



## The Influence of Understanding Project Management and Construction Implementation on the Success of Electricity Projects

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### Abstract

*In contemporary times, management has become a crucial asset for the functioning of an organization, thus warranting greater attention. Over the past two years, PT PLN UIP Sulawesi has experienced an expansion of its responsibilities; initially focused solely on infrastructure development in accordance with the RUPTL and catering to community customers, it has now taken on additional duties. These include the construction of electrical infrastructure for high-voltage customers, particularly for smelter clients located in Sulawesi. In light of this phenomenon, the researcher aims to conduct a study to ensure that future projects are completed in accordance with the stipulated time, quality, and budget. The objective of this research is to analyze the understanding of project management and construction implementation in relation to the success of electricity projects at PLN UIP Sulawesi. This study is quantitative in nature, involving the distribution of questionnaires to 107 respondents from a population of 146 project teams at PT PLN UIP Sulawesi. Data analysis in this research is conducted using path analysis. The results indicate that both the understanding of project management and construction implementation have a positive and significant simultaneous effect on project success.*

## Introduction

PT. PLN (Persero) is a State-Owned Enterprise (BUMN) operating in the electricity sector in Indonesia, responsible for all aspects of the downstream electricity supply, including generation, transmission, distribution, and customer service. In addition to its primary role as a supplier of electricity, PT PLN (Persero) also operates in the development of electricity infrastructure, responsible for planning and constructing electricity infrastructure, from power plant construction and high-voltage and medium-voltage transmission lines to substations. With the increasing demand for electricity from the public and industry, PT PLN (Persero) has established business units responsible for the success of this infrastructure development. Therefore, every PLN employee is required to innovate in carrying out business activities within their respective work units.

Human resources, specifically the workforce, play a vital role in the company, requiring a workforce that is well-educated, skilled, and possesses integrity, ready to support the company's development (Bawono, 2021; Edeh et al., 2023; Kostadinova et al., 2024; Rekha, 2024; Pattanayak, 2025; Emeka et al., 2025). Following government directives, PLN acts as an economic driver to support and realize economic growth in various sectors, particularly Sulawesi, which has become a hub for the nickel industry in the past five years. In this case, PLN UIP Sulawesi has been specifically assigned Beyond KPI to support nickel downstream in Indonesia by conducting high-voltage connections to support the nickel industry

in the Sulawesi region. This nickel industry requires a substantial power supply and a set start-up time as stipulated in the power purchase agreement. Several power purchase agreements with nickel smelters must be completed on time and without financial loss. One clause stipulates a penalty for late completion (COD). Therefore, the completion of this infrastructure project must not experience delays that could result in financial losses. The current phenomenon underlying this research, aside from the development of the smelter industry in Sulawesi, is the slow progress of several projects or the delays in completing the project (Hanafi, 2024; Michel, 2024; Malik, 2024; Utomo et al., 2025). This underpins this research, which examines whether project management is properly aligned with management principles and theories, from the planning phase through implementation to completion.

Since its inception, project management has undergone significant changes. According to Althiyabi & Qureshi (2021), project management was not considered a research field because its scope was not yet defined. However, there has been a dramatic increase in research since project management emerged as a distinct academic subfield within management (Ciric et al., 2022; Flyvbjerg, 2021; Langholf & Wilkens, 2021; Taboada et al., 2023; Hellström et al., 2023). Companies seeking to stay ahead of the competition are increasingly utilizing project management expertise to maintain their business viability (Jääskä & Aaltonen, 2022; Naz et al., 2022; Alzoubi, 2022; Prieto et al., 2023).

To determine what companies were doing differently in project management in 2017, the Project Management Institute (PMI) polled 3,234 project managers from various fields and 200 C-level executives from around the world. According to the survey, organizations increase the likelihood of project success by using project management across their programs and portfolios (Silvius & Marnewick, 2022; Norrie, 2024; Watanabe et al., 2024). Greater project success and reduced waste are the result of learning and implementing project management, according to a similar 2018 survey by the Project Management Institute (PMI) involving over 5,400 project management experts.

The North, Central, and Gorontalo Sulawesi regions are required to build an electricity system, and PT. PLN (Persero) UIP SULAWESI is a member of the PLN family of companies. According to the PLN UIP Sulawesi 2024 project data table, there are sixty electricity projects spread across the island of Sulawesi. These projects primarily involve the construction of substations and transmission lines and are part of efforts to achieve the goals outlined in PLN's 2019–2028 RUPTL (Work Plan for Electricity), which is revised every ten years. Based on the graph above, of the 60 substation and transmission projects, 31 are operational, 16 are under construction (some indications of delays), 28 are not yet operational, 1 project has been terminated, and 41 have been handed over (ST1 or ST2). This data indicates that less than 50% of all electricity projects are not yet operational or have not yet completed their construction period. This is one of the factors that motivated researchers to conduct research on project success.

As a member of the PLN group of companies, PT. PLN (Persero) UIP SULAWESI is responsible for the construction of the electricity grid in Gorontalo, North Sulawesi, and Central Sulawesi. To achieve the objectives stated in PLN's RUPTL (which is revised every ten years), PT. The company's HR Department provides the following assistance to PLN (Persero) UIP SULAWESI, with a total of 235 employees. In carrying out its task of constructing and overseeing electricity projects in North Sulawesi, PT PLN (Persero) UIP SULAWESI, along with its subordinate units, namely PT PLN (Persero) UPP KITRING SULUT, PT PLN (Persero) UPP KITRING SULSEL, UPP KITRING SULTRA, and PT PLN (Persero) UPP KITRING SULTENG, are required to provide reliable and competent human

resources in their respective fields. In addition to sufficient numbers, the quality of human resources also influences the timely completion of projects. Project management and construction plan implementation are two crucial aspects of any project, influencing its quality and final outcome. According to research published in the journal by McKeivitt et al. (2022), a good understanding of project management is a key component in determining job satisfaction. Project management has a significant impact on project success, according to the study (Hussain, 2022). Furthermore, project management is also linked to improved project outcomes, according to research by Sajid et al. (2024).

Reflecting on the aforementioned issues, this study examines the influence of Project Management Understanding, Sustainable Construction Implementation, and Project Success. Researchers observed that with increased understanding of project management among employees and teams involved and active in each project, the PLN UIP SULAWESI project completion target will be on time or even earlier. This will significantly impact the reliability of the electricity system in Sulawesi and can reduce the Cost of Production (BPP), ultimately increasing the company's profits.

