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ANALYSIS OF THE EFFECT OF VARIATION ORDER ON WASTEWATER PROJECTS

Muhammad Riska Dirgantoro, Sarwono Hardjomuljad
Fakultas Teknik, Universitas Mercu Buana
E-mail: muhammadriskad@gmail.com, sarwonohm2@yahoo.co.id

Abstract

The objectives of this study are: (1) Knowing the factors causing variation order in the Wastewater project. (2) Knowing the effects of variation orders on contractors/service providers in wastewater projects. The type of research used in this study is the quantitative research method. The quantitative research method uses research data in the form of numbers and analyzed using statistics from the results of data collection that have been verified and validated by experts, research variables that will be used in the next questionnaire stage obtained 11 variables of factors causing variation orders and 10 variables of the influence of variation orders on contractors, can be seen in appendix 2. then the following conclusions can be drawn: a) The dominant factors causing the Variation Order in wastewater projects in the DKI Jakarta Government, b) The dominant influence of the Variation Order on service providers/contractors.

Keywords: Wastewater; Project; Variation Order

INTRODUCTION

DKI Jakarta City as the Metropolitan Capital has various urban problems that are urgent to overcome. One of the urban problems is water pollution in rivers and water bodies that pass through the city of DKI Jakarta. Indicators of water pollution that are easily visible and can be felt are concentrated and black water in waterways and rivers that are black and smell bad.

Figure 1
Identification of Wastewater Management in DKI Jakarta

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From the identification of wastewater management in DKI Jakarta, it can be seen that 71% of wastewater is still managed individually with septic tanks, 16% with integrated treatment, 2% with sewerage, and 11% is not treated at all (in slum areas). In the implementation of a construction project, the change order is regulated by the terms of the contract. A contract is a legally binding agreement between the parties who sign it. To define and facilitate various contract provisions of construction projects, many industrial organizations have introduced standard contract documents and agreements (Syal & Bora, 2016).

Variation Order is something that always happens in every construction project, in several studies it was found to be one of the factors causing claims. Variation orders or change orders always have implications for cost and time, whatever the variation there will be a risk to the work being done both in the delay of work and additional costs that must be borne (Hardjomuljadi, 2016).

In projects organized by the Government, Variation orders have been regulated in article 87 of Presidential Regulation Number 4 of 2015 concerning the Fourth Amendment to Presidential Regulation Number 54 of 2010 which reads "paragraph (1): if there is a discrepancy between field conditions during implementation, with drawings/or technical specifications specified in the Contract Document, KDP together with the Provider of Goods/Services can make changes to the contract which include: (a) Increase or decrease the volume of work stated in the contract; (b) Increase and/or decrease the type of work; (c) Change the technical specifications of the work by field needs; (d) Change the execution schedule.

The contract change referred to in paragraph (1), applies to work using the Unit Price Contract or part of the work using the unit price of the Lump sum and Unit Price Combined Contract". The term change order is more commonly called a variation order, but in government-organized projects, the term change order is better known as a change order contract. In construction projects, work order changes (variation order or change order), in fact, often occur because the application of project planning methods does not always work well. The main cause of variation order or change order is the lack of understanding of related parties at the planning stage or in the implementation of construction projects. Therefore, there are many impacts caused both in terms of cost, quality, and time.

If changes occur very often, it will have an impact on increasing costs, late project completion, and also building quality that is not following the quality plan. A project will experience project delays if it is not completed as soon as possible. Punctuality in construction projects greatly affects the absorption of funds and physical realization in the field so that it is expected to have maximum project time performance, where the project can be completed on time, or even ahead of the schedule planned (Khalim, 2020).

In the wastewater project in DKI Jakarta, there has been a Variation Order that is being faced and completed by the parties involved in the project. Efforts to deal with the Variation Order are problems that are not expected by construction industry players because they will be faced with serious ethical problems and disputes, if not based on good technical innovation in dealing with Variation Order problems (Budiutomo, Santoso, & Hakim, 2021). Research is needed to analyze the right strategy in dealing with the Variation Order in the implementation of wastewater development construction projects located in DKI Jakarta, on the causes and impacts caused so as not to have a significant effect.

