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ANALYSIS OF THE EFFECT OF INDIRECT COSTS ON THE PERFORMANCE OF CONSTRUCTION PROJECT IMPLEMENTATION

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Abstract

The phenomenon that is currently happening in the field, especially in the implementation of the construction of flats within the work unit of the Ministry of Public Works and Public Housing, contractors who provide offers with an indirect cost of ≤ 10% on average there is a change in the time for completion of work implementation, while there are several implementing contractors who do not offer indirect costs but can complete the job on time. The purpose of this research is to find out whether indirect costs affect the performance of construction project execution time. The type of research used is a mixed method, namely quantitative methods and qualitative methods, in which data collection is carried out based on relevant theories and data sourced from the apartment development project within the work unit of the Ministry of Public Works and Public Housing. Data processing was carried out by distributing questionnaires to respondents and analyzed using statistical analysis methods with the help of Microsoft Excel and SPSS version 24 software. The results of the analysis show that the granting of indirect costs in the project budget plan has a significant effect on the performance of construction project implementation time taking into account the influence of (1) environmental factors, (2) claims policy factors and government regulations, (3) organizational factors and (4) project factors.

Keywords: Indirect Costs, Time Performance, Construction Projects

Introduction

The success of a construction project performance can be seen from the timeliness of completion of the implementation of work that has been agreed upon by the owner and contractor (Takim, 2005; Wang & Huang, 2006). Time performance is a comparison between the agreed time between the owner and the contractor and the actual time of project completion (Agsarini, 2015; Anuar Othman et al., 2006; Sinesilassie et al., 2017).

One of the efforts that can be made to maximize project performance includes including overhead costs in the project cost budget plan to carry out planning, and inspections to evaluate whether the contractor has done the work that must be met related to these additional overhead costs (Rose & Manley, 2010; Yana et al., 2020).

The costs included in indirect costs are overhead costs, unexpected costs, profits, taxes and others (Christian & Anondho, 2019; Nurdiana, 2015). Overhead costs are identical to indirect costs in the implementation of construction projects or cost which could not be identified (Cilensek, 1991; Plebankiewicz & Leśniak, 2013). Indirect costs consist of general costs (overhead) and profits with a percentage of 10% to 15% of direct costs (PUPR, 2022)

When indirect cost practices are not managed with good management and appropriate resources, then key project performance outcomes will be affected (Becker et al., 2014; Cash, 1997). The following is as a list of development projects within the Ministry of Public Works and Public Housing for the Fiscal Year 2019 to 2021 with indirect cost offers of ≤ 10%, including:

Table 1. List of flat construction with an indirect cost offer of 10%

No	F.Y	Number of Packages	10% Overhead Fee	Add. Time
1	2019	16	11	9
2	2020	15	13	7
3	2021	24	18	14
Total		**55**	**42**	**30**

Based on Table 1, the number of packages for construction of flats from the fiscal year 2019 to 2021 is 55 packages with an overhead cost offer of 10% as many as 42 packages or 76.36%, and there is a change in implementation time of 30 packages or 54.55%.

Table 2. List of flat construction with indirect cost offers of <10%

No	F.Y	Number of Packages	10% Overhead Fee	Add. Time
1	2019	16	-	-
2	2020	15	-	-
3	2021	24	5	5
Total		**55**	**5**	**5**

Based on Table 2, the number of packages for construction of flats from fiscal year 2019 to 2021 is 55 packages with an overhead cost offer of < 10% as many as 5 packages or 9.09%, and there is a change in the implementation time of 5 packages or 9.09% in the implementation of flat construction work in fiscal year 2021.

Table 3. List of construction of flats with an offer of indirect costs of 0%

No	F.Y	Number of Packages	10% Overhead Fee	Add. Time
1	2019	16	5	5
2	2020	15	2	-
3	2021	24	1	1
Total		**55**	**8**	**6**

Based on Table 3, the number of packages for construction of flats from fiscal year 2019 to 2021 is 55 packages with an overhead fee offer of 0% as many as 8 packages or 14.55%, and there is a change in the implementation time of 6 packages or 10.91%.

From the table of construction of flats with each offer of overhead costs ≤ 10%, it can be concluded that from 2019 to 2021 as many as 55 packages, there was of a change in the time of work implementation as many as 41 packages or 74.55%. Where the change in work execution time is dominated by 10% overhead offers of 30 packages or 54.55%, overhead <10% as many as 5 packages or 9.09% and 0% overhead offers as many as 6 packages or 10.91%. With the change in implementation time will automatically add costs beyond the initial calculation before implementation in the form of office and field overhead costs (Ibbs et al., 2003; Kaliba et al., 2009).

The phenomenon that occurs with the many changes in the implementation of the implementation of the work implementation time, is indicated that service users as owners and service providers as contractors do not understand the importance of determining the amount of overhead costs in the budget plan for the implementation of the flat construction project (Enshassi et al., 2008; Šiškina et al., 2009). The tendency in determining the amount of overhead costs by service users or owners to reduce the available budget, while from the service provider or contractor to reduce the offer as low as possible in order to get a work package (Shrestha & Pradhananga, 2010).

The amount of indirect cost allocation for the implementation of construction projects results from previous research is 16% with a profit allocation of 10%, Quality Costs 0.54%, Risk Costs 5.17%, Overhead costs and other costs 0.29% (Nurdiana, 2015, pp. 105-109). The percentage of indirect costs to the contract value is an indirect cost ratio of 7% - 14% in the range of the contract value of Rp. 100,000,000,000 – Rp. 200,000,000,000 indirect cost ratio 12% - 14% for the contract value Rp. 200,000,000,000 – Rp. 300,000,000,000 and there was a decrease in the indirect cost ratio of 14% as the project contract value was above Rp. 320,000,000,000 (Andhika, 2017). Estimated indirect costs range from 13.210% for buildings, 9.663% for roads, and 11.408% for irrigation/other water projects with an average total of 11.279% of the total costs (M. L. K. Lino, 2019). The overhead cost of a project is one element of the cost of construction products (Leśniak & Juszczyk, 2018; Ujene et al., 2013). This cost is an element of construction costs, which is relatively large and difficult to control, and is not easily charged directly to a particular production output (Assaf et al., 2001; Hartanto et al., 2022)

In determining the amount of indirect costs, it is necessary to take into account factors that are directly related to the implementation of a construction project (Bower, 2000; Saini et al., 2021). Influential factors in determining the size of indirect cost estimates are grouped into 4 groups of factors, namely project groups, organizations, clients and government regulations, and environmental factors (Akintoye, 2000; M. Lino, 2018). A total of 30 factors is effective against overhead costs in four areas: (a) projects, (b) clients, (c) Government regulations, and (d) environmental factors (Hesami & Lavasani, 2014). A total of 3 groups of external factors that predominantly affect the overhead costs of construction projects, namely economic factors, legal factors, and socio-cultural factors (Wijaya & Anondho, 2022).

