenance management is required.

Variation Order/Change Order

A change order is a written agreement to modify, add or provide alternatives to work that has been regulated in the contract document between the owner and contractor, where these changes can be considered to be included in the original / original project scope, and is the only legal way to change work activities (contract change orders) are changes that occur during contract implementation, where these changes are caused by time extensions, additions or reductions in the contract value as a result of design revisions (Galih Gumelar, 2014). Contract change orders can also be is defined as an agreement signed by the contractor, architect and owner after the initial contract is made, then several scopes of work are modified to adjust costs and time (Shcaulfelbeger & Holm, 2002).

Broadly speaking, change orders can have a direct impact on the project in terms of: 1 Project costs, according to Barrie and Paulson (1992) consist of direct costs, time extension costs, and impact costs. 2. Project time terms. According to the American Institute of Architect (AIA) a Variation Order is a written request signed by the architect, contractor and owner made after the contract is issued, which has the authority to change the scope of work or make adjustments to the contract value and work completion time. Another meaning of variation order is an official document signed by the owner and contractor to provide compensation to the contractor for changes, additional work, delays, or other consequences of the collective agreement written in the contract (Barrie, Donald S, and Paulson, 1992).

The purpose of a Variation Order or change order (Fisk & Wayne D, 2006) is: 1. Changes to the contract plan with a special method of payment. 2. Changes in work specifications, including changes in payment and contract time from the previous 3. As additional approval for new work, in this case including payment and changes in the contract. 4. Administrative adjustments in determining payment methods for work (extra work) and additions thereto. 5. Adjustments to the contract unit price if there are changes to specifications. 6. As a proposal to reduce the proposal incentive fee if there are changes to the value engineering proposal. 7. Adjustment of the project schedule due to changes.8. As a tool to reduce disputes between the contractor and the owner.

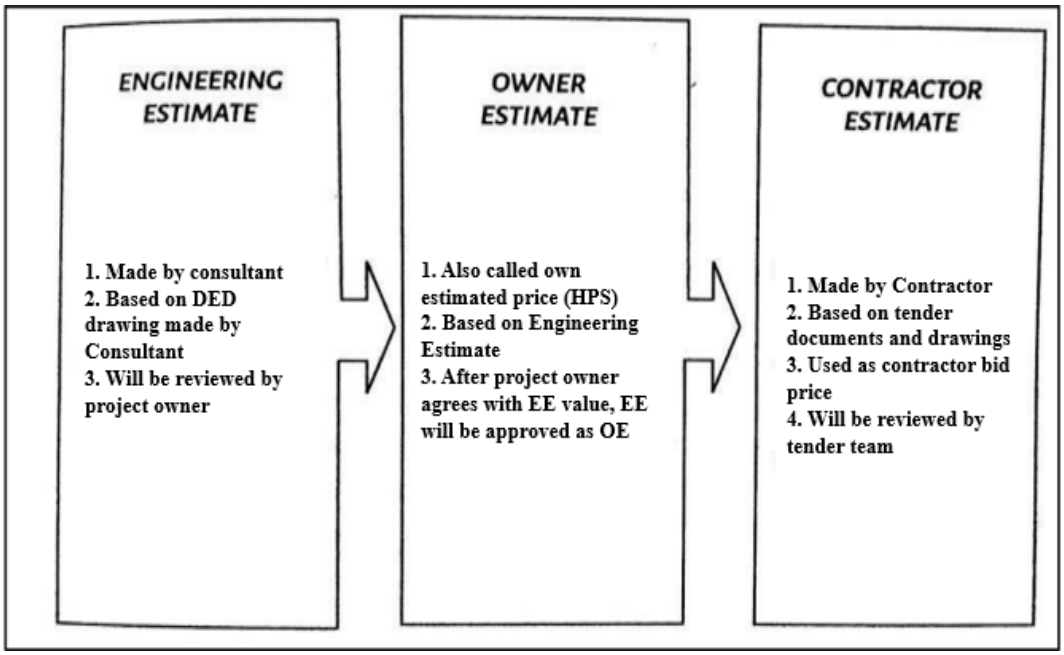


Figure 7. Types of Project Implementation Estimates. Source: Project management, Graha Ilmu, 2023

pISSN 2302-4240
eISSN 2655-2086

Volume 13, Issue 3, October 2024, pp.941-957
DOI: http://dx.doi.org/10.32832/astonjadro.v13i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

Low-cost construction projects are attempts to build structures with high cost efficiency without sacrificing quality, safety, and functionality. The main goal of these projects is to minimize expenses by optimizing the use of cheaper but still efficient resources and technologies (Natasasmita G et.al, 2020). One of the main strategies in low-cost construction projects is the use of alternative building materials that are more economical but durable. For example, the use of recycled materials, such as recycled concrete or scrap steel, can significantly reduce material costs. In addition, the selection of local materials can help reduce transportation costs, since shipping materials from distant locations is usually expensive (Anwar S, Ida Hayati N, 2013).

