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THE EFFECT OF RISK MANAGEMENT, SCHEDULE PERFORMANCE, AND COST EFFICIENCY ON THE FEASIBILITY OF INFRASTRUCTURE PROJECT INVESTMENT

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ABSTRACT

Infrastructure project investments tend to face challenges related to risk, schedule delays, and cost efficiency, which can affect the project's financial feasibility. This issue is crucial because appropriate investment decisions are crucial to project success and returns for stakeholders. This study aims to analyze the influence of risk management, schedule performance, and cost efficiency on the investment feasibility of infrastructure projects. The research method used is quantitative, with a population of individuals with direct experience in infrastructure project management. The sample was selected using purposive sampling with the criteria of a minimum of one to three years of experience on related projects. Data were collected through questionnaires, tested for validity and reliability, then analyzed using multiple regression and the R^2 value to measure the contribution of independent variables to investment feasibility. The results show that risk management, schedule performance, and cost efficiency simultaneously have a significant effect on the investment feasibility of infrastructure projects. The R^2 value indicates that the independent variables together are able to explain most of the variation in investment feasibility. These findings emphasize the importance of good risk management, proper schedule monitoring, and cost efficiency to improve investment feasibility. The implications of this study can be used as a reference for project management and stakeholders in making more effective infrastructure investment decisions and reducing the risk of financial loss.

KEYWORDS *Risk management, schedule performance, cost efficiency, investment feasibility, infrastructure projects.*

INTRODUCTION

Infrastructure development plays a strategic role in driving economic growth and improving public welfare. Projects such as roads, bridges, buildings, and airports require significant investment and often face various risks and uncertainties during implementation (Hutajulu, 2024). Therefore, assessing investment feasibility is an important step for stakeholders. According to (Alhamami et al., 2023), as businesses grow and projects scale, feasibility studies become a crucial tool for assessing the potential success of investments. Thorough analysis helps minimize risks while simultaneously increasing profit opportunities. Based on a feasibility study, various factors influencing investment outcomes can be analyzed, thus increasing the likelihood of projects delivering optimal returns and minimizing losses.

The success of an infrastructure project depends not only on technical proficiency in its implementation, but also on effective risk management, adherence to schedules, and cost efficiency. Projects well-managed in these three areas will run more smoothly, generate maximum economic benefits, and provide significant added value for all parties involved.

The basic concept of risk in management refers to the possibility of an event occurring that could disrupt the achievement of an organization's or individual's goals, where there is uncertainty regarding the outcome of decisions taken. Risks can arise from various sources, both external and internal (Maskur & Khuzaini, 2024). External factors include economic conditions, regulatory changes, or natural disasters, while internal factors can include

operational errors, inappropriate strategic decisions, or information technology system failures. In these cases, risk management is crucial because it involves a systematic process to identify, analyze, evaluate, and control these risks so that their impact can be minimized, while opportunities to achieve goals remain wide open (Barraza de la Paz et al., 2023).

Risk management plays a crucial role in infrastructure projects, which frequently face potential disruptions such as material price fluctuations, supply delays, natural disasters, and regulatory changes. Therefore, risk management is a key consideration in investment decision-making. Previous research, through a literature review, has shown that risk assessment methods for investment projects can help assess project feasibility, determine the initial time period after the project begins generating revenue, and estimate the probability of future profits (Jaka Raharja et al., 2021). A study by (Iqbal & Purwanto, 2022) analyzed 27 risk variables using Monte Carlo simulations and found only one risk to be insignificant, highlighting the importance of risk management to ensure investment feasibility.

Furthermore, schedule performance plays a crucial role in the success of infrastructure projects because it directly relates to cost efficiency and return on investment. Any delay in project implementation can result in longer-than-planned resource usage, increased operational costs, and extended payback periods (Fossum et al., 2020). This can increase financial burdens and reduce project profitability. Furthermore, schedule performance impacts all aspects of project management. Timely implementation encourages better coordination between teams, minimizes the risk of rework, and maintains standard work quality.

Projects managed with a well-managed schedule are able to deliver optimal returns on investment, while projects that frequently experience delays will face increased costs and potentially greater losses. Therefore, effective schedule management is a critical component in ensuring infrastructure projects remain financially and operationally viable. Previous research, including surveys, has shown that poor project management, rework, and weak oversight negatively impact the time, cost, and quality of construction projects (Kamal et al., 2022). Poor schedule performance increases costs and reduces investment viability, while effective schedules can improve cost efficiency and strengthen the investment viability of infrastructure projects (Saifur et al., 2020).