Based on the background above, the objectives of this study (1) Identifying what factors influence in calculating the indirect costs of implementing construction projects because in providing the amount of indirect costs it is very important to consider what factors influence in estimating indirect costs in order to create a quality indirect cost estimate. (2) Identify what factors are most influencing in calculating the indirect costs of implementing a construction project because in providing the amount of indirect costs it is very important to consider at least what factors are most influencing in estimating indirect costs in order to create a quality indirect cost estimate. (3) Knowing whether indirect costs affect the performance of the construction project implementation time because in construction projects there are technical and non-technical problems that often occur and are faced in the field.

Research Methodology

The type of research used in this study is a mixed type of research, which uses mixed methods, namely quantitative and qualitative. Collecting data with quantitative methods is done by finding sources from theories that are relevant to this research. While data collection using a qualitative method was obtained from project data for the construction of flats and distributing questionnaires to service users (owners) and construction consultants who were involved in the construction of flats within the Work Unit of the Ministry of Public Works and Public Housing.

The instruments used in the questionnaire in this study included 6 variables with 52 indicators including:

Table 4. Research instruments

No	Variable	Indicator
1	Project Factor (X1)	Project complexity (X1.1)
		Project size and volume (X1.2)
		Project duration (X1.3)
		Inability to obtain materials (X1.4)
		Project location (X1.5)
		Project quality level (X1.6)
		Scope of work (X1.7)
		Site layouts (X1.8)
		Type of project or work (X1.9)
2	Organizational Factors (X2)	Contractor requirement for work (X2.1)
		Availability of contractor capital (X2.2)
		Outsourced work (X2.3)
		Company experience with owner (X2.4)
		Cash flow (X2.5)
		Relations in the project (X2.6)
		Similar project experience (X2.7)
		Expertise in determining the percentage of overhead costs (X2.8)
		Ability to comply with contracts and specifications (X2.9)
		Ability to solve problems (X2.10)
		Periodic financial audit (X2.11)
		Ability to face risks (X2.12)
		Presumption in claims and dispute resolution (X2.13)
		Overhead cost monitoring and evaluation system (X2.14)
		Diversity in company business (X2.15)
		Project management method (X2.16)
		Company classification (X2.17)
		Cooperation of foreign companies (X2.18)
		Availability of similar projects (X2.19)
3	Client Policy Factors and Government Regulations (X3)	Payment schedule (X3.1)
		Contract type (X3.2)
		Type and nature of client/owner (X3.3)
		Type of consultant (X3.4)
		Firmness in supervision (X3.5)
		Tender method

No	Variable	Indicator
		(X3.6)
		Project implementation method (X3.7)
		Warranty level and terms (X3.8)
		Contractor design requirements (X3.9)
4	Environmental Factors (X4)	Country implementing project (X4.1)
		Available information level (X4.2)
		Fraudulent practices and bribes (X4.3)
		Number of competitors (X4.4)
		Inflation and interest rates (X4.5)
		Regional economic conditions (X4.6)
		Stakeholder concern (X4.7)
		Work volume for construction market conditions (X4.8)
5	Indirect Costs (Y1)	Tax (Y1.1)
		General conditions (Y1.2)
		Cost of risk (Y1.3)
		Operational costs (Y1.4)
6	Time Performance (Y2)	Implementation time is not in accordance with the original plan (Y2.1)
		Extension of implementation time for additional work and rework/redesign (Y2.2)
		Procurement of resources is not according to plan (Y2.3)

Before distributing the questionnaires, the variables mentioned above must be validated by experts engaged in construction services. The expert validation stage was carried out by 7 experts in the field of construction services. The purpose of expert validation is to strengthen the variables in the questionnaire. From the results of expert validation obtained as many as 6 variables with 27 approved indicators, including:

Table 5. Research instruments that have been validated by experts

No	Variable	Indicator
1	Project Factor (X1)	Project complexity (X1.1)
		Project size and volume (X1.2)
		Project duration (X1.3)
		Inability to obtain materials (X1.4)
		Project location (X1.5)
2	Organizational Factors (X2)	Availability of contractor capital (X2.2)
		Outsourced work (X2.3)
		Expertise in determining the percentage of overhead costs (X2.8)
		Ability to solve problems (X2.10)
		Project management method (X2.16)
3	Client Policy Factors and Government Regulations (X3)	Payment schedule (X3.1)
		Contract type (X3.2)
		Firmness in supervision (X3.5)
		Tender method (X3.6)
		Project implementation method (X3.7)
4	Environmental Factors (X4)	Country implementing

No	Variable	Indicator
		project (X4.1)
		Fraudulent practices and bribes (X4.3)
		Number of competitors (X4.4)
		Inflation and interest rates (X4.5)
		Regional economic conditions (X4.6)
5	Indirect Costs (Y1)	Tax (Y1.1)
		General conditions (Y1.2)
		Cost of risk (Y1.3)
		Operational costs (Y1.4)
6	Time Performance (Y2)	Implementation time is not in accordance with the original plan (Y2.1)
		Extension of implementation time for additional work and rework/redesign (Y2.2)
		Procurement of resources is not according to plan (Y2.3)

The approved variable is used as the question variable in the questionnaire which will be distributed to the respondents (Gorsuch, 2000). The respondents who were targeted for filling out the questionnaire were service users (owners), including heads of work units, commitment-making officials, technical implementing staff and service providers (consultants), including directors, team leaders/experts, engineering staff.

The data processing method in this study is a non-parametric and parametric statistical analysis technique with the help of SPSS software version 24. Non-parametric statistical analysis was carried out to analyze the respondents' descriptiveness with the Kruskal Wallis test (Hassan et al., 2012) which aimed to determine the differences in respondents' perceptions in answering questions with Asymp values. Sig 0.05, where if the Asymp value. Sig > 0.05 can be interpreted as no difference in perception in answering the question while if the value of Asymp. Sig < 0.05 can be interpreted as there are differences in perception in answering questions. Parametric statistical analysis aims to perform multiple and simple regression tests (Schenker & Taylor, 1996). The multiple regression test aims to determine the relationship of more than one independent variable with the dependent variable and also aims to find the factor that most influences the dependent variable, as well as a simple regression test which aims to find out the relationship of one independent variable with the dependent variable (Cohen, 1968; Turóczy & Marian, 2012). Before conducting a regression analysis, a valid test is carried out with a minimum correlation value of 0.3, where if the correlation value > 0.3 can be interpreted as valid data and can be continued with a reliable test. The reliability test is carried out to determine the consistency of the measuring instrument, in determining whether it is reliable or cannot be used, the alpha value limit, which is < 0.6, is not good while 0.7 is acceptable and > 0.8 is declared good and can be continued to the next test stage.