Technology also plays an important role in reducing construction costs. The use of pre-fabrication technology, for example, allows building components to be manufactured in a factory and quickly assembled at the project site. This technique can save construction time, which in turn reduces labor costs. In addition, the use of construction planning software can help identify potential waste and optimize resource use, thereby reducing costs (Sabariah I et.al, 2012; Khatami H et.al, 2021). Effective project management is also very important. This includes close monitoring of construction times, efficient allocation of labor, and careful logistics planning. Controlling design or specification changes midway can also avoid unwanted cost overruns (Marguna A et.al, 2012). Low-cost construction projects also involve the involvement of experts, such as engineers and architects, who are able to design buildings with cost efficiency in mind. They can provide innovative solutions that are not only cost-effective but also sustainable, environmentally friendly, and durable (Syaiful S, Sutarsa S, 2020; Dharma Pratama S et.al, 2024).

Methods

Research using a survey method was carried out to find out what factors caused change orders to occur and how they affected project performance in terms of costs and construction time for channel diversion infrastructure projects in residential areas. This survey method was carried out by following the research flow chart. At the field study research stage, data collection is carried out directly at the research object where phenomena related to this research occur. The aim is to obtain precise and accurate information related to this research.

Research using field studies is described in a research flow chart. In collecting primary data in field study method research, the researcher previously made a permission letter to collect data for research purposes addressed to those who had been determined. When you have obtained permission from the company owner or party who has the authority to provide data, the researcher will coordinate with the parties involved through interview techniques and data observation. The stages in this research flow diagram are:

1. Determining the number of samples for this research determines the required sample size, so the Slovin formula is used.
2. Questionnaires that have been validated by experts will be distributed to respondents and then processed the data using the Likert scale method
3. Test the validity and reliability of smart pls.
4. Data Analysis Method

A. Impact on cost (%)

$$X = \frac{\text{Value of variation order}}{\text{Contract value}} \; x \; 100\%$$

B. Impact on time

$$X = \frac{\text{Change in time due to variation order}}{\text{Total completion time according to contract}} \; x \; 100\%$$

Figure 8. Data analysis method. Source: Project management, Graha Ilmu, 2023

Data Analysis

From the results of data collection that has been verified and validated by experts, the research indicators that will be used in the next questionnaire stage are 37 variable indicators.

No	Variable	Expert P1	Expert P2	Expert P3	Expert P4	Expert P5	Total	Results
1	X1.1	1	1	1	1	1	5	Accepted
2	X1.2	1	0	0	0	0	1	Rejected
3	X1.3	1	1	1	1	1	5	Accepted
4	X1.4	1	0	0	0	0	1	Rejected
5	X5.5	1	0	0	0	0	1	Rejected
6	X2.1	1	1	1	1	1	5	Accepted
7	X2.2	1	1	1	1	1	5	Accepted
8	X2.3	1	1	1	1	1	5	Accepted
9	X2.4	1	1	1	1	1	5	Accepted
10	X2.5	1	1	1	1	1	5	Accepted
11	X2.6	1	1	1	1	1	5	Accepted
12	X2.7	1	1	1	1	1	5	Accepted
13	X3.1	1	1	1	1	1	5	Accepted
14	X3.2	1	1	1	1	1	5	Accepted
15	X3.3	1	1	1	1	1	5	Accepted
16	X3.4	1	1	1	1	1	5	Accepted
17	X3.5	1	1	1	1	1	5	Accepted
18	X3.6	1	1	1	1	1	5	Accepted
19	X4.1	1	1	1	1	1	5	Accepted
20	X4.2	1	1	1	1	1	5	Accepted
21	X4.3	1	1	1	1	1	5	Accepted
22	X4.4	1	1	1	1	1	5	Accepted
23	X4.5	1	1	1	1	1	5	Accepted
24	X4.6	1	1	1	1	1	5	Accepted
25	X4.7	1	1	1	1	1	5	Accepted
26	X5.1	1	1	1	1	1	5	Accepted
27	X5.2	1	1	1	1	1	5	Accepted
28	X5.3	1	1	1	1	1	5	Accepted
29	X5.4	1	1	1	1	1	5	Accepted
30	X5.5	1	1	1	1	1	5	Accepted
31	X5.6	1	1	1	1	1	5	Accepted
32	X5.7	1	1	1	1	1	5	Accepted
33	X5.8	1	1	1	1	1	5	Accepted
34	X6.1	1	1	1	1	1	5	Accepted
35	X6.2	1	1	1	1	1	5	Accepted
36	X6.3	1	1	1	1	1	5	Accepted
37	X6.4	1	1	1	1	1	5	Accepted
38	X6.5	0	0	0	1	0	1	Rejected
49	X6.6	0	1	0	0	0	1	Rejected
40	X6.7	1	1	1	1	1	5	Accepted
41	Y1.1	1	1	1	1	1	5	Accepted
42	Y1.2	1	1	1	1	1	5	Accepted