Furthermore, cost efficiency is another important factor in project management because it shows how effectively available resources are used to achieve project objectives (Beste & Klakegg, 2022). Projects that maximize the use of limited resources will be more efficient and reduce waste, thus maintaining operational costs under control. With good cost management, projects can run within the established budget without sacrificing work quality, thus supporting the optimal achievement of financial targets. In addition, cost efficiency also plays a role in increasing the profitability and sustainability of projects in the long term. Proper use of resources and controlling expenses helps project managers make more strategic and measurable decisions, thus minimizing the risk of waste or loss.

However, the impact of cost efficiency on the investment feasibility of infrastructure projects has not been directly studied. A study by (Widowati & Rachmawati, 2020) emphasized that cost analysis plays a significant role in improving project performance. Effectively managed costs help project managers make more informed decisions by comprehensively understanding the benefits and risks associated with various project alternatives. Therefore,

cost efficiency not only impacts expenditure control but also contributes to improved project performance, ultimately supporting investment feasibility.

Based on several previous studies discussing risk management, schedule performance, or cost efficiency in infrastructure projects, no research has used a quantitative approach to simultaneously analyze these three variables in relation to investment feasibility. This means that previous research tends to discuss each factor separately, resulting in a lack of empirical evidence statistically measuring how the combination of risk management, schedule performance, and cost efficiency collectively affects project investment feasibility. This indicates a research gap that opens up opportunities for more comprehensive and integrated studies.

The novelty of this research lies in its approach, which examines the simultaneous and partial effects of three variables using empirical data obtained directly from infrastructure project practitioners, such as project managers, site engineers, financial analysts, and developers. The research's focus on risk management, schedule performance, and cost efficiency is expected to guide more effective and efficient project management.

Practically, the findings of this study can be used by stakeholders in planning and controlling risks, managing implementation schedules, and managing costs to improve the feasibility of project investments. Academically, this study adds to the infrastructure project management literature with a quantitative approach that examines all three factors simultaneously, thus providing a strong foundation for further research and broadening the understanding of the factors that influence project investment success.

METHOD

This study uses a quantitative method because the focus of the study is to measure and analyze the relationship between predetermined variables, namely risk management, schedule performance, cost efficiency, and investment feasibility of infrastructure projects. The quantitative approach was chosen so that the data obtained are numerical and can be analyzed statistically, so that the influence of each variable can be assessed objectively and measurably (Duckett, 2021). The research population consists of individuals with direct experience in infrastructure project management and therefore able to provide valid assessments of the research variables. The target population includes:

1. The project manager is responsible for the implementation of the project.
2. Field supervisors are directly involved in monitoring schedules and controlling costs.
3. Financial or investment analysts who assess the feasibility of investments and the financial aspects of a project.
4. The developer or project owner who has authority over investment decisions and project implementation.

The sampling technique used was purposive sampling, selecting respondents who met the criteria for experience and positions relevant to the research. Respondents were selected based on a minimum of one to three years of experience in infrastructure projects and an understanding of the project's cost, risk, schedule, and investment feasibility aspects. The initial target sample size was 100 respondents, a number chosen to ensure adequate analytical power in accordance with quantitative research standards (F. Hair Jr et al., 2014). However, in

practice, this study managed to collect data from 233 respondents. There were scientific reasons for selecting a larger number of respondents, including to increase the reliability and accuracy of the research results, reduce the margin of error, and meet the minimum requirements in multivariate analysis.

Data collection was conducted through a questionnaire compiled based on indicators for each research variable. This questionnaire was designed to allow quantitative measurement of the answers obtained and facilitate analysis of the influence of independent variables on the dependent variable. Data obtained from the questionnaire were analyzed using SPSS. Prior to conducting the regression analysis, validity and reliability tests were conducted on the research instrument. After the instrument was declared valid and reliable, the analysis continued with multiple regression. Multiple regression analysis was used to determine the simultaneous and partial effects of risk management, schedule performance, and cost efficiency on the investment feasibility of infrastructure projects.

RESULT AND DISCUSSION

Results

a. Descriptive Analysis

The results of the descriptive analysis regarding the influence of risk management, schedule performance, and cost efficiency on the feasibility of infrastructure project investments are presented as follows.

Table 1. Questionnaire Statements

	Statement
A. Risk Management	
1	Identification of potential risks is carried out from the early stages of project planning.
2	There are clear risk mitigation strategies in place to reduce negative impacts.
3	Risk evaluations are conducted periodically throughout the project.
B. Schedule Performance	
4	Project work is carried out according to the established schedule.
5	The target for completing each stage of the project can be achieved on time.
6	Schedule delays can be minimized with coordination between related parties.
7	Human resources and equipment are available according to the project schedule requirements.
8	The project schedule monitoring and evaluation system is running effectively.
C. Cost Efficiency	

	Statement
9	Use of the project budget in accordance with the initial planning.
10	Project operational costs can be minimized without reducing the quality of the results.
11	Cost control is carried out routinely to avoid waste.
D. Feasibility of Infrastructure Project Investment	
12	This infrastructure project provides long-term benefits that are commensurate with the costs incurred.
13	This infrastructure project is worth implementing because it has added value to economic and social growth.