After validity and reliability tests are carried out, the next tests before conducting regression tests are normality tests, multicollienarity tests and heterochedasticity tests. The normality test is used to determine the distribution of data in this case whether the distributed residual is normal or not (Ghasemi & Zahediasl, 2012). The assessment that the residual is normal by looking at the signification value > 0.05. The multicholinearity test is the discovery of a perfect or near-perfect correlation between independent variables in the regression model. A good regression model should not have a correlation between free variables (the correlation is 1 or close). In addition, tolerance and inflation factor (VIF) values can be seen or by comparing the value of the individual coefficient of determination with the value of determination simultaneously. The assessment of whether or not multicholinearity in the regression model is shown with a tolerance value of > 0.1 and a VIF value of < 10. A heterochedasticity test is a state in which a regression model occurs in the inequality of variation from residual on one observation to another. A good regression model is that heteroskedasticity does not occur (Baltagi et al., 2010). One way of testing heteroskedasticity by looking at dot patterns on scatterplots where dots spread above and below the number 0 on the Y axis states that heteroskedasticity does not occur in regression models.

After normality tests, multicollienarity tests and heterochedasticity tests, regression tests were then carried out, including the t test, coefficient of determination test (R2) and F test. The t test aims to determine the influence of independent variables on the dependent variables partially (Mishra et al., 2019). In making decisions on the t test if it counts > t table, the independent variable affects the dependent variable. The Coefficient of determination test (R2) is used to measure how far the model's ability to explain the variance of dependent variables is and Test F aims to determine the influence of independent variables on dependent variables stimulantly or together. In making decisions on the F test if F calculates > F table with signification 0.05, the independent variable affects the dependent variable. Data analysis using the help of SPSS software version 24.

Results and Discussion

From the results of the expert analysis of 7 people from academics and practitioners, 6 variables were obtained with 27 approved indicators. Then the approved variable is used as the question variable in the questionnaire. The results of the approved variables are as follows:

Table 6. Expert validation results

No	Code	Variable	Indicators
1	X1	Project Factors	Project complexity (X1.1)
			Project size and volume (X1.2)
			Project duration (X1.3)
			Inability to obtain materials (X1.4)
			Project location (X1.5)
2	X2	Organizational Factors	Availability of contractor capital (X2.2)
			Subcontracted work (X2.3)
			Expertise in determining the percentage of overhead costs (X2.8)
			Ability to resolve issues (X2.10)
			Project management methods (X2.16)
3	X3	Klain Policy and Government Policy Factors	Payment schedule (X3.1)
			Contract type (X3.2)
			Assertiveness in supervision (X3.5)
			Tender method (X3.6)
			Project execution methods (X3.7)
4	X4	Environmental Factors	Countries implementing the project (X4.1)
			Deceptive and bribery practices (X4.3)
			Number of competitors (X4.4)
			Inflation and interest rates (X4.5)
			Regional economic conditions (X4.6)
5	Y1	Indirect Costs	Tax (Y1.1)
			General conditions (Y1.2)
			Risk fee (Y1.3)

No	Code	Variable	Indicators
			Office and project operating costs (Y1.4)
6	Y2	Time Performance	The implementation time did not match the original plan (Y2.1)
			Extended execution time for added work and rework/redesign (Y2.2)
			Procurement of resources not on track (Y2.2)

After expert validation, a questionnaire was distributed to 60 respondents related to flat construction projects within the Ministry of Public Works and Public Housing from service users and construction service consultants. In this study, researchers managed to collect a questionnaire of 58 respondents. The respondent's profile is as follows:

Table 7. Respondent profile data

No	Description	Number of Respondents
1	▪ **Position:**	**58**
	▪ Service Users	
	- Head of Task Force	2
	- Commitment Making	2
	Officer	34
	- Technical Executive	
	Staff	1
	▪ Consultant	10
	- Company Director	9
	- Team Leader /	
	Expert	
	- Engineering Staff	
2	**Construction**	**58**
	Experience:	12
	▪ < 5 Years	24
	▪ 5 – 10 Years	14
	▪ 10 – 15 Years	8
	▪ > 15 Years	
3	**Last Education :**	**58**
	▪ High School /	3
	Vocational School	1
	Equivalent	41
	▪ Diploma – 3 (D3)	13
	▪ Bachelor of Strata - 1 (S1)	
	▪ Bachelor of Strata - 2 (S2)	

The following is as a tabulation of the data from the questionnaire collection:

Table 8. Tabulation of questionnaire results data

No	Code	Variable	Indicators	Scale				
				1	**2**	**3**	**4**	**5**
1	X1	Project Factors	Project complexity is a function of organizational complexity, resource complexity, and technical complexity where these factors influence the increase in overhead costs (X1.1)	0	1	5	26	26
			The size and volume of the project will affect the contractor's organizational structure, cost breakdown structure, and project period (X1.2)	0	0	1	41	16
			Project duration will affect project profit and overhead (X1.3)	0	0	2	34	22
			The inability to obtain materials will affect project profits and overhead (X1.4)	0	1	2	26	29
			Project location may affect several components of project	0	0	0	27	31

No	Code	Variable	Indicators	Scale				
				1	2	3	4	5
			overhead costs including travel costs, transportation, access, public property security, office, launch and preservation, and other temporary facilities and may prevent from allocating additional expensive resources (X1.5)					
2	X2	Organizational Factors	The availability of contractor capital affects the commitment to the duration of the project avoiding delays so as to reduce overhead costs to a minimum (X2.2)	0	1	4	26	27
			Subcontracted work affects the need of staff for monitoring and guiding for the desired quality, the number of different types of project overhead that directly or indirectly exert pressure on the sum of various project overhead costs and affect the number of work packages (X2.3)	0	0	9	33	16
			Expertise in determining the percentage of overhead costs for the company is very necessary for smooth completion of work (X2.8)	0	1	2	34	21
			The ability to resolve issues will affect overhead costs (X2.10)	0	1	5	34	18
			A good project management method in the implementation by the company will affect overhead costs (X2.16)	0	0	3	33	22
3	X3	Klain Policy and Government Policy Factors	The repayment schedule will significantly affect the financial liquidity of the project, the percentage value of overhead and surcharges and the increase in overhead costs (X3.1)	1	1	9	33	14
			The type of contract will affect the allocation of overhead costs, project risk and avoid disputes with clients (X3.2)	0	6	5	38	9
			Assertiveness in supervision will affect the increase in technical staff costs and may result in delays in project duration which can increase general overhead costs and resource overhead at most (X3.5)	1	0	8	28	21
			Tender methods such as the type of contract and the size of the contract requirement affect the amount of project overhead costs (X3.6)	0	4	11	35	8
			The method of project execution affects overhead costs and should be considered in terms of engineering, supply and supply of goods, construction, financial support, maintenance and exploitation (X3.7)	0	0	4	28	26
4	X4	Environmental Factors	The country implementing the project will also affect the amount of overhead costs in aspects of culture, government legislation, taxes, war safety, sanctions from other countries (X4.1)	0	0	3	33	22
			Fraudulent practices and bribery affect overhead costs (X4.3)	0	2	2	33	21
			The number of competitors will affect the project overhead costs and have an effect in determining the percentage of overhead costs (X4.4)	0	1	4	40	13
			Inflation and interest rates will affect the effects of long-term overhead costs and will cause fluctuations so that it will have an impact on increasing claims (X4.5)	0	0	2	34	22
			Regional economic conditions will affect the mechanism of indirect costing and the impact on staff salaries, service prices, machine rentals affecting the amount of overhead costs (X4.6)	0	0	4	31	23