## Method

Quantitative methods were used in this research. For the purpose of studying a specific population or subset, quantitative methods are research methodologies based on positivism. The goal of data collection is to evaluate the effectiveness of hypotheses through research data and statistical analysis. Research using deductive-inductive methodologies is essentially known as quantitative research. This approach begins with the researcher's prior knowledge of the topic, expert opinion, and theoretical framework. This approach generates questions that require confirmation or rejection based on empirical evidence recorded in the field.

The objectives of a quantitative approach include: estimating and predicting outcomes; testing hypotheses; establishing facts; demonstrating relationships between variables; and providing statistical explanations. Quantitative research designs must be comprehensive, standardized, and formal. As a representation of the actual research agenda, research designs are intended to be detailed and precise. Studying how variable X (knowledge of project management and its application in construction) affects variable Y (project success) is the primary objective of this research. We used basic linear regression techniques to assess the impact of each variable. The researchers wanted to determine the extent to which knowledge of project management processes and their application simultaneously impact project success, thus choosing this type of research. Project success (Y) is the dependent variable in this study, while knowledge of project management and the concurrent construction process (X) is the independent variable. To collect data and draw conclusions, researchers used various tools, known as research variables. Phenomena with various standard, quantitative, and qualitative attributes are called variables.

A research variable is anything that can be changed to aid analysis and investigation in drawing conclusions. These variables can be attributes, values, objects, or activities. Variables in this study can be exogenous (affecting other variables) or endogenous (affected by other variables). The independent variable X in this study uses aspects of construction project management knowledge, as determined by the PMI (Project Management Institute) and project construction implementation. Variable Y in this study assesses the success of PLN UIP Sulawesi in handling electricity projects. This study uses three project success indicators.

## **Type of Research**

This research is quantitative and examines direct influence. The approach used is known as associative or investigative research, and aims to examine the correlation between variables. This research falls into the descriptive research category. Research using a descriptive approach seeks to describe a topic in its natural state. The SPSS method was used to examine the relationship between project management knowledge and project success. The research variables were project management understanding, simultaneous project construction, and the endogenous variable (project success), denoted by Y. To determine the impact of project management knowledge and the ability to apply that knowledge on the completion rate of electricity projects at PT PLN UIP Sulawesi, the researcher utilized a descriptive research method, which is characteristic of causal research. Data collection for this study was conducted on projects completed between 2022 and 2024 in Sulawesi.

## **Population and Sampling Techniques**

A population is a general area consisting of objects/subjects that possess qualities and characteristics determined by the researcher to be studied and conclusions drawn. The population in this study was the project control team at PLN UIP Sulawesi, which was involved in the five projects covered by the study. The total team handling these five projects was 146 people. The samples and respondents in this study are those who have the criteria of senior manager level, sub-field manager, unit manager, assistant manager, team leader, PM, SM, QAQC and project control, thus it is guaranteed that the respondents used have a good understanding of project management and provide real data in the field.

## **Data Collection Techniques**

The researchers used primary and secondary sources to compile their findings. A questionnaire completed by 107 people served as the primary source of information for this study. The survey was distributed to all staff using the Google Forms platform to collect data. Studies and books related to the research variables, as well as literature collected from journals and previous research on the same topic, served as secondary data used in this study. Two types of data were used in this study: Primary data, in this case, is data directly from the original source. In this case, the primary data was obtained from a questionnaire distributed to respondents, namely the Project Control and Management Team of PLN UIP Sulawesi, a total of 107 people. The primary data from this questionnaire consisted of respondents' knowledge of project management and data on the success of completed projects by PLN UIP Sulawesi. The questionnaire was tested using validation and reliability tests. The validation test was used to determine whether the data in the study was valid for measuring the variables studied. This validation test was declared valid if the calculated ( $r$ ) > the tabulated ( $r$ ) value. Next, a reliability test was used to measure the reliability of the completed questionnaire. This reliability test used the Crohn's Alpha formula, where data were considered satisfactory if a value >0.6 was obtained.

Secondary data was obtained indirectly in this study, using data taken from the PMBOK (Project Management Body of Knowledge) book published by the PMI (Project Management Institute). Literature from this book was used to determine the variables and indicators. The questionnaire used in this study used a Likert scale. In responding to questions on the Linker scale, respondents indicated their level of agreement with the question by selecting one of the available options. This study used a closed-ended questionnaire with pre-defined answers with different weights. Statements regarding knowledge of science-based project management in the questionnaire used a Linker scale of 1 to 5, as shown in the table below.

## **Data Collection Instruments**

Documentation aims to collect data directly from the research location. This data can be found in various sources, including related literature studies, activity report regulations, images, and documentaries. Obtaining information and data from various sources, such as books, notes, magazines, and other references, as well as related references and previous research results. By asking questions (creating a request form) to participants in a predetermined order, researchers use questionnaires to collect data from participants.

## **Data Processing and Analysis**

Descriptive analysis is a statistic used to analyze data by describing and depicting the collected data as it is without drawing conclusions. In this case, descriptive analysis was conducted to determine the demographic profile of respondents. Data analysis attempts to uncover or depict the condition or quality of each variable studied, known as descriptive analysis. Only data obtained using valid and reliable tools can be used in scientific research. This is because the reliability of the data significantly influences the credibility of the findings. If a research tool demonstrates a high level of precision in measuring the target item, the instrument is considered valid. Therefore, the effectiveness of a tool is related to the level of accuracy of the tool being measured. Based on the evaluation criteria for this research questionnaire, SPSS was used for validity testing. Validity testing is the accuracy between collected data and actual data on the object being studied. The testing technique used is correlation using the product-moment correlation coefficient. The ordinal score of each statement item being tested for validity is correlated with the overall ordinal score of the item. If the correlation coefficient is positive, then the item is valid. If it is negative, then the item is invalid and will be removed from the questionnaire or replaced with an improved statement.

## **Reliability Testing**

Reliability testing is used for questionnaires that serve as indicators of variables. A questionnaire can be considered reliable if respondents' answers to the questions are consistent. Reliability refers to the availability of instruments to determine the level being measured. The accuracy and precision of testing and measurement equipment are intended to ensure that the data they provide is as accurate as possible. Reliability is essentially a tool for measuring a questionnaire, which serves as an indicator of a variable or construct. A questionnaire can be considered reliable if a person's answers to questions are consistent or stable over time.