Based on the background stated above, the author identifies the following problems; (a) There are changes in the technical specifications of the work following field needs. (b) There is an adjustment in the type of work and volume of work after calculations are carried out in the field that allow changes in costs. The problem is formulated from the background of the existing problem in the research topic, as a research question, namely: (1) What factors cause variation orders in the Wastewater project? (2) What are the effects of variation orders on contractors/service providers in wastewater projects?

The objectives of this study are: (1) Knowing the factors causing variation order in the Wastewater project. (2) Knowing the effects of variation orders on contractors/service providers in wastewater projects. The benefit of this research is as a reference during the auction evaluation stage about how much-working capital must be owned by prospective service providers at the time of verification.

RESEARCH METHODS

The type of research used in this study is the quantitative research method. Quantitative research methods use research data in the form of numbers and are analyzed using statistics (Zano, 2019).

The research method used will determine a process starting from data collection, processing data into information to be analyzed, and finally will get results in the form of findings that can be concluded. Survey research is conducted to determine what factors are a cause of variation orders in wastewater projects and what factors influence the cost performance of contractors.

Research design is a concept or framework in a study. The research method contains a framework of thought that explains the aspects to be researched in this study. The research design was made to determine the most appropriate research method to answer the problem in research that is tailored to the topic, namely how the effect of variation orders on service provider financing on projects with a unit price contract system in wastewater projects.

In this study, a deductive hypothesis approach will be carried out, where problems are formulated from finding facts and drawing specific conclusions from general statements, or from general to specific. To determine the factors causing variation orders and their consequences, a survey approach will be carried out on several research objects on projects that have just been running or have just been implemented, then reviewed and analyzed the survey results from several correspondents related to the research object. The survey results through the distribution of questionnaires will be

carried out to parties related to the implementation of construction projects, namely service providers/contractors, service users/owners, and consultants.

For the topic raised in this study, namely the effect of variation orders on service provider financing in wastewater projects factors that cause variation orders for survey methods are formulated into 2 (two) variables that influence each other, namely: (a) Dependent variables as variables that are influenced, namely contractor cost performance. (b) Independent variable as an influencing variable, namely variation order in the unit price contract system, which includes: (1) Contract documents. (2) Stakeholders. (3) Design. (4) Service providers/contractors|

The independent variable (X) is the variable that affects the occurrence of Variation Order (Y). The following variables are the results of previous research which are grouped and then will be tested for validity by experts. Based on experience and interviews with several stakeholders, these variables can be seen in the table below.

Table 1 Free Variables (X) in Research

Variable		Indicator	Source
Contract Document (X1)	X1.1	Incomplete Contract Documents	(Memon et al., 2014). (Mohammad & Hamzah, 2019)
	X1.2	Technical specifications that are not clearly stated on the RKS, *bill of quantity*, and tender drawings.	(S. Gumolili et al., 2012). (Tenno &; Suroso, 2021)
	X1.3	Addition or reduction of work items	(Sandy A. Gumolili, Dinas, & Pemprov, 2012) (Mitra et al., 2020)
Variable		Indicator	Source
Stakeholder (X2)	X2.1	The project owner requests for optimization of building functions.	(Assbeihat, 2017). (Ana Yuni Martanti, 2018)
	X2.2	The owner instructs additional work	(Hardjomuljadi, 2016). (Assbeihat, 2017)
	X2.3	Owner's *delay* in approving drawings, contract design, and clarification	(Memon et al., 2014) (S. Gumolili et al., 2012)
Variable		Indicator	Source
Design (X3)	X3.1	A mismatch between the image and the field conditions.	(S. Gumolili et al., 2012) (Ana Yuni Martanti, 2018) (Muluk, Misriani, Atmaja, Ali, & Monica, 2018) (Mohammad & Hamzah, 2019)
	X3.2	Details of the initial tender drawings are incomplete / less clear.	(S. Gumolili et al., 2012) (Assbeihat, 2017) (Muluk et al., 2018) (Nurmala, n.d.)
	X3.3	Design *changes*	(Nurmala, n.d.). (S. Gumolili et al., 2012) (Hardjomuljadi, 2016)
	X3.4	Delay in the shop drawing approval by consultants and *owners*.	(Ana Yuni Martanti, 2018)
	X3.5	Significant volume differences between drawings, field conditions, and *the Bill of Quantity*	(Tenno & Suroso, 2021)