Figure 9. Data analysis method. Source: Project Management, Graha Ilmu, 2023

Questionnaire Data Results

Respondents in this study consisted of 18 respondents consisting of planning consultants/team planning and consisting of 42 respondents consisting of owners.

pISSN 2302-4240
eISSN 2655-2086

Volume 13, Issue 3, October 2024, pp.941-957
DOI: http://dx.doi.org/10.32832/astonjadro.v13i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

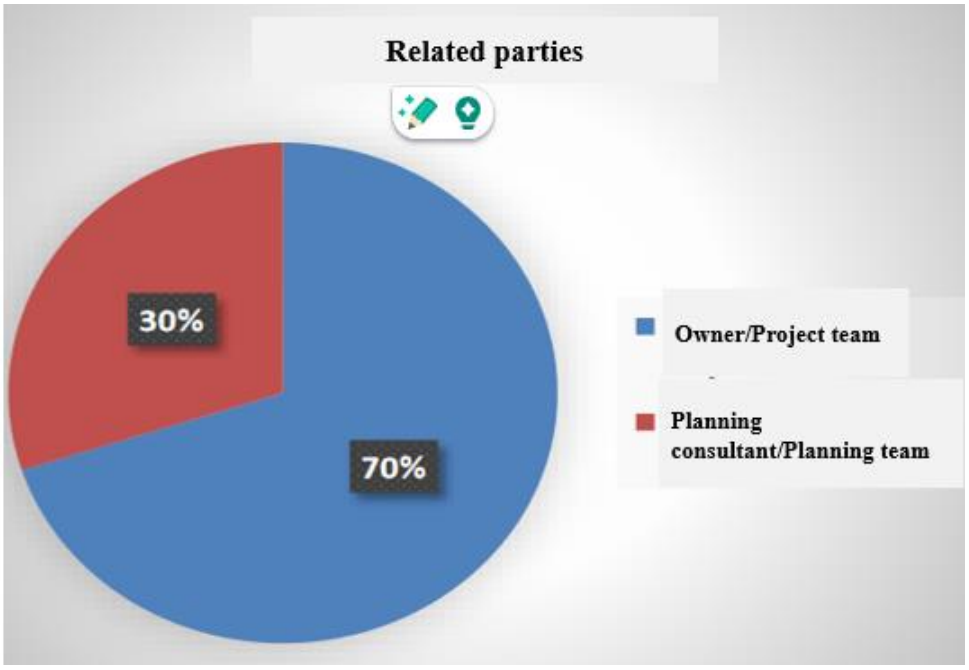


Figure 10. Related parties. Source: Processed Questionnaire Data, 2023

Respondents in research This consisted of 18 respondents consisting of consultants planner/team planning as well consisting of 42 respondents who consisting of the owner.

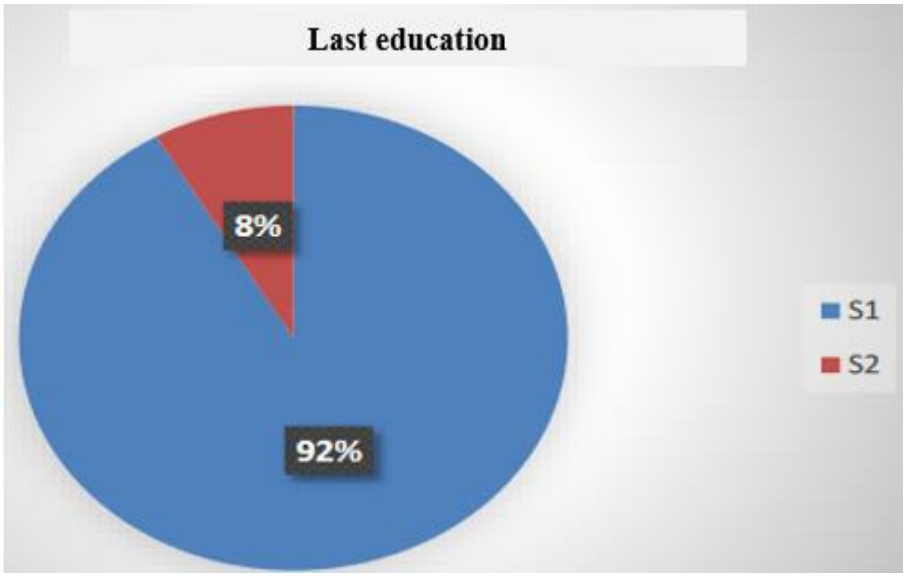


Figure 11. Last education. Source: Processed Questionnaire Data, 2023

Respondents in this study had a Master's degree education background consisting of 5 respondents and 55 respondents had a Master's degree education background.