## **Multicollinearity Test**

This test will detect a correlation between independent variables because it checks whether the regression model detects it. Independent variables should not be linked in a regression model. It is not orthogonal if two independent variables are correlated. None of the variables in the experiment are related to each other. Multicollinearity in a regression model can be tested using the tolerance value and Variance Inflation Factor (VIF) if the tolerance value is  $\geq 10$ , and the VIF value is  $\leq 10$  if the tolerance value is  $\geq 10$ .

## **Result and Discussion**

### **Instrument Validity Test Results**

Research results are declared valid if there is a similarity between the collected data and the actual data on the object being studied. The validity of an instrument item can be determined by comparing the Pearson product-moment correlation index value with a significance level of

5%. If the correlation probability is less than 0.05 (5%), it is considered valid; otherwise, it is declared invalid. The significance level r value for  $df = N - 2 = 107 - 2 = 105$  is 0.1900.

		Correlations					
		X1	X2	X3	X4	X5	TOTAL
X1	Pearson Correlation	1	.644**	.356**	.155	.359**	.759**
	Sig. (2-tailed)		.000	.000	.110	.000	.000
	N	107	107	107	107	107	107
X2	Pearson Correlation	.644**	1	.205*	.194*	.079	.638**
	Sig. (2-tailed)	.000		.034	.045	.420	.000
	N	107	107	107	107	107	107
X3	Pearson Correlation	.356**	.205*	1	.319**	.279**	.651**
	Sig. (2-tailed)	.000	.034		.001	.004	.000
	N	107	107	107	107	107	107
X4	Pearson Correlation	.155	.194*	.319**	1	.191*	.610**
	Sig. (2-tailed)	.110	.045	.001		.049	.000
	N	107	107	107	107	107	107
X5	Pearson Correlation	.359**	.079	.279**	.191*	1	.586**
	Sig. (2-tailed)	.000	.420	.004	.049		.000
	N	107	107	107	107	107	107
TOTAL	Pearson Correlation	.759**	.638**	.651**	.610**	.586**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	107	107	107	107	107	107

\*\* . Correlation is significant at the 0.01 level (2-tailed).  
\* . Correlation is significant at the 0.05 level (2-tailed).

		Correlations					
		X1	X2	X3	X4	X5	TOTAL
X1	Pearson Correlation	1	.691**	.088	.301**	.479**	.667**
	Sig. (2-tailed)		.000	.367	.002	.000	.000
	N	107	107	107	107	107	107
X2	Pearson Correlation	.691**	1	.098	.338**	.493**	.685**
	Sig. (2-tailed)	.000		.317	.000	.000	.000
	N	107	107	107	107	107	107
X3	Pearson Correlation	.088	.098	1	.404**	.243*	.605**
	Sig. (2-tailed)	.367	.317		.000	.012	.000
	N	107	107	107	107	107	107
X4	Pearson Correlation	.301**	.338**	.404**	1	.568**	.762**
	Sig. (2-tailed)	.002	.000	.000		.000	.000
	N	107	107	107	107	107	107
X5	Pearson Correlation	.479**	.493**	.243*	.568**	1	.781**
	Sig. (2-tailed)	.000	.000	.012	.000		.000
	N	107	107	107	107	107	107
TOTAL	Pearson Correlation	.667**	.685**	.605**	.762**	.781**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	107	107	107	107	107	107

\*\* . Correlation is significant at the 0.01 level (2-tailed).  
\* . Correlation is significant at the 0.05 level (2-tailed).

		X1	X2	X3	X4	X5	TOTAL
X1	Pearson Correlation	1	.547**	.477**	.392**	.357**	.763**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	107	107	107	107	107	107
X2	Pearson Correlation	.547**	1	.605**	.494**	.452**	.830**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	107	107	107	107	107	107
X3	Pearson Correlation	.477**	.605**	1	.414**	.448**	.783**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	107	107	107	107	107	107
X4	Pearson Correlation	.392**	.494**	.414**	1	.528**	.708**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	107	107	107	107	107	107
X5	Pearson Correlation	.357**	.452**	.448**	.528**	1	.705**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	107	107	107	107	107	107
TOTAL	Pearson Correlation	.763**	.830**	.783**	.708**	.705**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	107	107	107	107	107	107

\*\* . Correlation is significant at the 0.01 level (2-tailed).

		Y1	Y2	Y3	TOTAL
Y1	Pearson Correlation	1	.431**	.589**	.827**
	Sig. (2-tailed)		.000	.000	.000
	N	107	107	107	107
Y2	Pearson Correlation	.431**	1	.520**	.777**
	Sig. (2-tailed)	.000		.000	.000
	N	107	107	107	107
Y3	Pearson Correlation	.589**	.520**	1	.861**
	Sig. (2-tailed)	.000	.000		.000
	N	107	107	107	107
TOTAL	Pearson Correlation	.827**	.777**	.861**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	107	107	107	107

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 1. Instrument Validity Test Results

Variabel	Item	r count	r table	Sig Value	Information
Project Management Understanding (X1)	X1.1	0.667	0.1900	0.000	Valid
	X1.2	0.685		0.000	Valid
	X1.3	0.605		0.000	Valid
	X1.4	0.762		0.000	Valid
	X1.5	0.791		0.000	Valid

Construction Execution	X2.1	0.763	0.1900	0.000	Valid
	X2.2	0.830		0.000	Valid
	X2.3	0.783		0.000	Valid
	X2.4	0.708		0.000	Valid
	X2.5	0.705		0.000	Valid
(X2)	X2.1	0.759	0.1900	0.000	Valid
	X2.2	0.683		0.000	Valid
	X2.3	0.651		0.000	Valid
	X2.4	0.610		0.000	Valid
	X2.5	0.586		0.000	Valid
Project Management Understanding & Construction Execution	Y1.1	0.827	0.1900	0.000	Valid
	Y1.2	0.777		0.000	Valid
	Y1.3	0.861		0.000	Valid

From the validity test results, as shown in Table 4.5 above, it can be seen that all items are valid because they have a significance value below 0.05 and the calculated r value is greater than the table r value.