Variable		Indicator	Source
Service Provider / Contractor (X4)	X4.1	The contractor's work start schedule is later than the planned schedule	(Muluk et al., 2018)
	X4.2	Poor material control	(S. Gumolili et al., 2012) (Muluk et al., 2018)
	X4.3	Lack of contractor teamwork in the	(Assbeihat, 2017)*(Muluk et al.,*

	implementation of work	*2018)*(Muluk et al., 2018)
X4.4	Changes in work methods	(Tenno & Suroso, 2021) (Muluk et al., 2018)
X4.5	Errors and omissions in the calculation of volume estimation	(Muluk et al., 2018), (Tenno & Suroso, 2021)
X4.6	Less quick decision-making by contractors	(Assbeihat, 2017)(Muluk et al., 2018)(Muluk et al., 2018)
X4.7	Poor project management	(Wali & Saber, 2019)
X4.8	Disruption of *cash flow* of service providers/contractors	Observation
X4.9	Project profit/profit increases	Observation
X4.10	Project profit/profit drops	Observation
X4.11	Quality of work drops	Observation
X4.12	Quality of work goes up	Observation

In field studies, the effect of variation orders on contractors includes; (1) Project information. (2) Initial budget. (3) Project achievements during project implementation. In this study take samples that are part of the population where the characteristics of the sample are those that represent the entire population, namely the parties involved in the implementation of the Wastewater project.

The three parties are (a) Party I, originating from the owner or work unit at the DKI Jakarta Government involved in the implementation of the project; (2) Party II, consisting of supervisory consultants involved in the implementation of the project; (3) Third Party, originating from the service provider/implementing contractor on the DKI Jakarta Government project.

For the measurement of the questionnaire value, a measurement technique with a Linkert scale will be used, namely in the form of what factors cause variation orders in the Wastewater project for the unit price contract system, with the following measurement scale: Description for the measurement scale of the frequency level of factors causing variation orders in construction projects; (a) Never. (b) Very Rare. (c) Rarely. (d) Often. (e) Very Often.

In the survey method research, primary data was obtained from the results of collecting questionnaires on the three respondents, consisting of service users/owners or work units at the DKI Jakarta Government involved in project implementation, supervisory consultants involved in project implementation, and service providers/contractors implementing Wastewater in DKI Jakarta Government projects.

Secondary data for survey methods and field studies are obtained from literature studies such as journals, books, references, and other studies related to the research topic. From the responses from correspondents regarding the factors causing variation orders in the Air project for the unit price contract system, an analysis of the calculation of the Relative Importance Index (RII) was carried out with the formula:

$$RII = \frac{\Sigma W}{HS} \times 100$$

Where:

ΣW = The weight of each factor by respondents ranged from 1 to 5

H = Largest weight

S = The sum of respondents' responses from never there to always there.

RII is used as a ranking technique for each statement and compares responses received from the three respondents, consisting of service users/owners or work units in the DKI Jakarta Government involved in project implementation, supervisory consultants involved in project implementation, and service providers/contractors implementing Wastewater in DKI Jakarta Government projects. To measure the confidence received from the data, the level of reliability and validity will be tested on the data obtained from the questionnaire.

Validity tests are used to measure the validity or absence of a questionnaire, the questionnaire will be said to be valid if the questionnaire can or can measure the object being measured. The validity test is used to determine whether or not it is significant by comparing the calculated r-value (judging from the corrected item value – total correlation) with the table r value. Where if the corrected item value – total correlation ≥ r table then the data is valid.

Reliability tests are used to describe stability and reliability so that the measuring instrument has high reliability and can be trusted (Ana Yuni Yuni Martanti, 2019). The reliability test in this study used the internal reliability coefficient of alpha. With a reliability test, a study will know how each question in the questionnaire is related. The reliability test used is to calculate the alpha coefficient, the questionnaire question can be said to have a level of reliability if the value of the Cronbach Alpha coefficient is above 0.6. Reliability testing with the help of SPSS (Statistical Package for the Social Sciences) version 26 program.

The normality test in this study aims to determine whether a test variable is normally distributed or not. Testing in the study using the Kolmogorov-Smirnov one-sample test. A data has a normal distribution if the value of sig. (α) greater than the predetermined significant level. In this test, the significant level determined is 5%.