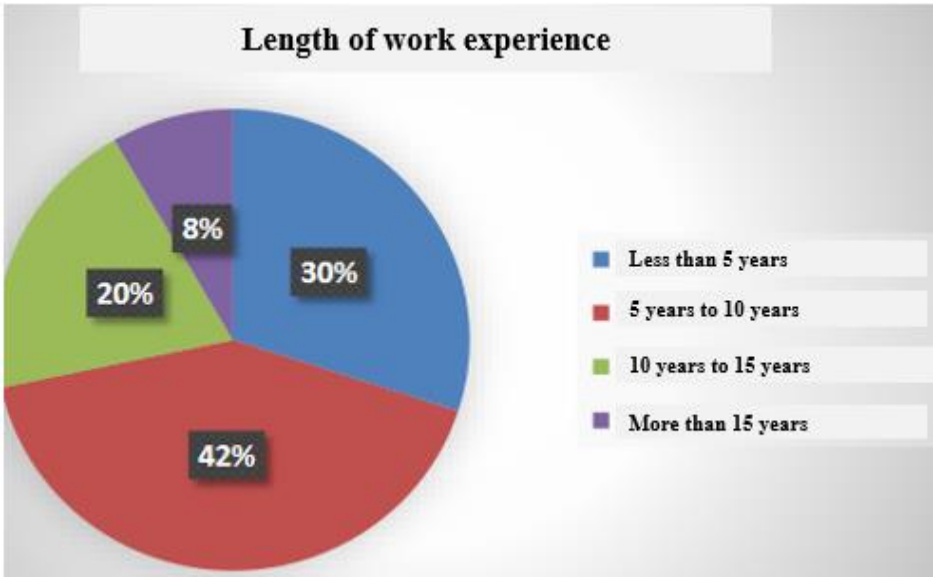
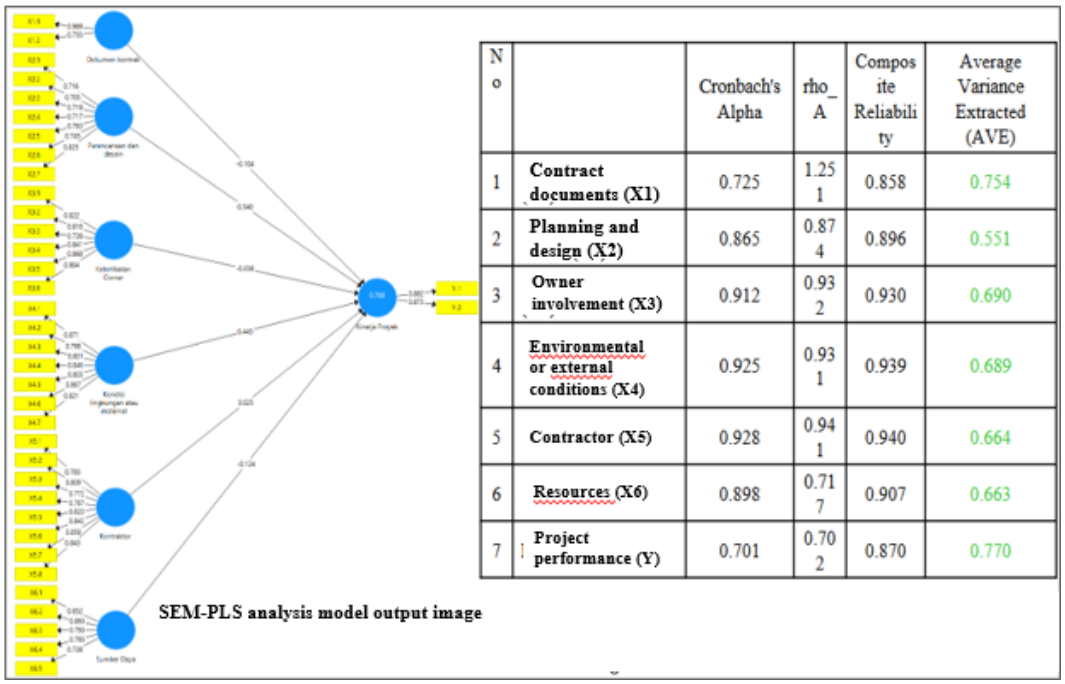


Figure 12. Long Work Experience. Source: Processed Questionnaire Data, 2023

Respondents in this study had a long working background, namely 18 respondents for < 5 years, 25 respondents for 5 years to 10 years, 12 respondents for 10 years to 15 years and as many as 5 respondents worked for > 15 years.