Based on Table 1, the questionnaire was designed to measure four key aspects of infrastructure project investment feasibility: risk management, schedule performance, cost efficiency, and the project's investment feasibility. Regarding risk management, the questionnaire emphasized the importance of early risk identification, implementation of mitigation strategies, and periodic evaluation. Schedule performance was measured through the accuracy of work execution, achievement of time targets, coordination to minimize delays, resource availability, and monitoring effectiveness. Cost efficiency encompassed adherence to budget plans, cost-saving efforts without compromising quality, and routine cost control. Meanwhile, investment feasibility was assessed based on the long-term benefits commensurate with costs and the project's contribution to economic and social growth. Therefore, this questionnaire provides a comprehensive instrument for assessing key factors for the success of infrastructure project investments. The descriptive analysis of the questionnaire results is as follows:

Table 2. Results of Descriptive Analysis

Descriptives

			Statistics	Std. Error
X1	Mean		9.99	.172
	95% Confidence Interval for Mean	Lower Bound	9.65	
		Upper Bound	10:33	
	5% Trimmed Mean		10.02	
	Median		10.00	
	Variance		6,879	
	Standard Deviation		2,623	
	Minimum		3	
	Maximum		15	
	Range		12	
	Interquartile Range		4	
	Skewness		-.125	.159
	Kurtosis		-.170	.318
X2	Mean		17.98	.273

	95% Confidence Interval for Mean	Lower Bound	17.45	
		Upper Bound	18.52	
	5% Trimmed Mean		18.09	
	Median		18.00	
	Variance		17,336	
	Standard Deviation		4.164	
	Minimum		6	
	Maximum		25	
	Range		19	
	Interquartile Range		6	
	Skewness		-.250	.159
	Kurtosis		-.275	.318
X3	Mean		11.69	.178
	95% Confidence Interval for Mean	Lower Bound	11.34	
		Upper Bound	12.04	
	5% Trimmed Mean		11.86	
	Median		12.00	
	Variance		7,413	
	Standard Deviation		2,723	
	Minimum		3	
	Maximum		15	
	Range		12	
	Interquartile Range		4	
	Skewness		-.624	.159
	Kurtosis		-.064	.318
Y	Mean		6.71	.154
	95% Confidence Interval for Mean	Lower Bound	6.41	
		Upper Bound	7.02	
	5% Trimmed Mean		6.79	
	Median		7.00	
	Variance		5,525	
	Standard Deviation		2,350	
	Minimum		2	
	Maximum		10	
	Range		8	
	Interquartile Range		3	
	Skewness		-.341	.159
	Kurtosis		-.699	.318

Based on the results of the descriptive analysis in Table 2, it is known that the Risk Management variable (X1) has an average value (mean) of 9.99 with a standard deviation of 2.623, which indicates that the data is quite spread around its middle value. The Schedule

Performance variable (X2) has a mean of 17.98 with a standard deviation of 4.164, indicating a relatively larger data variation compared to X1. Meanwhile, the Cost Efficiency variable (X3) has a mean of 11.69 with a standard deviation of 2.723, indicating a fairly moderate data distribution. The Infrastructure Project Investment Feasibility variable (Y) has a mean of 6.71 with a standard deviation of 2.350, which means that the data distribution is relatively small compared to other variables.

b. Normality Test

A normality test is a statistical procedure used to determine whether a data set is normally distributed or approximately normally distributed, a key assumption in many parametric statistical analyses. Test results are typically assessed using a significance level; if the p-value is greater than the significance level, the data are considered normally distributed (Nurhaswinda et al., 2025).

Table 3. Normality Test Results

Tests of Normality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
X1	.100	233	<.001	.975	233	<.001
X2	.068	233	.012	.976	233	<.001
X3	.124	233	<.001	.923	233	<.001
Y	.124	233	<.001	.936	233	<.001

a. Lilliefors Significance Correction

Based on Table 2, the results of the normality test using Kolmogorov-Smirnov and Shapiro-Wilk, all research variables, namely Risk Management (X1), Schedule Performance (X2), Cost Efficiency (X3), and Infrastructure Project Investment Feasibility (Y), have a significance value (Sig.) <0.05. This indicates that the data distribution in the four variables is not normally distributed.

c. Reliability Test

Reliability testing is a statistical method used to measure the consistency or reliability of a research instrument in generating data. An instrument is considered reliable if repeated measurements on the same subjects or conditions yield relatively similar results (Janna & Herianto, 2021).