### Instrument Reliability Test Results

An instrument can be considered reliable if it has a reliability coefficient (Cronbach's Alpha) of 0.6 or greater. If the Alpha is less than 0.6, it is considered unreliable, and vice versa, it is considered reliable. The test results for all variables are shown in Table 2. below:

Table 2. Results of Instrument Reliability Test

Variables	Cronbach's Alpha Value	information
Project Management Understanding (X1)	0.720	Reliable
Construction Implementation (X2)	0.650	Reliable
Project Management Understanding Construction Implementation (X1 X2)	0.812	Reliable
Project Success (Y1)	0.761	Reliable

The reliability test indicates that all the variables examined in this research have met the reasonable levels of internal consistency and hence affirms the appropriate operation of the measurement tools. Project Management Understanding (X1) has a Cronbachs Alpha of 0.720 showing consistency of respondents and that the items used are reliable enough in showing the understanding of the project management principles by the respondents.

In the meantime, Construction Implementation (X2) has a Cronbachs Alpha of 0.650. This is low compared to other variables, but this value remains at the minimum required threshold to be considered a reliable variable in the context of social science research, which means that the indicators have a high level of coherence to reflect the true construction implementation practices. The reliability is significantly high in the case of a combination of both the constructs

of Project Management Understanding and Construction Implementation (X1 X2) where it is found to be 0.812 which is a measure of high internal consistency and a kind of reinforcement that all the dimensions have each other in case they are assessed together.

Lastly, the Cronbach of Alpha of Project Success (Y 1 ) is 0.761. This result implies that the measurements of project success used are consistent in that they measure what they are designed to measure. Altogether, the results of reliability can be regarded as the strong basis of the further analysis as it is guaranteed that the relationships explored in the study are based on the reliable and internally consistent measurements.

Reliability Statistics	
Cronbach's Alpha	N of Items
.720	5

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
X1	17.16	3.475	.496	.671
X2	17.14	3.442	.522	.663
X3	17.97	3.254	.282	.780
X4	17.39	3.014	.586	.629
X5	17.44	2.984	.618	.616

Figure 1. Instrument Reliability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
.812	5

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
X1	17.30	4.363	.572	.790
X2	17.13	4.228	.697	.744
X3	17.11	4.572	.637	.764
X4	16.83	5.236	.577	.786
X5	16.90	5.093	.555	.789

Reliability Statistics	
Cronbach's Alpha	N of Items
.650	5

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
X1	16.31	4.159	.571	.515
X2	16.37	4.727	.413	.594
X3	16.17	4.707	.436	.584
X4	16.31	4.574	.303	.655
X5	16.15	4.864	.327	.633

Reliability Statistics	
Cronbach's Alpha	N of Items
.761	3

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Y1	8.41	1.188	.589	.682
Y2	8.53	1.364	.534	.741
Y3	8.53	1.119	.657	.600

Based on the reliability test results shown in Table 4.6 above, it can be seen that all variables used in this study had a Cronbach's Alpha value  $> 0.6$ , thus all variables can be declared reliable.

### Results of the Classical Assumption Test

The purpose of the classical assumption test is to ensure that the obtained regression equation is accurate in its estimation, unbiased, and consistent.

### Normality Test

The normality test is conducted to assess the distribution of data in a data group or variable, to determine whether the data is normally distributed or not. In short, the normality test is a test of the normality of the data distribution. The method used to test normality is a scatterplot and histogram graph. If the scatterplot points are spread around the diagonal line and follow the direction of the diagonal line, then the regression meets the assumption of normality. Meanwhile, for histogram graphs, if the dependent curve and regression standardized residuals

form a bell-shaped figure, then the regression meets the assumption of normality. The normality test used is the Probability Plot test, as shown in the image below:

### One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		107
Normal Parameters <sup>a,b</sup>	Mean	.0000000
	Std. Deviation	1.22412185
Most Extreme Differences	Absolute	.108
	Positive	.070
	Negative	-.108
Test Statistic		.108
Asymp. Sig. (2-tailed)		.064 <sup>c</sup>

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

### Heteroscedasticity Test

The heteroscedasticity test assesses whether there is inequality in the variance of the residuals across all observations in a linear regression model. The results of the heteroscedasticity test conducted in this study can be analyzed by examining the scatterplot graph shown below:

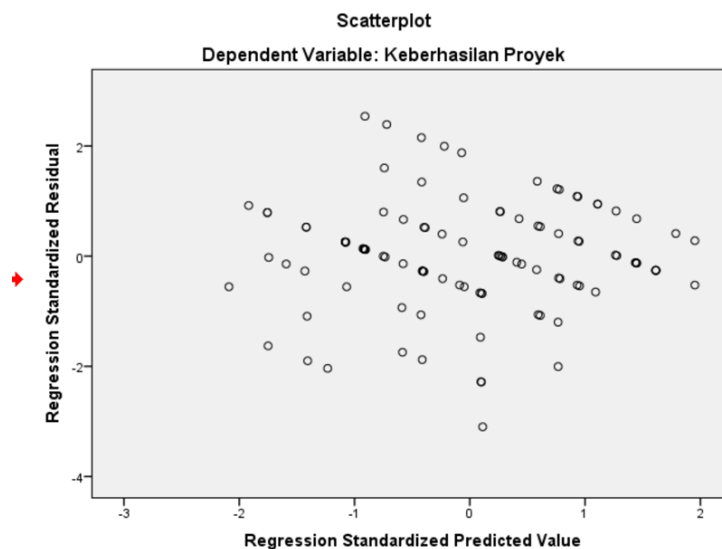


Figure 2. Heteroscedasticity Test for Variables X1 and X2 Against Variable Y

Figure 4.9 above shows that the points are randomly distributed and do not form a specific pattern, and are spread both above and below the number 0 on the Y-axis. Therefore, it can be concluded that heteroscedasticity does not occur.

### Multicollinearity Test

Multicollinearity is a situation where there is a strong correlation or relationship between two or more independent variables in a multiple regression model. Multicollinearity will appear when a correlation occurs between the independent variables during a multicollinearity test. The occurrence of multicollinearity between independent variables can be seen from the Tolerance and Variable Inflation Factor (VIF) values of each independent variable. If the tolerance value is greater than 0.1 and the VIF is less than 10, multicollinearity is considered absent.