Construct Validity Test

Based on the data here, there is a value for each research indicator so that variables with an outer loading value above 0.7 and an AVE value above 0.5 can be categorized as valid as indicators in research on factors causing variation order.



No		Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
1	Contract documents (X1)	0.725	1.251	0.858	0.754
2	Planning and design (X2)	0.865	0.874	0.896	0.551
3	Owner involvement (X3)	0.912	0.932	0.930	0.690
4	Environmental or external conditions (X4)	0.925	0.931	0.939	0.689
5	Contractor (X5)	0.928	0.941	0.940	0.664
6	Resources (X6)	0.898	0.717	0.907	0.663
7	Project performance (Y)	0.701	0.702	0.870	0.770

SEM-PLS analysis model output image

Figure 13. Output Model Analisa SEM-PLS Source: Suhardi M Anwar, 2019

pISSN 2302-4240
eISSN 2655-2086

Volume 13, Issue 3, October 2024, pp.941-957
DOI: http://dx.doi.org/10.32832/astonjadro.v13i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

(SEM) VARIANT BASED: Basic Application Concepts with the SmartPLS Program 3.2.8 dalam Riset, 2023)

Outer loading value

No		Contract documents	Owner involvement		Environmental or external conditions	Contractor	Planning and design	Resources
1	X1.1	0.969						
2	X1.2	0.755						
3	X2.1						0.716	
4	X2.2						0.705	
5	X2.3						0.719	
6	X2.4						0.717	
7	X2.5						0.763	
8	X2.6						0.745	
9	X2.7						0.825	
10	X3.1		0.822					
11	X3.2		0.81					
12	X3.3		0.728					
13	X3.4		0.841					
14	X3.5		0.868					
15	X3.6		0.904					
16	X4.1				0.871			
17	X4.2				0.798			
18	X4.3				0.801			
19	X4.4				0.846			
20	X4.5				0.803			
21	X4.6				0.867			
22	X4.7				0.821			
23	X5.1					0.783		
24	X5.2					0.809		
25	X5.3					0.772		
26	X5.4					0.787		
27	X5.5					0.82		
28	X5.6					0.842		
29	X5.7					0.859		
30	X5.8					0.843		
31	X6.1							0.852
32	X6.2							0.893
33	X6.3							0.793
34	X6.4							0.795
35	X6.5							0.728
36	Y.1			0.882				
37	Y.2			0.873				

Figure 14. Outer Loading Value. Source: SEM-PLS analysis model (2024)

Discriminant Validity Test

Correlation values between latent constructs

No		Contract documents	Owner involvement	Project performance	Environmental or external conditions	Contractor	Planning and design	Resources	AVE	Square root of AVE
1	Contract documents	1.000	0.055	-0.091	0.017	0.097	0.014	0.022	0.754	0.868
2	Owner involvement	0.055	1.000	-0.164	-0.128	-0.159	-0.117	-0.031	0.690	0.830
3	Project performance	-0.091	-0.164	1.000	0.645	0.332	0.697	-0.176	0.770	0.877
4	Environmental or external conditions	0.0018	-0.128	0.645	1.000	0.213	0.327	-0.125	0.689	0.830
5	Contractor	0.097	-0.159	0.332	0.213	1.000	0.401	-0.004	0.664	0.814
6	Planning and design	0.014	-0.117	0.697	0.327	0.401	1.000	0.010	0.571	0.755
7	Resources	0.022	-0.031	-0.176	-0.125	-0.004	0.010	1.000	0.663	0.814

Figure 15. Correlation Values Between Latent Constructs Source: SEM-PLS Analysis Data (2024)

The variables of contract documents, owner involvement, environmental and external conditions, planning and design, contractors and resources have correlation values between latent variables that are smaller than the square root value of AVE, so it can be interpreted that the construct is categorized as valid.

• The correlation value of project performance with contract documents is -0.091.

• The correlation value of project performance with owner involvement is -0.164.

• The correlation value of project performance with environmental and external conditions is 0.645.

• The correlation value of project performance with contractors is 0.332.

• The correlation value of project performance towards planning and design is 0.697.

• The correlation value of project performance to resources is -0.031 smaller than square root ofAVE

• The project performance variable is 0.814.

Dominant Factors Causing Variation Order

The significant results on project performance greatly influence indicator Y1.1, namely the influence on project cost performance, namely 33,481. The variables that have a significant influence are planning and design on the dominant indicator X2.7, namely errors in planning drawings with a value of 14,130 and environmental or external condition variables on the dominant indicator.