No	Code	Variable	Indicators	Scale				
				1	2	3	4	5
5	Y1	Indirect Costs	Taxes on materials, equipment and workers as applied at the project site (Y1.1)	0	0	1	31	26
			General conditions on projects implemented by service providers to support construction activities (Y1.2)	0	0	2	37	19
			Risk costs are unforeseen gains and costs for contractors in carrying out construction activities (Y1.3)	0	0	10	37	11
			Office and project operational costs for service providers in carrying out construction activities (Y1.4)	0	0	1	42	15
6	Y2	Time Performance	Extension of implementation time from planned (Y2.1)	2	4	4	16	32
			Extension of implementation time caused by additional work and rework (Y2.2)	0	1	12	19	26
			Procurement of labor resources, materials, equipment that is not in accordance with project planning / inefficient causing delays in work (Y2.3)	1	4	1	22	30

Respondent Descriptive Analysis

Testing the answers to questionnaire samples from respondents taken from different position backgrounds, then statistically it can be tested with the Kruskal Wallis test, which is a test test of data of three or more samples unrelated (independently), the following Kruskal Wallis test results can be seen as follows:

Table 9. Kruskal Wallis test results (position)

No	Description	Project Factors (X1)	Organizational Factors (X2)
1	Asymp. Sig	0,440	0,232
		Other Policy Factors and Government Regulations (X3)	Environmental Factors (X4)
2	Asymp. Sig	0,167	0,722
		Indirect Costs (Y1)	Time Performance (Y2)
3	Asymp. Sig	0,536	0,876

It can be seen from the results of the Kruskal Wallis test in table 7, the value of Asymp. Sig > 0.05, which means that there is no difference in respondents' perceptions in answering questions from the background of the position.

Figure 1. Respondents by job title

Based on figures 1. Regarding the distribution of data according to the position of the respondent, it is known that the distribution of positions into 2 (two) categories, namely service users and construction service consultants. The distribution of service user categories is 3.40% for the position of Head of Work Unit, 3.40% for the position of Commitment Making Officer and 58.60% for the position of technical implementing staff. As for the construction services consultant category, 1.70% for the position of company director, 17.20% for the position of team leader / expert and 15.50% for the position of engineering staff.

Testing the answers to the questionnaire sample of respondents taken from different experiential backgrounds, then statistically it can be tested with the Kruskal Wallis test, which is a test test of data of three or more unrelated samples (independently), the following Kruskal Wallis test results can be seen as follows:

Table 10. Kruskal Wallis test results (experience)

No	Description	Project Factors (X1)	Organizational Factors (X2)
1	Asymp. Sig	0,756	0,793
		Other Policy Factors and Government Regulations (X3)	**Environmental Factors (X4)**
2	Asymp. Sig	0,834	0,411
		Indirect Costs (Y1)	**Time Performance (Y2)**
3	Asymp. Sig	0,857	0,893

It can be seen from the results of the Kruskal Wallis test in table 8, Asymp values. Sig > 0.05, which means that there is no difference in respondents' perceptions in answering questions from experiential backgrounds.

Figure 2. Respondents based on experience

Based on figures 2. Regarding the distribution of data according to the length of experience of respondents in the construction field as much as 20.70% experienced for < 5 years, 41.40% experienced for 5 – 10 years, 24.10% experienced for 10 – 15 years and 13.80% experienced for > 15 years.

Testing the answers to the questionnaire sample of respondents taken from different educational backgrounds, then statistically it can be tested with the Kruskal Wallis test, which is a test of data of three or more unrelated samples (independently), the following Kruskal Wallis test results can be seen as follows:

Table 11. Kruskal Wallis test results (education)

No	Description	Project Factors (X1)	Organizational Factors (X2)
1	Asymp. Sig	0,280	0,926
		Other Policy Factors and Government Regulations (X3)	**Environmental Factors (X4)**
2	Asymp. Sig	0,948	0,880
		Indirect Costs (Y1)	**Time Performance (Y2)**
3	Asymp. Sig	0,593	0,872

It can be seen from the results of the Kruskal Wallis test in table 9. Asymp value. Sig > 0.05, which means that there is no difference in respondents' perceptions in answering questions from educational backgrounds.

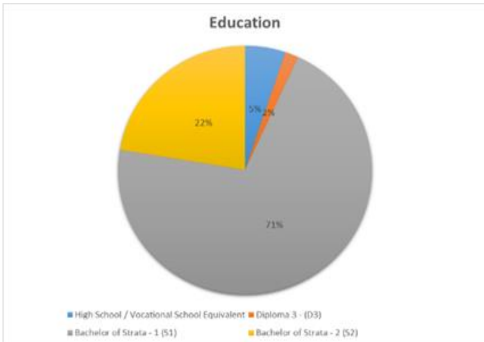

Figure 3. Respondents by education

Based on figures 3. Regarding the distribution of data according to respondents' education, it is known that as many as 5.20% have high school / vocational education as equals, 1.70% have Diploma 3 – (D3) education, 70.70% have Bachelor's degree 1 – (S1) and 22.40% have Master's degree – (S2).