Coefficients <sup>a</sup>								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.288	1.347		1.699	.092		
	X1	.163	.067	.226	2.450	.016	.693	1.443
	X2	.169	.054	.277	3.108	.002	.745	1.343
	X1X2	.162	.059	.274	2.767	.007	.603	1.658

a. Dependent Variable: Keberhasilan Proyek

Figure 3. Multicollinearity Test for Variables X1, X2, X1X2 Against Y

Based on Table 4.10 above, it can be seen that the multicollinearity test in this study showed no correlation between the independent variables because the tolerance value of X1 = 1.443, X2 = 1.343, X1X2 = 1.658, or a VIF below 10. Therefore, it can be concluded that there are no symptoms of multicollinearity between the variables in this study.

### Hypothesis Test Results

#### Determination Test

This test was conducted to determine the extent to which the independent variables influence the dependent variable. Furthermore, this test was conducted to measure the contribution of variable X to the variation (increase or decrease) in variable Y.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.625 <sup>a</sup>	.391	.373	1.242

a. Predictors: (Constant), X1X2, X2, X1

Figure 4. Determination Test

Figure 7. above shows that the coefficient of determination (R<sup>2</sup>) is 0.625, meaning that the variables "Understanding Project Management (X1) and Construction Implementation (X2) and Understanding Project Management & Construction Implementation (X1X2)" contribute 62.5% to Project Success (Y). The remaining 37.5% is influenced by variables outside this model. Therefore, the variability in the Project Success variable that can be explained using the variables "Understanding Project Management and Construction Implementation" is 62.5%. The remaining 37.5% is due to other variables not included in the study.

## Multiple Linear Regression Test

According to Ghozali, multiple regression analysis is an investigation that aims to prove whether or not there is an influence between independent variables on related variables.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.288	1.347		1.699	.092
	X1	.163	.067	.226	2.450	.016
	X2	.169	.054	.277	3.108	.002
	X1X2	.162	.059	.274	2.767	.007

a. Dependent Variable: Keberhasilan Proyek

$$Y = 2.288 + 0.163X1 + 0.169X2 + 0.162X1X2$$

The constant is 2.288, indicating that if both X1 and X2 are equal to 0, the value of Y remains at 2.288. Based on variable X1, the regression test results show that variable X1 has a positive regression coefficient with a value of  $b = 0.163$ . This means that a 1-point increase in variable X1 will also result in an increase in variable Y of 0.163. Based on variable X2, the regression test results show that variable X2 has a positive regression coefficient with a value of  $b = 0.169$ . This means that a 1-point increase in variable X2 will also result in an increase in variable Y of 0.169. Based on the X1X2 variables, the regression test results show that the X1X2 variable has a positive regression coefficient with a b value of 0.162. This means that a 1-point increase in the X2 variable will also result in a 0.162 increase in the Y variable.

### Partial Effect Test (T-Test)

The partial effect of the variables Project Management Understanding (X1), Construction Implementation (X2), and Project Management & Construction Implementation Understanding (X1X2) on Project Success (Y) can be determined based on hypothesis testing with the following conditions: The calculated t-value is compared with the t-table value at the 5% significance level, where the effect is considered significant if the calculated t-value is greater than the t-table value. The significance value (Sig) is considered significant if the sig value is less than 0.05.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.288	1.347		1.699	.092
	X1	.163	.067	.226	2.450	.000
	X2	.169	.054	.277	3.108	.002
	X1X2	.162	.059	.274	2.767	.003

a. Dependent Variable: Keberhasilan Proyek

Figure 5. T-Test (Coefficients Analysis)

**Partial Effect of Project Management Understanding (X1) on Project Success (Y)**

Based on Table 4.13, the Beta value in the Standardized Coefficients column is 0.226, indicating a positive effect of Project Management Understanding (X1) on Project Success (Y). This means that if project management understanding increases by 1 unit, project success increases by 0.226 units. The calculated t-value for the Project Management (X1) on Project Success (Y) is 2.460, with a significance value of 0.016. The t-value can be calculated as follows:  $t\text{-value} = (0.05/2: \text{number of respondents} - \text{number of independent variables} - 1)$   $t\text{-value} = (0.05/2: 107 - 3 - 1) = (0.025: 103) = 1.98326$ . Therefore, the partial test requirements for model 2 are: Value The calculated t value > t table value is  $2.460 > 1.98326$ . The significance value < 0.05 is  $0.00 < 0.05$ . Based on the explanation above, it can be concluded that the influence of the Project Management variable (X1) on the Project Success variable (Y) is positive and significant.

**The partial influence of the Construction Implementation variable (X2) on the Project Success variable (Y)**

Based on Table 4.14, the Beta value in the Standardized Coefficients column is 0.277, indicating a positive influence of the Construction Implementation variable (X2) on the Project Success variable (Y). This means that if construction implementation increases by 1 unit, project success increases by 0.277 units. The calculated t value for the Construction Implementation variable (X2) on the Project Success variable (Y) is 3.108, with a significance value of 0.02. The t-table value can be found as follows:  $t\text{-table} = (0.05/2: \text{number of respondents} - \text{number of independent variables} - 1)$ .  $t\text{-table} = (0.05/2: 107 - 3 - 1) = (0.025: 103) = 1.98326$ . Therefore, the partial test requirements for model 1 are: The calculated t-value > t-table is  $3.108 > 1.98326$ . The significance value < 0.05 is  $0.02 < 0.05$ . Based on the explanation above, it can be concluded that the influence of the Construction Implementation variable (X1) on the Project Success variable (Y) is positive and significant.

**Partial Effect of the Project Management & Construction Implementation Understanding (X1X2) Variable on Project Success (Y)**

Based on Table 4.14, the Beta value in the Standardized Coefficients column is 0.274, indicating a positive effect of the Project Management & Construction Implementation Understanding (X1X2) variable on Project Success (Y). This means that if construction implementation increases by 1 unit, project success increases by 0.274 units. The calculated t-value for the Project Management & Construction Implementation Understanding (X1X2) variable on Project Success (Y) is 2.767, with a significance value of 0.000. The t-table value can be calculated as follows:  $t\text{-table} = (0.05/2: \text{number of respondents} - \text{number of independent variables} - 1)$ .  $t\text{-table} = (0.05/2: 107 - 3 - 1) = (0.025: 103) = 1.98326$ . Thus, the partial test requirements for model 1 are: The calculated t-value > t-table is  $2.767 > 1.98326$ . The significance value < 0.05 is  $0.03 < 0.05$ , Based on the explanation above, it can be concluded that the influence of the Construction Implementation variable (X1) on the Project Success variable (Y) is positive and significant.