ASTONJADRO

pISSN 2302-4240
eISSN 2655-2086

Volume 13, Issue 3, October 2024, pp.941-957
DOI: http://dx.doi.org/10.32832/astonjadro.v13i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

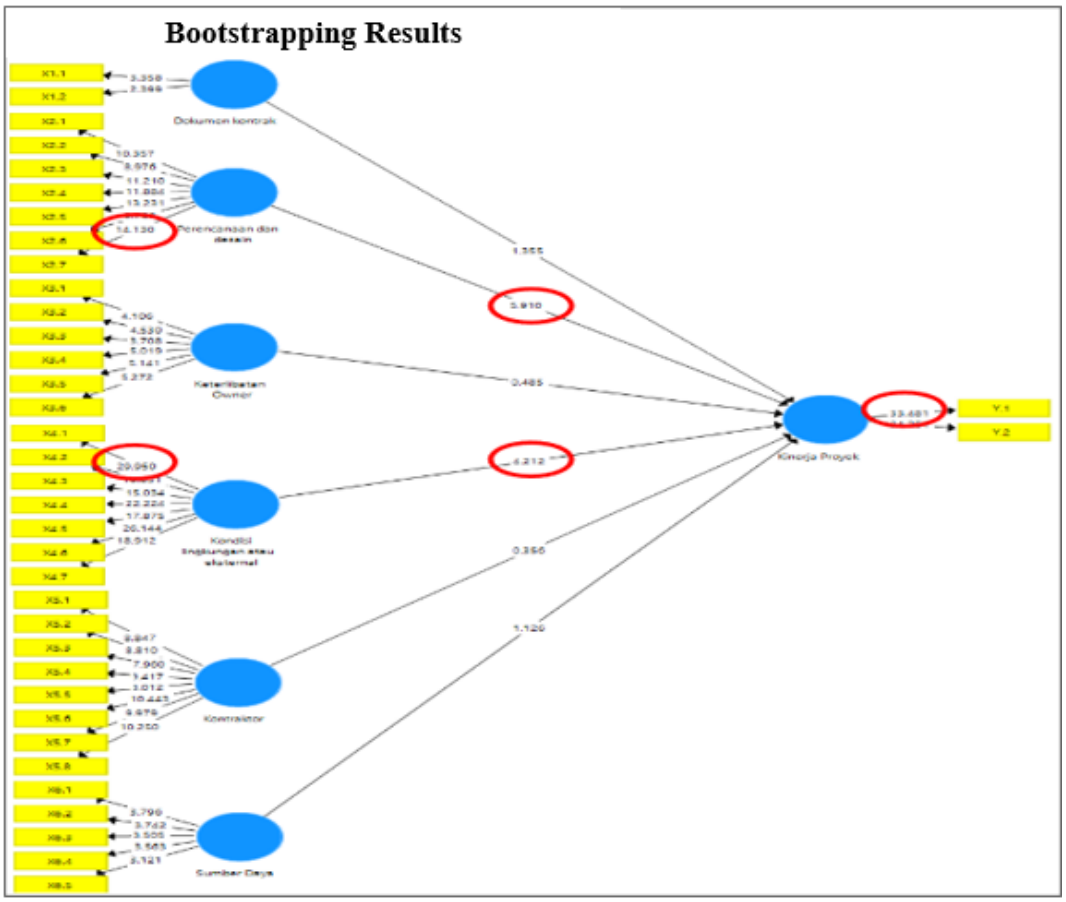


Figure 16. SEM-PLS Analysis Model Output. Source: SEM-PLS Analysis Data 2024

Data analysis was carried out by descriptive method on changes in moisture value, water content, temperature and pH. The calorific value results are compared with the criteria set in Indonesia. In addition, data analysis is also supported by literature studies related to this research.

RESULT AND DISCUSSION

Contract Documents on Project Performance

The results of the analysis show that contract documents have a negative and insignificant effect on project performance, therefore, in work changes (variations orders), the causal factor due to the existence of contract document variables does not affect project performance and variation orders.

Planning and Design on Project Performance

The results of the analysis show that planning and design have a positive and significant effect project performance, therefore that in work changes (variations orders) the causal factor is that planning and design variables have a direct effect on project performance and variation orders.