RESULTS AND DISCUSSION

The data collection method is carried out through the distribution of questionnaires with question items obtained from predetermined research variables based on literature studies, which are related to the factors causing variation orders and their effects on construction project performance. Data collection with the distribution of questionnaires consists of a validation stage by experts and a subsequent stage of correspondents. The data that has been obtained is then tested for validity and reliability, after which data analysis is carried out with a statistical analysis of the SPSS v.26.0 programs.

Table 2 Research Expert Profile

Expert	Educational Background	Experience Background in Project Construction	Length of Experience
Expert 1	S3	Academy	30 years
Expert 2	S2	Consultant Practitioner	40 years
Expert 3	S2	Consultant Practitioner	22 years old
Expert 4	S2	Contractor Practitioner	13 years old
Expert 5	S1	Consultant Practitioner	20 years

Expert 6	S1	Contractor Practitioner	12 years
Expert 7	S1	Bureaucracy	7 years

The data obtained is a statement of agreement or no to the variables that cause variation orders and their effects on contractor financing. The format form of expert validation of the questionnaire can be seen in Appendix 1. The results obtained from the data collection process against expert validation are then used as a basis for collecting questionnaire data on the three respondent parties consisting of, owners or work units at the DKI Jakarta Government involved in project implementation, consultants both planning consultants and supervisory consultants involved in project implementation, and service providers/contractors implementing wastewater in DKI Jakarta Government projects.

The data obtained from experts are described in the data tabulation in Table 3 below. For tabulations, the number 1 indicates a value for the expert who agrees with the variable, and the number 0 indicates the expert who disagrees. From the results of the sum, if it is greater than or equal to 4, the variable is considered to be usable in the questionnaire.

Table 3 Expert Validation Results

Variable (X)	P1	P2	P3	P4	P5	P6	P7	Sum	Result
X1.1	1	1	0	1	0	1	1	5	Accepted
X1.2	1	1	0	1	0	0	1	4	Accepted
X1.3	1	1	1	1	0	1	1	6	Accepted
X2.1	1	1	1	0	0	1	1	5	Accepted
X2.2	1	1	1	1	1	1	1	7	Accepted
X2.3	1	1	1	0	0	0	1	4	Accepted
X3.1	1	1	1	1	0	1	1	6	Accepted
X3.2	1	1	0	1	0	1	1	6	Accepted
X3.3	1	1	1	1	1	1	1	7	Accepted
X3.4	1	1	1	1	0	0	1	5	Accepted
X3.5	1	1	1	1	0	1	1	6	Accepted
X4.1	1	1	0	1	0	0	0	3	Rejected
X4.2	1	1	0	1	0	0	1	4	Accepted
X4.3	1	1	0	1	0	0	1	4	Accepted
X4.4	1	1	1	0	1	0	0	4	Accepted
X4.5	1	1	0	0	0	1	0	3	Rejected
X4.6	1	1	1	1	0	0	0	4	Accepted
X4.7	1	1	0	1	1	0	0	4	Accepted
X4.8	1	1	1	1	1	0	1	6	Accepted
X4.9	1	1	1	1	1	1	1	7	Accepted
X4.10	1	1	1	1	1	0	1	6	Accepted
X4.11	1	1	1	1	1	0	1	6	Accepted
X4.12	1	1	1	1	1	1	1	7	Accepted

From the results of data collection that have been verified and validated by experts, research variables that will be used in the next questionnaire stage obtained 11

variables of factors causing variation orders and 10 variables of the influence of variation orders on contractors, which can be seen in Appendix 2.

Furthermore, 11 variables of factors causing variation orders and 10 variables of influence of variation orders on contractors are submitted in the form of questionnaire questions and made into a format that can be seen in Appendix 2. The questionnaire for respondents itself was distributed to the three respondents, consisting of service users/owners or work units at the DKI Jakarta Government involved in project implementation, consultants, both planning consultants and supervisory consultants involved in implementation. Here is the data from respondents in this study.