Table 3. Summary of Research Results

Variable Y	Variable X1, X2	t-count	Significance	Information
Project Success	Understanding Project Management (X1)	2.460	0.000	Positive and Significant

	Construction Implementation (X2)	3.108	0.02	Positive and Significant
	Understanding Project Management & Construction Implementation	2.767	0.03	Positive and Significant
Simultaneous Determination ( $R^2$ ) = 0.625 Simultaneous Correlation ( $R$ ) = 0.391 Probability = 0.000 t table = 1.98326				

### **The Influence of Project Management Understanding (X1) on Project Success (Y)**

After conducting a series of tests on this research data, the results showed that Project Management Understanding (X1) had a positive and significant effect on Project Success (Y), with a significance level of  $0.000 < 0.05$ . Using a t-table of 1.98304, the data above shows that the calculated t-value is greater than the t-table value, namely  $4.016 > 1.98304$ , which means H1 is accepted. Understanding project management encompasses the knowledge and skills needed to plan, execute, and monitor projects to achieve established objectives. This involves managing resources, time, and risk. Project success is often measured by achieving project objectives, stakeholder satisfaction, and completing projects on budget and schedule. Research by Herath & Chong (2021) indicates that factors such as thorough planning and effective control, which are part of project management, contribute significantly to project success.

Understanding project management significantly impacts project success. It is a driving force for employees or project teams to perform at their best in achieving work goals or targets (Shamim, 2022; Venczel et al., 2021; Irfan et al., 2021). This understanding of project management can come from training, education, and knowledge sharing. These factors influence project performance and successful completion. Based on data from all employees at PT PLN (Persero) UIP SULAWESI, including its four sub-units: PLN UPP KITRING SULUT, PLN UPP KITRING SULSEL, PLN UPP KITRING SULTRA, and PLN UPP KITRING In the SULTENG survey, 63.55% of employees were between 21 and 30 years old, young, productive individuals with a strong work ethic, integrity, and idealism. High employee motivation is evident in the large percentage of employees who agreed with statements regarding their understanding of project management. These positive aspects must be maintained and improved at PLN UIP SULAWESI. The positive and significant relationship between Project Management Understanding (X1) and Project Success (Y) indicates that when employees have a high understanding of project management, project success will also increase (McKevitt, et al., 2022; Muneer et al, 2022). Conversely, if employees have a low understanding of project management, project success will also decrease. This research aligns with research conducted by Cunio (2024). Based on the analysis and discussion above, it can be concluded that a good understanding of project management plays a crucial role in increasing project success. This aligns with previous theories and research that emphasize the importance of effective planning, control, and resource management in achieving project objectives. This research strengthens

the argument that investment in project management training and skills development can have a positive impact on project outcomes.

### **The Effect of Construction Implementation (X2) on Project Success (Y)**

After conducting a series of tests in this study, the results showed that Construction Implementation (X2) had a positive and significant effect on Project Success (Y), with a significance level of  $0.020 < 0.05$ . Using a t-table of 1.98304, based on the data above, the calculated t-value is greater than the t-table value, namely  $4.534 > 1.98304$ , indicating that H2 is accepted. Construction implementation is a critical phase in the project life cycle, where technical and logistical plans are implemented. According to the PMI (Project Management Institute), project success depends on effective control of time, cost, and quality during implementation. Imbalances in this phase can lead to delays, cost overruns, or technical failures.

According Unegbu et al. (2022) found a positive correlation between construction implementation and project time performance. Factors such as coordination between workers, material supervision, and technical risk management directly influence schedule adherence. These results are consistent with the findings of this study, where good implementation (X2) accelerates the achievement of project objectives (Y). Rocha et al. (2023) emphasized that quality control in the implementation plan positively impacts project performance. For example, the use of innovative construction methods or regular inspections can reduce structural defects, thereby minimizing revisions and additional costs (Al Shraah et al., 2022; Ignace & Amolo, 2025). This strengthens the argument that X2 (implementation) is the foundation for Y (success). Previous studies have shown that a good understanding of project management can improve the efficiency and effectiveness of project implementation. For emphasized that well-trained project managers tend to be more successful in achieving project targets. Identified project-inhibiting factors, such as inconsistencies in implementation, as a major cause of delays. This study shows that good implementation management (e.g., optimal resource allocation and effective team communication) can mitigate these risks, thereby increasing project success.

This positive and significant relationship between Construction Implementation (X2) and Project Success (Y) indicates that as construction implementation improves, project success rates also increase. Likewise, if construction work is poorly executed by employees, the project's success rate will also decline. This finding also aligns with research by Malik et al. (2021), which showed a significant positive relationship between construction work and project success. "Project success indicators are often measured based on the achievement of project objectives, stakeholder satisfaction, and project completion on budget and schedule. Regarding the relationship between project management and project management, shows that factors such as thorough planning and effective control, which are part of project management, contribute significantly to project success. Based on questionnaire data, it is clear that career development (promotion, rotation, and demotion) at PLN UIP SULAWESI has been running almost entirely correctly. However, a number of employees still disagree and are neutral. For the construction implementation variable, an average of 21.50% of the 107 respondents surveyed chose neutral, and an average of 4.21% of the 107 respondents chose disagree. Construction implementation must be carried out properly according to the sequence and procedures for each stage to ensure proper execution and control. Proper construction implementation also requires reliable, qualified, and certified human resources. Based on statistical analysis and support from previous theory/research, construction implementation (X2) is a critical factor. which significantly impact project success (Y). These findings emphasize the importance of focusing

on execution quality, risk control, and efficiency management during the construction phase. The implication for practitioners is to expand investment in team training, technology, and monitoring systems to maximize project outcomes.

### **The Effect of Understanding Project Management & Construction Implementation (X1X2) on Project Success (Y)**

After conducting a series of tests in this study, the results showed that Understanding Project Management & Construction Implementation (X1X2) had a positive and significant effect on Project Success (Y), with a significance level of  $0.030 < 0.05$ . Using a t-table of 1.98304, based on the data above, the calculated t-value is greater than the t-table value, namely  $4.534 > 1.98304$ , indicating that H3 is accepted. This positive and significant relationship between Construction Implementation (X2) and Project Success (Y) indicates that when construction implementation improves, project success will also increase. Conversely, if employee construction implementation is poor, project success will also decrease. The above is also in accordance with research by Andersen et al. (2025), which shows that there is a significant positive influence between construction implementation and the level of project success." Project management is a discipline that involves planning, organizing, and managing resources to achieve project objectives. According to Kerzner (2025), project success depends heavily on a sound understanding of project management, including thorough planning and effective control. According to the PMI (Project Management Institute), indicators of project success include completion on time, within budget, and meeting established specifications.