Validity Test

Test validity to find out if each item is valid or not. The following are the validity test results:

Table 12. Validity test results

No	Code	Corrected Item-Total Correlation	Coef.	Inf.
1	X1.1	0,480	0,3	Valid
2	X1.2	0,493	0,3	Valid
3	X1.3	0,488	0,3	Valid
4	X1.4	0,539	0,3	Valid
5	X1.5	0,712	0,3	Valid
6	X2.2	0,570	0,3	Valid
7	X2.3	0,421	0,3	Valid
8	X2.8	0,303	0,3	Valid
9	X.2.10	0,506	0,3	Valid
10	X2.16	0,411	0,3	Valid
11	X3.1	0,560	0,3	Valid
12	X3.2	0,623	0,3	Valid
13	X3.5	0,518	0,3	Valid
14	X3.6	0,638	0,3	Valid
15	X3.7	0,558	0,3	Valid
16	X4.1	0,536	0,3	Valid
17	X4.3	0,461	0,3	Valid
18	X4.4	0,386	0,3	Valid
19	X4.5	0,459	0,3	Valid
20	X4.6	0,575	0,3	Valid
21	Y1.1	0,546	0,3	Valid
22	Y1.2	0,518	0,3	Valid
23	Y1.3	0,489	0,3	Valid
24	Y1.4	0,446	0,3	Valid
25	Y2.1	0,645	0,3	Valid
26	Y2.2	0,565	0,3	Valid
27	Y2.3	0,455	0,3	Valid

The validity test results can be seen in Table 10 items total statistics limit the minimum value of correlation 0.3, according to the values listed in the column corrected item total correlation variables all items get a value of > 0.3 then the variable items project factor (X1), organizational factor (X2), client policy factor and government regulation (X3), environmental factor (X4), Indirect Cost (Y1) and time performance (Y2) are declared valid.

Reliability Test

Reliability tests are carried out to determine the consistency of measuring instruments. The following are the reliability test results:

Table 13. Reliability test results

No	Code	Cronbach's Alpha	Coef.	Inf.
1	X1	0,761	0,6	Good
2	X2	0,686	0,6	Good
3	X3	0,795	0,6	Good
4	X4	0,721	0,6	Good
5	Y1	0,711	0,6	Good
6	Y2	0,724	0,6	Good

Results from reliability analysis in table 11, with Cronbach's alpha technique. It can be seen from the output of the table above that Cronbach's alpha value for variable X1 is 0.761 > 0.6, variable X2 is 0.686 > 0.6, variable X3 is 0.795 > 0.6, variable X4 is 0.721 > 0.6, variable Y1 is 0.711 > 0.6 and variable Y2 is 0.724 > 0.6 so it can be concluded that this study is acceptable, both and reliable.

Multiple Regression Analysis

The purpose of multiple regression analysis in this study is to determine the relationship between independent variables, namely Project Factors (X1), Organizational Factors (X2), Other Policy Factors and Government Regulations (X3) and Environmental Factors (X4) to the dependent variables, namely indirect costs (Y1).

The normality test is used to test whether the residual value resulting from the regression is normally distributed or not. The following are the results of the normality test:

Table 14. One-sample Kolmogoroz-Smirnov test

No	Description	Unstandardized Residual`
1	N	58
2	Monte Carlo Sig. (2-tailed)	0,218

The results of the normality test analysis show that the significant value of 0.218 > 0.05, the residual value is normal.

The multicollinearity test is the discovery of a perfect or near-perfect correlation between independent variables in the regression model. The following are the results of the multicollinearity test:

Table 15. Multicollinearity test results

No	Model	Collinearity Statistics	
		Tolerance	VIF
1	Project Factors (X1)	0,440	2,274
2	Organizational Factors (X2)	0,271	3,683
3	Other Policy Factors and Government Regulations (X3)	0,517	1,934
4	Environmental Factors (X4)	0,502	1,991

a. Dependent Variable: Indirect Costs (Y1)

The results of the multicollinearity test analysis in table 13 showed that the tolerance value for the project factor variable (X1) was 0.440 > 0.1 and the inflation factor (VIF) value was 2.274 < 10, the tolerance value for the organizational factor variable (X2) was 0.271 > 0.1 and the inflation factor (VIF) value was 3.683 < 10, the tolerance value for the claim policy factor and government regulation (X3) variable was 0.517 > 0.1 and the inflation factor (VIF) value was 1.934 < 10, and the inflation factor (VIF) value was 10, and the value of inflation factor (VIF) was 10, and the value of tolerance for the environmental factor variable (X4) of 0.502 > 0.1 and the inflation factor (VIF) value of 1.991 < 10, it was concluded that there was no multicollinearity in the regression model.

A heteroscedasticity test is a state in which a regression model occurs in the inequality of variation from residual on one observation to another. The following are the results of the heteroscedasticity test:

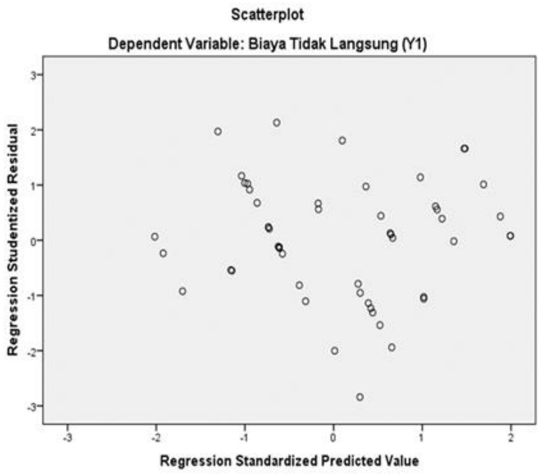

Figure 4. Heteroscedasticity test results

Based on figures 4. The results of the heteroscedasticity test showed that the ticks did not form a clear pattern and spread above and below the number 0 on the Y axis so that it was concluded that heteroscedasticity did not occur in the regression model.

The t test aims to determine the influence of independent variables on the dependent variables partially. As for decision making on the t test if t count > t table or sign value. < 0.05 then the independent variable affects the dependent variable. The following are the results of the t test in this study:

Table 16. t test results

No	Model	B	t	Sig.
1	(Constant)	0,494	0,621	0,537
2	Project Factors (X1)	0,169	3,488	0,001
3	Organizational Factors (X2)	0,185	3,058	0,003
4	Other Policy Factors and Government Regulations (X3)	0,199	5,997	0,000
5	Environmental Factors (X4)	0,226	4,946	0,000

a. Dependent Variable: Indirect Costs (Y1)

Multiple linier regression equation:

Y1= a + b1X1 + b2X2 + b3X3 + b4X4

= 0,494 + 0,169X1 + 0,185X2 + 0,199X3
+ 0,226X4

Where:

Y1 = Indirect Costs
X1 = Project Factors
X2 = Organizational Factors
X3 = Other Policy Factors and Government Regulations
X4 = Environmental Factors

From the results of the analysis in table 14, the value of the positive constant shows that the variables of project factors (X1), organizational factors (X2), policy factors and government regulations (X3) and environmental factors (X4) have a positive effect on the dependent variable of indirect costs (Y1), with sig values. For the project factor variable (X1) of 0.001 < 0.05 and the calculated t value of 3.488 > t table 2.006, the sig. value. For the organizational factor variable (X2) of 0.003 < 0.05 and the calculated t value of 3.058 > t table 2.006, the sig value. for the klain and government regulation policy factor variables (X3) of 0.000 < 0.05 and the calculated t value of 5.997 > t table 2.006 and the sig value. for the environmental factor variable (X4) of 0.000 < 0.05 and the calculated t value of 4.946 > t table 2.006. So in other words, it can be interpreted that the provision of indirect costs in the budget plan for project implementation costs is influenced by 4 factors, namely project factors, organizational factors, Klain policy factors and government regulations and environmental factors. Meanwhile, the most influential factor in providing indirect costs is environmental factors.