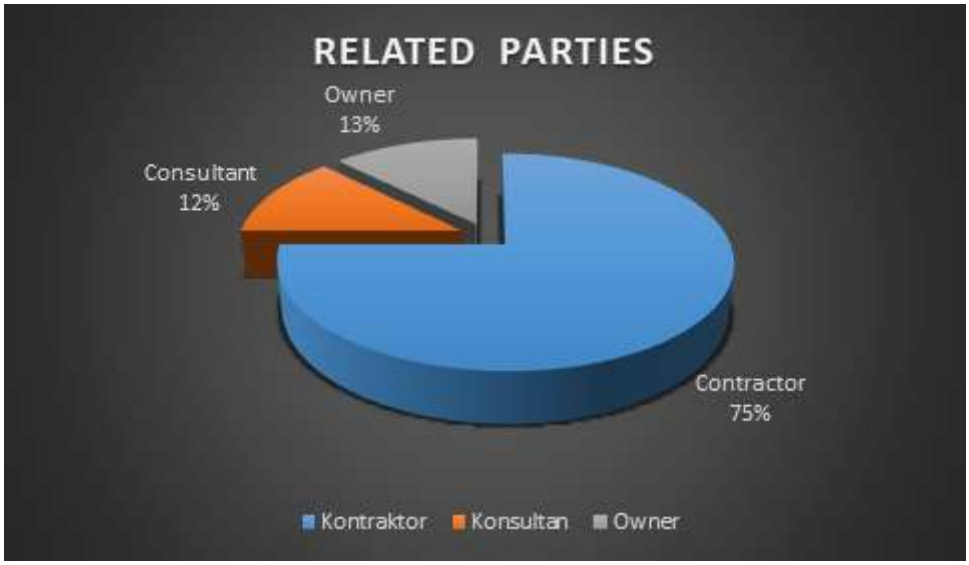

Figure 2 Respondent Composition
(Source: processed by the researcher)

Figure 2 shows that the respondents in this study consisted of 40 respondents consisting of 30 contractor respondents, 5 consultant respondents, and 5 owner respondents with the following percentages, namely 75% contractors/service providers, 12% consultants, and 13% owners/service users involved in wastewater projects, especially in DKI Jakarta Government projects. With the educational background of each respondent is listed in Figure 4.2 and the long experience of work is listed in Figure 3.

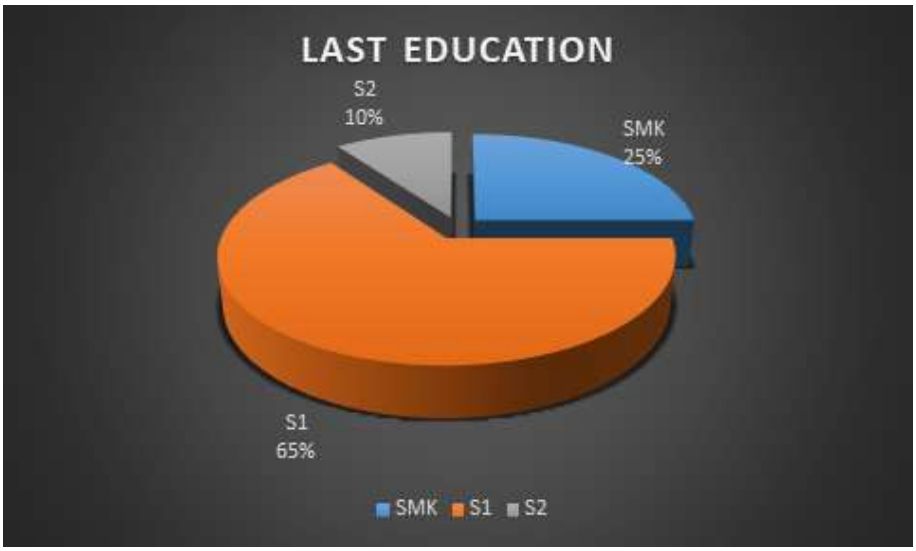

Figure 3 Educational Background of Correspondent
(Source: processed researcher)

Figure 4 Length of Work Experience
(Source: processed researcher)

The next stage of this study was tabulating data on statements obtained from respondents, namely the factors that cause the *Variation Order* on wastewater projects to project costs. The results of the data tabulation were then analyzed using SPSS version 26.0. The results of the data tabulation can be seen in Appendix 3. After tabulating the data, the next step before analyzing the RII calculation of the factors that cause the Variation Order in the DKI Jakarta Government wastewater project and the effect of the Variation Order on the financing of service providers/contractors is to test the results of respondents' statements. These tests include:

A. Validity Test

Validity according to Sugiyono (2013) is a measure that can show the validity or validity of the instrument. In this validity test refers to an instrument in carrying out its

function. Variables obtained from articles, journals, and scientific papers published. Data processing using the help of the SPSS for Windows program. An instrument can be said to be valid if the instrument can be used to measure what is to be measured. To calculate data measured by a formula:

$$r_{xy} = \frac{N\sum XY - (\sum x)(\sum y)}{\sqrt{(\sum x^2 - (\sum x)^2)(N\sum Y^2 - (\sum Y)^2)}}$$

Where:

X = The score obtained by the subject from all items

Y = Total score obtained from all items

ΣX = Number of scores in distribution X

ΣY = Number of scores in the Y distribution

ΣX2 = Number of squares in the distribution score

X ΣY2 = Number of squares in distribution score Y

N = Number of respondents

The interpretation of the processing results is to compare the Sig value with the α value (0,05) by criteria: (a) If Sig < 0,05 then the statement item is valid. (b) If Sig > 0,05 then the statement item is invalid.

In addition, it can also be seen by comparing the calculated r-value with the table r-value, namely: (1) If recalculate> table, Then the question items tested are declared valid. (2) If calculate < table, Then the question item tested is declared invalid. The calculated value is the value contained from the corrected item–total correlation and looks at the table value with significance 0,05 for test 2 side (two-tailed) and N=40, df=(N-2), df=40 –2 = 38, then obtained label (0,05;38) =0,312. A correlation coefficient of at least 0.312 differentiating power is considered satisfactory. This limitation is a convention, so test authors may determine their limits on the discriminating power of items in consideration of the content and purpose of the scale prepared.

Table 4 Validity Test Data Results

Variable Code	r calculate	r table	Result
X1.1	0,398	0,312	VALID
X1.2	0,361	0,312	VALID
X1.3	0,354	0,312	VALID
X2.1	0,431	0,312	VALID
X2.2	0,397	0,312	VALID
X2.3	0,757	0,312	VALID
X3.1	0,757	0,312	VALID
X3.2	0,811	0,312	VALID
X3.3	0,597	0,312	VALID
X3.4	0,593	0,312	VALID
X3.5	0,674	0,312	VALID
X4.2	0,379	0,312	VALID
X4.3	0,617	0,312	VALID

X4.4	0,805	0,312	VALID
X4.6	0,376	0,312	VALID
X4.7	0,313	0,312	VALID
X4.8	0,379	0,312	VALID
X4.9	0,617	0,312	VALID
X4.10	0,849	0,312	VALID
X4.11	0,634	0,312	VALID
X4.12	0,654	0,312	VALID

Source: (processed by the researcher)

From the results of the statistical validity test data above, it can be seen that none of the statement items of the variable are valid. The minimum requirement is considered qualified with a value of r = 0.312. So if the correlation between items with a total score of more than 0.312 then the variable is declared valid.

B. Reliability Test

Reliability tests are performed to determine how far the measurement results remain consistent when measuring two or more times of the same symptoms using the same measurement tool. There are several reliability testing methods, one of which will be used in this study is Cronbach's Alpha method. To see the level of reliability based on Cronbach's Alpha value can be seen in the following table:

Table 5 Reliability Levels

Cronbach's Alpha	Reliability Level
0.00 s/d 0.20	Less Reliable
0.20 s/d 0.40	Somewhat Reliable
0.40 s/d 0.60	Quite Reliable
0.60 s/d 0.80	Reliable
0.80 s/d 1.00	Highly Reliable

Source: Parametric Statistical Research

In this study, after a validity test was carried out and all factors were declared valid, the factors were included in the reliability test. The reliability test results can be seen in the following table 6:

Table 6 Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	**N of Items**
.895	**21**

(Source: SPSS V.26 researcher)

Table 6 can explain the value of Cronbach's Alpha with the number of indicators of the independent variable as many as 21 variables with a value > 0.80. Cronbach's alpha value > 0.80 so this variable is declared reliable with the level of reliability being very reliable because it is located in the range of 0.80 – 1.00.