Hypothesis

No		Hypothesis	Path Coefficient	T Statistics	P Values	Results
1	Contract Document (X1) > Project performance	H1	-0.104	1.355	0.088	Rejected
2	Planning and design (X2) > Project performance	H2	0.540	5.910	0.000	Accepted
3	Owner involvement (X3) > Project performance	H3	-0.038	0.485	0.314	Rejected
4	Environmental or external conditions (X4) > Project performance	H4	0.445	4.212	0.000	Accepted
5	Contractor (X5) > Project performance	H5	0.025	0.356	0.361	Rejected
6	Resources (X6) > Project performance	H6	-0.124	1.126	0.130	Rejected

Figure 17. Hypothesis Analysis Source: SEM-PLS Analysis Data (2024)

Owner Involvement in Project Performance

The results of the analysis show that owner involvement has a negative and insignificant effect on project performance, therefore, in work changes (variations orders), the causal factor due to the owner involvement variable does not affect project performance and variation orders.

Environmental or external conditions on Project Performance

The results of the analysis show that environmental or external conditions have a positive and significant effect on project performance, therefore in work changes (variations orders) the causal factor is due to the presence of environmental or external condition variables that have a direct effect on project performance and variation orders.

Contractor on Project Performance

The results of the analysis show that the contractor has a positive and insignificant effect on project performance, therefore, in work changes (variations orders), the causal factor due to the existence of this contractor variable does not affect project performance and variation orders

Resources on Project Performance

The results of the analysis show that resources have a negative and insignificant effect on project performance, therefore, in work changes (variations orders), the causal factor due to the resource variable does not have a direct effect on project performance and variation orders.

pISSN 2302-4240
eISSN 2655-2086

Volume 13, Issue 3, October 2024, pp.941-957
DOI: http://dx.doi.org/10.32832/astonjadro.v13i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

No	Description of work	Initial contract	Additional work	Short work	Variantion order
1	River stone and grading	Rp. 1.497.432.425	Rp. 2.360.577.598		Rp. 863.145.173
2	Closed channel segment	Rp.7.051.531.920	Rp. 7.166.016.389		Rp. 114.484.469
3	Open channel segment	Rp 6.628.461.533	Rp.989.711.359	Rp.6.628.461.533	Rp. 989.711.359
Total before PPN		Rp. 15.177.424.878	Rp. 10.516.305.346	Rp.6.628.461.533	Rp.1.967.341.001

Figure 18. Hypothesis Analysis. Source: SEM-PLS Analysis Data (2024)

There are changes in costs that occur due to variation orders of 12.96% of the initial contract price so they are in the bad category. For work items with large changes in added costs and changes in lower costs that occur in work items in the open channel segment due to changes in drawings from the initial design using sheet piles to borepile, DPT and gabions. The implementation time for the channel diversion project based on the contract is 18 weeks, from 14 February 2022 to 14 July 2022.

However, there was a delay in implementation, due to:

1. There are work items designed by the planning consultant & planning team that are not in accordance with the actual conditions existing in the field.
2. For 2 weeks the project was stopped by local residents, due to technical problems implementing the sheetpile work.
3. There were changes to the design by the planning consultant so it took 2 weeks for it to be realized in the field. For the completion time, it was finally agreed between the owner and the contractor that the completion time would be extended for 5 months until November 11 2022 or 125% so it was in the poor category.

CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that: 1) based on the results of the smart PLS analysis, it was obtained that the variables that cause variation orders that are most dominant and have an influence on project performance are planning and design variables with error indicators in drawing planning, 2) based on the results of the analysis of the influence of variables on project performance in this research, the variables that have a negative influence and do not influence project performance and the factors that cause variation orders are contract documents, owner involvement and resources, while the variables that have a positive influence and influence project performance and factors that occur variation orders are planning and design, environmental and external conditions and contractors, 3) based on the results of the cost performance analysis for the amount of costs resulting from variation orders on work, the total added amount is IDR. 10,516,305,346 and for less work the total is IDR. 6,628,461,533 around 12.96% of the initial work contract price so it is in the not good category, 4) based on the results of the time performance analysis for the amount of time resulting from variation orders on the project work, there was an extension of time of 5 months or 125% so it was in the poor category, 5) based on the results of the analysis of the contract document, contractor and resource variables in this research, it does not support the previous research that has been carried out, namely as a variable that does not influence project performance and variation orders. The owner involvement variable in this research is in contrast to previous research which said that the involvement variable is a factor that influences project performance and variation orders, while the planning and design variables as well as environmental and external conditions in this research support previous research as variables that influence project performance and variation orders, 6) control of this research is the planning and design factors carried out by the planning consultant to adapt to actual conditions in the field so that

there is no conflict with the surrounding area environment or the occurrence of variation orders as well as environmental & external condition factors so that a survey is carried out first at the planning stage in detail so that conflicts with residents can be avoided so that there are no variation orders.

ACKNOWLEDGEMENT

Many thanks are expressed to respondents and expert construction on my title Analysis of the Influence of Variation Factors Order Against Cost and Time Construction Project Implementation Channel Switching Infrastructure In Residential Area who were willing to help run this research smoothly.