The coefficient of determination test (R^2) is used to measure how far the model is capable of explaining the variance of dependent variables. The following are the results of the coefficient of determination test (R^2):

Table 17. Coefficient of determination test results (R^2)

No	R Square
1	0,903

a. Predictors: (Constant), Environmental Factors (X4), Other Policy and Government Regulation Factors (X3), Project Factors (X1), Organizational Factors (X2)
b. Dependent Variable: Indirect Cost (Y1)

Based on table 15, the result from R Square was 0.903 or 90.30%. This means that 90.30% of the variance of the dependent variable, i.e. indirect costs (Y1) are influenced by the variety of independent variables, namely the project factor variable (X1), organizational factor (X2), the Klain policy factor and government regulation (X3) and the environmental factor (X4) in this research model. Meanwhile, 9.70% were influenced by other variables outside the study model.

The F test aims to determine the influence of independent variables on the dependent variables simultaneously or together. In decision making on the F test if F calculates the > F of the table with the sign value. < 0.05 then the independent variable affects the dependent variable. The following are the results of the F test in this study:

Table 18. F test results

No	Model	F	Sig.
1	Regression	123,779	0,000[b]

a. Dependent Variable: Indirect Cost (Y1)
b. Predictors: (Constant), Environmental Factors (X4), Other Policy and Government Regulation Factors (X3), Project Factors (X1), Organizational Factors (X2))

Based on table 16, the results of the F test on indirect costs are known signification values for the influence of project factor variables (X1), organizational factors (X2), policy factors and government regulations (X3) and environmental factors (X4) simultaneously / jointly against indirect costs (Y1) of 0.000 < 0.05 and calculated F values of 123,779 > F table 2.53 then it can be concluded that the variables project factor (X1), organizational factor (X2), Klain policy factors and government regulations (X3) and environmental factors (X4) stimulant/together have a significant effect on indirect costs (Y1).

Simple Regression Analysis

The purpose of a simple analysis in this study is to determine the relationship between independent variables, namely indirect costs (Y1) two dependent variables, namely time performance (Y2). In this analysis, the coding of an independent variable, namely indirect cost (Y1) is considered an independent variable (X), because in regression analysis for the code the independent variable is X and the dependent variable is Y.

The normality test is used to test whether the residual value resulting from the regression is normally distributed or not. The following are the results of the normality test:

Table 19. One-sample Kolmogorov-Smirnov test

No	Description	Unstandardized Residual`
1	N	58
2	Monte Carlo Sig. (2-tailed)	0,288

The results of the normality test analysis show that the significant value of 0.288 > 0.05, the residual value is normal.

The multicollinearity test is the discovery of a perfect or near-perfect correlation between independent variables in the regression model. The following are the results of the multicollinearity test:

Table 20. Multicollinearity test results

No	Model	Collinearity Statistics	
		Tolerance	VIF
1	Indirect Cost (X)	1,000	1,000
a.	Dependent **Variable:** Time Performance (Y2)		

The results of the multicollinearity test analysis showed that the tolerance value for the indirect cost variable (X) was 1,000 > 0.1 and the inflation factor (VIF) value was 1,000 < 10, it was concluded that multicollinearity did not occur in the regression model.

A heteroscedasticity test is a state in which a regression model occurs in the inequality of variation from residual on one observation to another. The following are the results of the heteroscedasticity test:

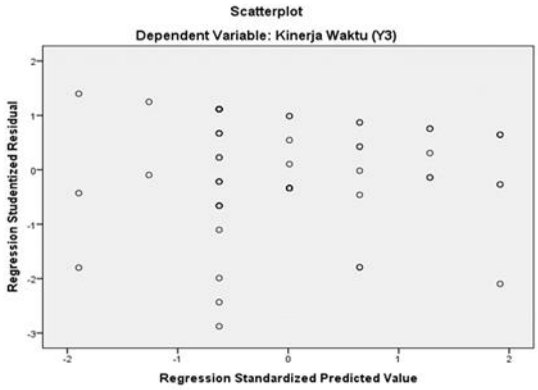

Figure 5. Heteroscedasticity test results

Based on figures 5. The results of the heteroscedasticity test showed that the ticks did not form a clear pattern and spread above and below the number 0 on the Y axis so that it was concluded that heteroscedasticity did not occur in the regression model.

The t test aims to determine the influence of independent variables on the dependent variables partially. As for decision making on the t test if t count > t table or sign value. < 0.05 then the independent variable affects the dependent variable. The following are the results of the t test in this study:

Table 21. t test results

No	Mode	B	t	Sig.
1	(Constant)	8,090	24,667	0,000
2	Indirect Cost (X)	0,275	14,296	0,000
a.	Dependent **Variable:** Time Performance (Y2)			

Simple linier regression equation:

Y2 = a + b1X

= 8,090 + 0,275X

Where:

Y2 = Time Performance

X = Indirect Cost

From the results of the analysis in table 19, the value of the positive constant shows that the indirect cost variable (X) has a positive effect on the dependent variable of time performance (Y2), with a significant value. For variable indirect costs (X) of 0.000 < 0.05 and calculated t values of 14.296 > t table 2.003. So, in other words, it can be interpreted that indirect costs have a significant effect on the performance of the time of implementation of construction projects.

The coefficient of determination test (R^2) is used to measure how far the model is capable of explaining the variance of dependent variables. The following are the results of the coefficient of determination test (R^2):

Table 22. Coefficient of determination test results (R^2)

No	R Square
1	0,785

a. **Predictors:** (Constant), Indirect Cost (X)
b. Dependent **Variable:** Time Performance (Y2)

Based on table 20, the result of R Square is 0.785 or 78.50%. This means that 78.50% of the variance of the dependent variable, i.e. time performance (Y2) are influenced by the variance of the independent variable i.e. the indirect cost variable (X) in this study model. Meanwhile, 21.50% were influenced by other variables outside the study model.