Construction execution encompasses all activities undertaken to build a project according to plan. Good execution can reduce risk and increase efficiency, which in turn contributes to project success. Shows that factors such as workforce skills, time management, and cost control significantly influence the final outcome of a construction project. A significance value of 0.030 indicates a strong relationship between the independent variables (X1: Project Management Understanding and X2: Construction Execution) and the dependent variable (Y: Project Success). This aligns with the theory that good management and effective execution are key to achieving project success. With a t-value of 4.534, which is greater than the t-table (1.98304) indicates a significant impact of understanding project management and construction implementation on project success. This indicates that improvements in both aspects can directly contribute to project success. Based on the questionnaire data, it is clear that career development (promotion, rotation, and demotion) at PLN UIP SULAWESI has been running almost entirely appropriately. However, a number of employees still disagreed and held a neutral position. For the construction implementation variable, an average of 21.50% of the 107 respondents surveyed chose neutral, and an average of 4.21% of the 107 respondents chose disagree.

Based on the above analysis, it can be concluded that understanding project management and construction implementation significantly influence project success. This research supports existing theory and demonstrates the importance of both aspects in achieving desired outcomes in construction projects. Therefore, the recommendation for project management practitioners is to continuously improve their understanding and skills in these two areas to ensure future project success.

### **Conclusion**

Project Management Understanding (X1) has a positive and significant influence on Project Success (Y). This indicates that improving project management knowledge and skills, such as planning and control, can increase the chances of project success. With a significance value of

0.000, this result confirms the importance of investing in project management training for employees at PT PLN (Persero) UIP SULAWESI. Construction Execution (X2) also contributes significantly to Project Success (Y) with a significance value of 0.020. This finding indicates that good implementation, including managing time, cost, and quality, is key to achieving project objectives. Good skills and coordination during the construction phase can reduce the risk of delays and additional costs. The combination of Project Management Understanding and Construction Execution (X1X2) comprehensively demonstrated a positive and significant influence on Project Success (Y) with a significance value of 0.030. This indicates that these two aspects complement each other and are crucial for project success. Improving project management understanding and construction execution simultaneously can improve overall project outcomes.

### Recommendations

Research shows that employees with a good understanding of project management tend to be more successful in achieving project targets. PLN UIP SULAWESI is recommended to map and plan training and competency certification related to project management, especially for employees responsible for and involved in the project world. This can improve knowledge and competencies that are beneficial to both employees and the company. PLN UIP SULAWESI is recommended to conduct project initiation through to completion by referring to the fundamentals of project management and the project cycle, simultaneously. Future research could highlight important aspects that influence project management success from various perspectives, including technical, human, and technological.

### References

- Al Shraah, A., Abu-Rumman, A., Al Madi, F., Alhammad, F. A. F., & AlJboor, A. A. (2022). The impact of quality management practices on knowledge management processes: a study of a social security corporation in Jordan. *The TQM Journal*, 34(4), 605-626. <https://doi.org/10.1108/TQM-08-2020-0183>
- Althiyabi, T., & Qureshi, M. (2021). Predefined project scope changes and its causes for project success. *International Journal of Software Engineering & Applications (IJSEA)*, 12(2/3). <https://doi.org/10.5121/ijsea.2021.12304>
- Alzoubi, H. M. (2022). BIM as a tool to optimize and manage project risk management. *International Journal of Mechanical Engineering*, 7(1).
- Andersen, E. S., Grude, K. V., & Haug, T. (2025). *Goal directed project management: effective techniques and strategies*. Taylor & Francis.
- Bawono, S. (2021). Human capital, technology, and economic growth: A case study of Indonesia. *Journal of Asian Finance, Economics and Business*.
- Ciric Lalic, D., Lalic, B., Delić, M., Gracanin, D., & Stefanovic, D. (2022). How project management approach impact project success? From traditional to agile. *International Journal of Managing Projects in Business*, 15(3), 494-521. <https://doi.org/10.1108/IJMPB-04-2021-0108>
- Cunio, J. D. (2024). *A Correlational Study Examining Project Management Leaders' Implementation of Lessons Learned Practices That Increases Organizational Revenue*. National University.

- Edeh, I. L., Nnamani, E., & Mbah, P. C. (2023). Skilled manpower and organizational performance in Manufacturing Firms in South East Nigeria. *Advance Journal of Arts, Humanities and Social Sciences*, 6(1), 1-28.
- Emeka, E. T., Asongu, S. A., & Ajah, A. C. (2025). Economic Policy Uncertainty and Structural Transformation in Africa: The Conditional Role of Human Resource Development. *Thunderbird International Business Review*. <https://doi.org/10.1002/tie.70047>
- Flyvbjerg, B. (2021). Top ten behavioral biases in project management: An overview. *Project Management Journal*, 52(6), 531-546. <https://doi.org/10.1177/87569728211049046>
- Hanafi, M. (2024). Designing nickel smelter industry investment competitiveness policy in Indonesia through system dynamics model. *Journal of Science and Technology Policy Management*. <https://doi.org/10.1108/JSTPM-01-2024-0016>
- Hellström, M. M., Jaccard, D., & Bonnier, K. E. (2023). A systematic review on the use of serious games in project management education. *International Journal of Serious Games*, 10(2), 3-24. <https://doi.org/10.17083/ijsg.v10i2.630>
- Herath, S., & Chong, S. (2021). Key components and critical success factors for project management success: A literature review. *Operations and supply chain management: An International Journal*, 14(4), 431-443. <http://doi.org/10.31387/oscm0470314>
- Hussain, U. Y. (2022). The mediating role of job satisfaction and transformational leadership on emotional intelligence and project success. *Journal of Positive School Psychology* <http://journalppw.com>, 6(8), 3668-3682.
- Ignace, H., & Amolo, A. E. J. (2025). The Impact of Quality Management Strategies on Project Performance and Sustainability. *International Journal of Finance & Banking Studies*, 14(1), 195-204.
- Irfan, M., Khan, S. Z., Hassan, N., Hassan, M., Habib, M., Khan, S., & Khan, H. H. (2021). Role of project planning and project manager competencies on public sector project success. *Sustainability*, 13(3), 1421.
- Jääskä, E., & Aaltonen, K. (2022). Teachers' experiences of using game-based learning methods in project management higher education. *Project Leadership and Society*, 3, 100041. <https://doi.org/10.1016/j.plas.2022.100041>
- Kerzner, H. (2025). *Project management: a systems approach to planning, scheduling, and controlling*. John Wiley & Sons.
- Kostadinova, N. S., & Boncilica, A. N. (2024). The Role Of Vocational Education And Training And Human Resources Development In Bulgaria'S Economic Growth. In *Proceedings of the INTERNATIONAL MANAGEMENT CONFERENCE* (Vol. 18, No. 1, pp. 370-379). Faculty of Management, Academy of Economic Studies, Bucharest, Romania. <https://doi.org/10.24818/IMC/2024/04.03>
- Langholf, V., & Wilkens, U. (2021). Agile project management, new leadership roles and dynamic capabilities—insight from a case study analysis. *Journal of Competences, Strategy & Management*, 11, 1-18. <https://doi.org/10.25437/jcsm-vol11-17>
- Malik, R. H. (2024). *Stakeholder views on the uptake of sustainable and responsible nickel mining and processing supply chains for electric vehicles in Indonesia*. Massachusetts Institute of Technology.