C. Normality Test

Normality Analysis is a sample testing method to determine the level of normality of answer data from research respondents. The goal is to find out the distribution of data in a variable used in research, whether it is normally distributed or not. Normality analysis in this study used the Kolmogorov–Smirnov Test. Data are normally distributed if the Kolmogorov–Smirnov significance value is greater than 0.05. In this normality analysis, tests were carried out on variables that had passed the validity and reliability analysis, namely 21 variable indicators with 40 research respondents, and processed using IBM SPSS v26 software to obtain data normality information.
Here are the results of normality analysis using the Kolmogorov – Smirnov Test:

Table 7 Normality Analysis Results

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		40
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	3.70140225
Most Extreme Differences	Absolute	.157
	Positive	.107
	Negative	-.157
Test Statistic		.157
Asymp. Sig. (2-tailed)		.074[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

(Source: SPSS V.26 researcher)

Based on the results of normality analysis using the Kolmogorov–Smirnov Normality Test, the significance value of Asiymp. sig was obtained. (2-tailed) 0.074 > 0.05. So according to the basis of decision-making in the Kolmogrov-Smirnov normality test above, it can be concluded that the data are normally distributed. Thus, the assumption or statement of normality in the regression model has been fulfilled.

D. Implementation of RII (Relative Importance Index)

RII is used as a ranking technique for each statement and compares responses received from the three respondents, consisting of Owners in the DKI Jakarta

Government involved in project implementation, supervisory consultants involved in project implementation, and wastewater implementation contractors in DKI Jakarta Government projects. The calculation of RII from the results of processing respondent data and the calculation of RII from the factors that cause the Variation Order in the DKI Jakarta government wastewater project can be seen in Table 8.

Table 8
Factors that Cause Variation Order in DKI Jakarta Government wastewater project

No.	Factors Causing *Variation Order*	Contractor		Consultant		Service User / Owner		Cumulative	
		RII	Level	RII	Level	RII	Level	RII	Level
1	Incomplete Contract Documents. (X1.1)	0,587	11	0,440	11	0,560	11	0,565	11
2	Technical specifications that are not clearly stated on the RKS, *bill of quantity* and tender drawings. (X1.2)	0,627	4	0,720	5	0,640	9	0,640	6
3	Addition or subtraction of work items. (X1.3)	0,593	9	0,560	10	0,760	2	0,610	10
4	Project owner requests for optimization of building functions. (X2.1)	0,633	3	0,720	5	0,680	6	0,650	4
5	The owner instructed additional work. (X2.2)	0,667	2	0,720	5	0,760	2	0,685	2
6	Owner's delay in approving drawings, contract design and clarifications. (X2.3)	0,620	5	0,680	8	0,680	6	0,635	7
7	Mismatch between the image and the field conditions. (X3.1)	0,593	9	0,880	1	0,640	9	0,635	7
8	Details of the initial tender drawings are incomplete / less clear. (X3.2)	0,613	7	0,880	1	0,760	2	0,665	3
9	Design *changes.* (X3.3)	0,680	1	0,880	1	0,760	2	0,715	1
10	Delay in the shop drawing approval by consultants and owners. (X3.4)	0,607	8	0,760	4	0,800	1	0,650	4
11	Significant volume differences between drawings, field conditions, and the Bill of Quantity. (X3.5)	0,620	5	0,640	9	0,680	6	0,630	9

From the table of RII calculation results on 11 variable factors that cause the Variation Order in the DKI Jakarta government wastewater project, 5 dominant factors are made to cause the Variation Order in the DKI Jakarta government wastewater project in Table 9.

Table 9
Dominant factors that cause Variation Order in DKI Jakarta Government wastewater project

No	Contractor	Consultant	Service User / *Owner*
1	Design *changes*	Design *changes*	Delay in the shop drawing approval by consultants

			and *owners*
2	The owner instructs additional work	Incomplete/unclear details of the initial tender drawings	Design *changes*
3	Project owner request for optimization of building functions	A mismatch between image and field conditions	Incomplete/unclear details of the initial tender drawings
4	Technical specifications that are not clearly stated in the RKS, *bill of quantity*, and tender drawings	Delay in the shop drawing approval by consultants and *owners*	The owner instructs additional work
5	Significant volume differences between drawings, field conditions, and *Bill of Quantity*	The owner instructs additional work	Addition or subtraction of work items

The calculation of RII from the results of processing respondent data for the effect of Variation Order on service providers/contractors can be seen in Table 10.