The F test aims to determine the influence of independent variables on the dependent variables simultaneously or together. In decision making on the F test if F calculates the > F of the table with the sign value. < 0.05 then the independent variable affects the dependent variable. The following are the results of the F test in this study:

Table 23. F test results

No	Model	F	Sig.
1	Regression	204,375	0,000[b]

a. Dependent Variable: Time Performance (Y2)
b. Predictors: (Constant), Indirect Cost (X)

Based on table 21, the results of the F test on time performance are known signification values for the effect of indirect cost variables (X) simultaneously / jointly on time performance (Y2) of 0.000 < 0.05 and calculated F values of 204.375 > F table 4.00. It can be concluded that the variable indirect cost (X) simultaneously / together has a significant effect on time performance (Y2).

Based on the results of the analysis above, it is found that determining the amount of costs is not directly influenced by (1) environmental factors, (2) claims policy factors and government regulations, (3) organizational factors and (4) project factors. Indirect costs are divided into 4 (four) components (Hastak, 2015) among others: (1) Taxes included in the indirect cost component are material taxes, equipment taxes and workers' taxes. The tax rate varies significantly depending on the location or country implementing the construction project, this includes environmental factors. (2) General conditions related to the General terms of the contract determine and define the rights and obligations of each party involved in the contract and make project regulations that are non-technical or administrative in nature. These regulations are still general in nature and depend on the characteristics of the project. Things included in the general condition are work that is not contained in the contract documents that must be carried out by the contractor to support construction activities that will be carried out in accordance with the contract documents. The complexity of the project starts from the resources and technical implementation which often occurs beyond the expectations of the service provider, the size and volume of the project, which sometimes does not match what is stated in the project budget plan. The inability of service providers to obtain materials according to the technical specifications in the contract documents, project locations that still require special handling or in other words not ready to build, these are project factors. In addition to the project work factor that is subcontracted by service providers to third parties, it is included in the company organizational factors that must be considered. The type of contract and tender method are factors in the claim policy and government regulations that are also a concern for service providers before bidding on work packages in giving indirect costs. Environmental factors are also included in general conditions, namely regional economic conditions, inflation and interest rates that occur in the country or location where the project implementation takes place. (3) Risk costs include the service provider's profit on the remaining project completion budget and unexpected costs, namely the service provider's ability to overcome problems that occur during the implementation of development projects, this is included in the company's organizational factors. From the factors of claim policy and government regulations in the form of strictness in supervising the project implementation in order to achieve conformity to the specifications contained in the contract documents. The duration of the project is the project implementation time that has been agreed upon in the contract documents, but as time goes by, service providers often pay less attention to the effectiveness of workers in completing work, this is included in project factors that need attention. The number of competitors, fraudulent practices and bribes is included in the risk cost category of service providers in obtaining a work project, which is included in environmental factors. (4) Operated/overhead costs are divided into 2 (two), namely an office overhead and project overhead. Office overhead in the form of the availability of contractor capital to start the implementation of work and expertise in determining the percentage of overhead costs as well as project management methods are things that need to be considered in carrying out work, this is included in the factor of the service provider organization. Project overheads in the form of payment schedules from service users and project implementation methods are also of extra concern in project implementation, this is included in the claims policy factor and government regulations that need to be considered in determining the amount of indirect costs.

The application of the amount of indirect costs has a significant effect on the performance of the time of project implementation. This is in accordance with the results of previous research that one of the efforts that can be made to maximize project performance includes including overhead costs in the estimation plan to carry out planning, and inspections to evaluate whether the contractor has carried out the work that must be fulfilled related to the additional overhead costs (Yana et al., 2020).

Conclusion

From the results of the analysis and discussion above, it can be concluded that the provision of indirect costs in the project cost budget plan is influenced by (1) environmental factors in the form of the country / place that implements the project, fraudulent practices and bribery, the number of competitors, inflation and interest rates as well as regional economic conditions. (2) Factors of Klain policy and government regulations in the form of payment schedules, types of contracts, firmness in supervision, tender methods and methods of project implementation. (3) Organizational factors in the form of availability of contractor capital, subcontracted work, expertise in determining the percentage of overhead costs and project management methods. (4) Project factors in the form of project complexity, project size and volume, project duration, inability to obtain materials and project location. Meanwhile, the most significant influencing factors in providing indirect costs in the project cost budget plan are environmental factors in the form of the country/place that implements the project, fraudulent practices and bribery, the number of competitors, inflation and interest rates as well as regional economic conditions. These factors influence the provision of indirect costs in accordance with the determination value (R2) obtained by 90.30%, of which 9.70% are influenced by other factors that are not present in this study. Indirect costs also have a significant effect on the performance of the time of implementation of construction projects for the construction of flats within the Ministry of Public Works and Public Housing with a determined value (R2) obtained about 78.50%, of which 21.50% are influenced by other factors that are not present in this study.

Suggestions that can be given by researchers in this study include, (1) the importance of accuracy in providing indirect costs in the project cost budget plan either by service users or owners or by service providers or contractors either before bidding on work packages or before the implementation of work. (2) There needs to be firmness of regulations from the government in settling the percentage of indirect costs in the project cost budget plan as a reference by both service users or owners and service providers or contractors. (3) Limitations and shortcomings in this study, it is hoped that for the next study, it can look for the percentage of indirect costs in the project cost budget plan that affects project performance in terms of cost performance, quality and time.

References

Agsarini, I. (2015). Pengaruh Faktor Internal Dan Eksternal Proyek Terhadap Kinerja Proyek Konstruksi Di Provinsi Kalimantan Selatan. *Institut Technology Sepuluh Nopember.*

Akintoye, A. (2000). Analysis of factors influencing project cost estimating practice. *Construction Management & Economics*, 18(1), 77–89.

ANDHIKA, W. (2017). *ANALISIS KOMPONEN DAN PEMODELAN RASIO BIAYA TIDAK LANGSUNG TERHADAP NILAI KONTRAK PADA PROYEK KONSTRUKSI BANGUNAN GEDUNG*. Universitas Mercu Buana Jakarta.

Anuar Othman, A., Victor Torrance, J., & Hamid, M. A. (2006). Factors influencing the construction time of civil engineering projects in Malaysia. *Engineering, Construction and Architectural Management*, 13(5), 481–501.

Assaf, S. A., Bubshait, A. A., Atiyah, S., & Al-Shahri, M. (2001). The management of construction company overhead costs. *International Journal of Project Management*, 19(5), 295–303.

Baltagi, B. H., Jung, B. C., & Song, S. H. (2010). Testing for heteroskedasticity and serial correlation in a random effects panel data model. *Journal of Econometrics*, 154(2), 122–124.