- Malik, S., Taqi, M., Martins, J. M., Mata, M. N., Pereira, J. M., & Abreu, A. (2021). Exploring the relationship between communication and success of construction projects: The mediating role of conflict. *Sustainability*, 13(8), 4513. <https://doi.org/10.3390/su13084513>
- McKevitt, D., Carbery, R., & Collins, S. (2022). Job crafting in project management: Implications for project success and career satisfaction. *International Journal of Project Management*, 40(7), 741-749. <https://doi.org/10.1016/j.ijproman.2022.08.004>
- McKevitt, D., Carbery, R., & Collins, S. (2022). Job crafting in project management: Implications for project success and career satisfaction. *International Journal of Project Management*, 40(7), 741-749. <https://doi.org/10.1016/j.ijproman.2022.08.004>
- Michel, T. (2024, May). *The Prospects of Indonesia's Nickel Boom Amidst a Systemic Challenge from Coal*.
- Muneer, M., Khan, N., Awais Hussain, M., Shuai, Z., Khan, A. A., Farooq, R., ... & Tariq, M. A. U. R. (2022). A quantitative study of the impact of organizational culture, communication management, and clarity in project scope on constructions' project success with moderating role of project manager's competencies to enhance constructions management practices. *Buildings*, 12(11), 1856. <https://doi.org/10.3390/buildings12111856>
- Naz, F., Kumar, A., Majumdar, A., & Agrawal, R. (2022). Is artificial intelligence an enabler of supply chain resiliency post COVID-19? An exploratory state-of-the-art review for future research. *Operations Management Research*, 15(1), 378-398.
- Norrie, J. (2024). *Improving results of project portfolio management in the public sector using a balanced strategic scoring model* (Doctoral dissertation, RMIT University).
- Pattanayak, B. (2025). *Human resource management*. PHI Learning Pvt. Ltd..
- Prieto, S. A., Mengiste, E. T., & García de Soto, B. (2023). Investigating the use of ChatGPT for the scheduling of construction projects. *Buildings*, 13(4), 857. <https://doi.org/10.3390/buildings13040857>
- Rekha, K. C. (2024). ENHANCING COMPETITIVENESS THROUGH HUMAN RESOURCE DEVELOPMENT: INSIGHTS FROM EMPLOYERS IN THE ILO STUDY. *MATERIAL SCIENCE*, 23(04).
- Rocha, A., Romero, F., Miranda, D., Amorim, M., & Lima, R. M. (2023). Quality management practices to direct and control the accomplishment of project objectives in R&D units. *Procedia Computer Science*, 219, 36-43. <https://doi.org/10.1016/j.procs.2023.01.261>
- Sajid, M., Awais, M., & Abrar, R. (2024). Examining the mediating effect of organizational commitment and job satisfaction between project manager emotional intelligence and project success. *Int. J. Manage. Res. Emerging Sci*, 14(1), 129-146. <https://doi.org/10.56536/ijmres.v14i1.528>
- Shamim, M. I. (2022). Exploring the success factors of project management. *American Journal of Economics and Business Management*, 5(7), 64-72.
- Silvius, G., & Marnewick, C. (2022). Interlinking sustainability in organizational strategy, project portfolio management and project management a conceptual

framework. *Procedia Computer Science*, 196, 938-947.  
<https://doi.org/10.1016/j.procs.2021.12.095>

- Taboada, I., Daneshpajouh, A., Toledo, N., & De Vass, T. (2023). Artificial intelligence enabled project management: a systematic literature review. *Applied Sciences*, 13(8), 5014. <https://doi.org/10.3390/app13085014>
- Unegbu, H. C. O., Yawas, D. S., & Dan-Asabe, B. (2022). An investigation of the relationship between project performance measures and project management practices of construction projects for the construction industry in Nigeria. *Journal of King Saud University-Engineering Sciences*, 34(4), 240-249.  
<https://doi.org/10.1016/j.jksues.2020.10.001>
- Utomo, D. P., Subrata, M. E., & Dhelika, R. (2025). Decarbonization Roadmap and Energy System Scenarios for Southern Sulawesi System: Response to Demand Growth from Smelters Sector. *Journal of Asian Energy Studies*, 9, 149-171.  
<https://doi.org/10.24112/jaes.090009>
- Venczel, T. B., Berényi, L., & Hriczó, K. (2021, May). Project management success factors. In *Journal of Physics: Conference Series* (Vol. 1935, No. 1, p. 012005). IOP Publishing.
- Watanabe, W. C., Shafiq, M., Nawaz, M. J., Saleem, I., & Nazeer, S. (2024). The impact of emotional intelligence on project success: Mediating role of team cohesiveness and moderating role of organizational culture. *International Journal of Engineering Business Management*, 16, 18479790241232508.  
<https://doi.org/10.1177/18479790241232508>