Table 10
Effect of Variation Order on service provider/contractor

No	Effect of *Variation Order*	Contractor		Consultant		Service User/owner		Cumulative	
		RII	Level	RII	Level	RII	Level	RII	Level
1	Poor material control. (X4.2)	0,567	9	0,480	9	0,600	6	0,560	9
2	Lack of contractor teamwork in the implementation of work. (X4.3)	0,580	7	0,600	7	0,600	6	0,585	7
3	Changes in working methods. (X4.4)	0,607	4	0,840	3	0,680	5	0,645	4
4	Less quick decision-making by contractors. (X4.6)	0,627	3	0,680	6	0,560	10	0,625	6
5	Poor project management. (X4.7)	0,733	1	0,800	4	0,720	4	0,740	1
6	Disruption of cash flow of service providers/contractors. (X4.8)	0,567	9	0,480	9	0,600	6	0,560	9
7	*Project profit/profit goes up*. (X4.9)	0,580	7	0,600	7	0,600	6	0,585	7
8	Project profit/profit falls. (X4.10)	0,593	5	0,880	1	0,760	2	0,650	3
9	The quality of work dropped. (X4.11)	0,660	2	0,880	1	0,760	2	0,700	2
10	The quality of work is up. (X4.12)	0,587	6	0,760	5	0,800	1	0,635	5

From the table of RII calculation results on 10 variables of the influence of Variation Order on service providers/contractors, then 5 dominant influences of Variation Order on service providers/contractors are made in table 11.

Table 11
Effect of Dominant Variation Order on the Contractor

No	Contractor	Consultant	Service User / *Owner*
1	Poor project management	Quality of work drops	Quality of work goes up
2	Quality of work drops	Project profit drops	Quality of work drops
3	Less quick decision-making by contractors	Changes in work methods	Project profit/profit drops
4	Changes in work methods	Poor project management	Poor project management
5	Project profit/profit drops	Quality of work goes up	Quality of work goes up

From the table of RII calculation results on 11 variables of dominant factors that cause the existence of Variation Order and 10 variables of the dominant influence of Variation Order on service providers/contractors, a cumulative table of calculations is then made in Table 12.

Table 12
Cumulative dominant factors that cause Variation Order and cumulative dominant influence of Variation Order on service providers/contractors

No	The dominant factors that cause the existence of *Variation Order* are cumulatively	The dominant influence of *Variation Order* is cumulatively
1	Design *changes.* (X3.3)	Poor project management. (X4.7)
2	The owner instructed additional work. (X2.2)	The quality of work dropped. (X4.11)
3	Details of the initial tender drawings are incomplete / less clear. (X3.2)	Project profit/profit falls. (X4.10)
4	The project owner requests for optimization of building functions. (X2.1)	Changes in working methods. (X4.4)
5	Delay in the shop drawing approval by consultants and *owners.* (X3.4)	The quality of work is up. (X4.12)

The results of survey research to determine the dominant factors causing the occurrence of Variation Order and the most dominant influence of Variation Order through the calculation of cumulative RII from the three correspondent parties are as follows:

The top five ranks of the cumulative RII calculation of the dominant factors causing the Variation Order are; (a) Design changes. (X3.3) with an RII value of 0.715; (b) The owner instructs additional work. (X2.2) with an RII value of 0.686; (c) Details of the initial tender drawings are incomplete/unclear. (X3.2) with an RII value of 0.665; (d) Differences in project owner requests for optimization of building functions. (X2.1) with an RII value of 0.650; (e) Delay in approval of shopdrawing by consultants and owners (X3.4) with an RII value of 0.650.

The top five ranks of the cumulative RII calculation of the dominant influence of the Variation Order are; (1) Poor project management. (X4.7) with an RII value of 0.740; (2) The quality of work has fallen. (X4.11) with an RII value of 0.700; (3) Project profit/profit decreased (X4.10) with an RII value of 0.650; (4) Changes in working methods. (X4.4) with an RII value of 0.645; (5) The quality of work goes up. (X4.12) with an RII value of 0.635;

CONCLUSION

Based on the results of the discussion and data analysis to answer the formulation of the problem in this study, the following conclusions can be drawn:

The dominant factors causing Variation Order in wastewater projects in the DKI Jakarta Government are (1) Design changes. (2) The owner instructs additional work. (3) Details of the initial tender drawings are incomplete/unclear. (4) Differences in

project owner requests for optimization of building functions. (5) Delay in approval of shop drawing by consultants and owners.

The dominant influence of Variation Order on service providers/contractors is () Poor project management. (b) The quality of work has fallen. (c) Project profit decreases. (d) Changes in work methods. (e) Quality of work goes up.

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