Becker, T. C., Jaselskis, E. J., & El-Gafy, M. (2014). Improving predictability of construction project outcomes through intentional management of indirect construction costs. *Journal of Construction Engineering and Management*, 140(6), 4014014.

Bower, D. (2000). A systematic approach to the evaluation of indirect costs of contract variations. *Construction Management & Economics*, 18(3), 263–268.

Cash, J. (1997). *Indirect Cost Management Guide: Navigating the Sea of Overhead.* DEFENSE SYSTEMS MANAGEMENT COLL FORT BELVOIR VA.

Christian, C., & Anondho, B. (2019). Analisis Variabel Pengurangan Biaya Overhead lapangan Yang Dominan Pada Proyek Konstruksi Gedung Bertingkat DI Jakarta. *Jurnal Mitra Teknik Sipil*, 2(2), 35–44.

Cilensek, R. (1991). Understanding contractor overhead. *Cost Engineering*, 33(12), 21.

Cohen, J. (1968). Multiple regression as a general data-analytic system. *Psychological Bulletin*, 70(6p1), 426.

Enshassi, A., Rashid Abdul Aziz, A., & el Karriri, A. (2008). Investigating the overhead costs in construction projects in Palestine. *Journal of Financial Management of Property and Construction*, 13(1), 35–47.

Ghasemi, A., & Zahediasl, S. (2012). Normality tests for statistical analysis: a guide for non-statisticians. *International Journal of Endocrinology and Metabolism*, 10(2), 486.

Gorsuch, G. J. (2000). EFL educational policies and educational cultures: Influences on teachers' approval of communicative activities. *TESOL Quarterly*, 34(4), 675–710.

Hartanto, E., Priana, S. E., & Masril, M. (2022). ANALISIS BIAYA OVERHEAD DALAM PROYEK PENGADAAN BARANG DAN JASA PEKERJAAN IRIGASI DI KOTA PADANG PANJANG. *Ensiklopedia Research and Community Service Review*, 1(2), 20–26.

Hassan, S., Ismail, N., Jaafar, W. Y., Ghazali, K., Budin, K., Gabda, D., & Samad, A. S. (2012). Using factor analysis on survey study of factors affecting students' learning styles. *International Journal of Applied Mathematics and Informatics*, 1(6), 33–40.

Hastak, M. (2015). *Skills and knowledge of cost engineering*. AACE international Morgantown, WV.

Hesami, S., & Lavasani, S. A. (2014). Identifying and classifying effective factors affecting overhead costs in constructing projects in Iran. *International Journal of Construction Engineering and Management*, 3(1), 24–41.

Ibbs, C. W., Kwak, Y. H., Ng, T., & Odabasi, A. M. (2003). Project delivery systems and project change: Quantitative analysis. *Journal of Construction Engineering and Management*, 129(4), 382–387.

Kaliba, C., Muya, M., & Mumba, K. (2009). Cost escalation and schedule delays in road construction projects in Zambia. *International Journal of Project Management*, 27(5), 522–531.

Leśniak, A., & Juszczyk, M. (2018). Prediction of site overhead costs with the use of artificial neural network based model. *Archives of Civil and Mechanical Engineering*, 18, 973–982.

Lino, M. (2018). Factors of Effect of Indirect Cost Estimation of Construction Project. *Jurnal Infrastruktur*, 4, 82–88.

Lino, M. L. K. (2019). *Estimasi biaya tidak langsung proyek konstruksi*. Program Magister Teknik Sipil Konsentrasi Manajemen Proyek Konstruksi ….

Mishra, P., Singh, U., Pandey, C. M., Mishra, P., & Pandey, G. (2019). Application of student's t-test, analysis of variance, and covariance. *Annals of Cardiac Anaesthesia*, 22(4), 407.

Nurdiana, A. (2015). Analisis biaya tidak langsung pada proyek pembangunan best western star hotel & star apartement semarang. *Teknik*, 36(2), 105–109.

Plebankiewicz, E., & Leśniak, A. (2013). Overhead costs and profit calculation by Polish contractors. *Technological and Economic Development of Economy*, 19(1), 141–161.

PUPR. (2022). *Indonesian Paten*.

Rose, T., & Manley, K. (2010). Client recommendations for financial incentives on construction projects. *Engineering, Construction and Architectural Management*.

Saini, A., Khursheed, S., Paul, V. K., & Kumar, K. (2021). Analysis of indirect cost of construction projects in India. *International Journal of Sustainable Building Technology*, 4(2), 9–23.

Schenker, N., & Taylor, J. M. G. (1996). Partially parametric techniques for multiple imputation. *Computational Statistics & Data Analysis*, 22(4), 425–446.

Shrestha, P. P., & Pradhananga, N. (2010). Correlating bid price with the number of bidders and final construction cost of public street projects. *Transportation Research Record*, 2151(1), 3–10.

Sinesilassie, E. G., Tabish, S. Z. S., & Jha, K. N. (2017). Critical factors affecting schedule performance: A case of Ethiopian public construction projects–engineers' perspective. *Engineering, Construction and Architectural Management*, 24(5), 757–773.

Šiškina, A., Juodis, A., & Apanavičiene, R. (2009). Evaluation of the competitiveness of construction company overhead costs. *Journal of Civil Engineering and Management*, 15(2), 215–224.

Takim, R. (2005). *A framework for successful construction project performance*. Glasgow Caledonian University.

Turóczy, Z., & Marian, L. (2012). Multiple regression analysis of performance indicators in the ceramic industry. *Procedia Economics and Finance*, 3, 509–514.

Ujene, A. O., Idoro, G. I., & Odesola, I. A. (2013). Contractors perceptions of effects of project overhead costs on building project performance in South-South of Nigeria. *Civil Engineering Dimension*, 15(2), 102–113.

Wang, X., & Huang, J. (2006). The relationships between key stakeholders' project performance and project success: Perceptions of Chinese construction supervising engineers. *International Journal of Project Management*, 24(3), 253–260.

Wijaya, H., & Anondho, B. (2022). Analysis of Dominant External Factors on Construction Project Overhead Costs. *Proceedings of the Second International Conference of Construction, Infrastructure, and Materials: ICCIM 2021, 26 July 2021, Jakarta, Indonesia*, 609–618.

Yana, A. A. G. A., Dewi, A. A. D. P., & Harefa, Y. K. K. (2020). FAKTOR-FAKTOR YANG MEMPENGARUHI KINERJA PROYEK DALAM PELAKSANAAN PROYEK KONSTRUKSI GEDUNG (STUDI KASUS: PROYEK PEMERINTAH KABUPATEN BADUNG). *Jurnal Spektran*, 8(2), 215.