REFERENCES

Abdillah & Jogiyanto. 2011. Partial Least Square (PLS), Alternatif Structural Equation Modeling (SEM) dalam Penelitian Bisnis (Buku). Andi Yogyakarta.

Albtoosh. Ja'far A & Ahmad tarmazi H (2017) Variation Orders Causes In Construction Buildings Projects In Jordan. Global Journal of Engineering Science and Research Management [Albtoosh* 4(9): September, 2017] ISSN 2349-4506.

Alhadithi, W., I. Naji, H., & N. Zehawi, R. (2021). Identifying the key causes and impacts of variation orders in Iraqi Construction Projects. Diyala Journal of Engineering Sciences, 14(2), 18–27. https://doi.org/10.24237/djes.2021.14202.

Alfian Malik, (2010). Pengantar Bisnis Jasa Pelaksana Konstruksi. Yogyakarta: Cv Andi Offset.

Alzara, M. (2022). Exploring the impacts of change orders on performance of construction projects in Saudi Arabia. Advances in Civil Engineering, 2022, 1–11.

Antuwan, Sintayehu T (2016) Assessment on the Impact of Variation Order on Project Performance in the Case of 40/60 Housing Project in Addis Ababa. Addis Ababa Science & Techology University School Of Civil Engineering & Construction.

Arain, F. M., & Pheng, L. S. (2006). Developers' views of potential causes of variation orders for institutional buildings in Singapore. Architectural Science Review, 49(1), 59–74. https://doi.org/10.3763/asre.2006.4908

Badan Standardisasi Nasional. 2004. SNI 03-1733-2004. Tata cara perencanaan lingkungan perumahan di perkotaan Frick, Heinz. 1984. Rumah Sederhana. Yogyakarta: Penerbit Kanisius.

Barrie, Donald S, and Paulson, Boyd C Jr.(1992). Professional construction management, third edition. Singapore:Mc Graw-Hill.

Chen, Chao. (2015) A Proactive Approach for Change Management and Control on onstruction Project. Doctor of Philosophy in Engineering – Civil and Environmental Engineering University of California, Berkeley.

Natasasmita, G., Murtejo, T., Chayati, N., & Lutfi, M. (2020). STUDI KELAYAKAN INVESTASI FINANSIAL (Studi Kasus: Perumahan BIA Residence). ASTONJADRO, 7(1), 1–7. https://doi.org/10.32832/astonjadro.v7i1.2272

Anwar, S., & Ida Hayati, N. (2013). ANALISIS PEMAKAIAN METODE EARNED VALUE SEBAGAI ALAT PENGENDALIAN PROYEK. ASTONJADRO, 2(2), 19–28. https://doi.org/10.32832/astonjadro.v2i2.795

Sabariah, I., Syaiful, S., & Ida Hayati, N. (2012). ANALISIS METODE NETWORK PLANNING DAN S-CURVE PROYEK KONSTRUKSI DI BOGOR. ASTONJADRO, 1(1), 28–34. https://doi.org/10.32832/astonjadro.v1i1.782

Khatimi, H., Fardian, M. R., & Sari, Y. (2021). EFFECTIVENESS OF APPLYING BIM BASED COST ESTIMATION IN DEVELOPMENT OF THE SYAMSUDIN NOOR AIRPORT PROJECT BANJARMASIN. ASTONJADRO, 10(1), 109–116. https://doi.org/10.32832/astonjadro.v10i1.4200

pISSN 2302-4240
eISSN 2655-2086

Volume 13, Issue 3, October 2024, pp.941-957
DOI: http://dx.doi.org/10.32832/astonjadro.v13i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

Marguna, A., Ida Hayati, N., & Rulhendri, R. (2012). APLIKASI TEKNIK EARNED VALUE DALAM PENGENDALIAN BIAYA DAN WAKTU PROYEK (Studi Kasus Proyek Pembangunan Gedung SDN Beji 2 Depok). ASTONJADRO, 1(2), 44–56. https://doi.org/10.32832/astonjadro.v1i2.789

Syaiful Syaiful, Soni Sutarsa, (2020). Analysis of Sustainable Financial Investment Feasibility Study on Housing Casase Cetrene. Proceeding of the 5th North American IEOM Society International Conference, Detroit, Michigan, USA. (5). 3631-3639. https://www.ieomsociety.org/detroit2020/papers/716.pdf

Dharmawati Pratama S, Hadi, P., Hamkah, H., Mansyur, M., Haerul P., Arman, H., Andi Arifuddin I., Andi I., Syaiful, S., (2024). MANAJEMEN PROYEK INFRASTRUKTUR. CV. Tohar Media. Makassar.