Table 4. Reliability Test Results

Reliability Statistics

Cronbach's Alpha	N of Items
.773	4

Based on the reliability test results in Table 3, a Cronbach's Alpha value of 0.773 was obtained for the four research variable items. This value is above the minimum limit of 0.70, which is generally used as a reliability standard. Therefore, it can be concluded that the research instrument used has good internal consistency and is suitable for measuring the

variables of Risk Management, Schedule Performance, Cost Efficiency, and Infrastructure Project Investment Feasibility.

d. Hypothesis Testing

Hypothesis testing is a statistical procedure used to test the validity of a hypothesis regarding a population parameter based on sample data. This process involves formulating a null hypothesis (H_0) as an initial statement assumed to be true, and an alternative hypothesis (H_1) that will be accepted if H_0 is rejected (Anuraga et al., 2021).

Table 5. Hypothesis Test Results

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1,671	.593		-2,818	.005
	X1	.165	.048	.185	3,417	<.001
	X2	.148	.033	.263	4,556	<.001
	X3	.348	.051	.403	6,840	<.001

a. Dependent Variable: Y

Based on Table 4, the results of the hypothesis test show that the three independent variables have a positive and significant effect on the dependent variable, Infrastructure Project Investment Feasibility (Y). The Risk Management variable (X1) has a positive effect with a coefficient value of 0.165 and a significance value of <0.001, indicating that the better the risk management, the higher the investment feasibility. The Schedule Performance variable (X2) also has a positive effect with a coefficient of 0.148 and a significance value of <0.001, indicating that the better the project schedule achievement, the higher the investment feasibility. Furthermore, the Cost Efficiency variable (X3) has the largest effect with a coefficient of 0.348 and a significance value of <0.001, indicating that cost efficiency is a dominant factor in increasing the investment feasibility of infrastructure projects. Thus, the research hypothesis stating that there is a positive effect of X1, X2, and X3 on Y can be accepted.

e. Correlation Test

A correlation test is a statistical method used to measure and analyze the strength and direction of the relationship between two or more variables. The significance of the relationship is assessed using the p-value; if the p-value ≤ α, the relationship is considered statistically significant.

Table 6. Correlation Test Results

Correlations

		X1	X2	X3	Y
X1	Pearson Correlation	1	.390**	.434**	.462**
	Sig. (2-tailed)		<.001	<.001	<.001
	N	233	233	233	233
X2	Pearson Correlation	.390**	1	.535**	.550**
	Sig. (2-tailed)	<.001		<.001	<.001
	N	233	233	233	233

X3	Pearson Correlation	.434**	.535**	1	.623**
	Sig. (2-tailed)	<.001	<.001		<.001
	N	233	233	233	233
Y	Pearson Correlation	.462**	.550**	.623**	1
	Sig. (2-tailed)	<.001	<.001	<.001	
	N	233	233	233	233

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

Based on Table 5, the results of the correlation test show that all independent variables have a positive and significant relationship with the Feasibility of Infrastructure Project Investment (Y) at a significance level of 0.01. The Risk Management variable (X1) correlates with Y by 0.462, Schedule Performance (X2) correlates with Y by 0.550, and Cost Efficiency (X3) has the highest correlation with Y by 0.623. This indicates that the better the risk management, schedule performance, and cost efficiency, the higher the feasibility of infrastructure project investment. In addition, the independent variables are also positively correlated with each other, where the highest correlation occurs between X2 and X3 (0.535), indicating a close relationship between schedule performance and cost efficiency in supporting investment feasibility.

Discussion

The Influence of Risk Management on the Feasibility of Infrastructure Project Investments

The research results show that the Risk Management variable has a positive and significant effect on the investment feasibility of infrastructure projects, with a coefficient value of 0.165 and a significance level of <0.001. This indicates that the better the implementation of risk management in a project, the higher the level of investment feasibility. Appropriate risk management will reduce potential losses and uncertainty, thus ensuring project investment is more secure.

Potential losses can arise when an institution fails to manage the risks it faces, whether financial, business, or systemic, which can ultimately disrupt operational stability and continuity. Therefore, implementing appropriate risk management is essential, especially for financial institutions facing market dynamics and economic uncertainty.

Risk management plays a crucial role in achieving effective corporate or organizational governance. Through proper risk management, potential threats that could disrupt operations and the achievement of objectives can be anticipated and controlled (Agil et al., 2023). The risk management process encompasses a series of strategic steps, such as risk identification, measurement, evaluation, and control, aimed at reducing the likelihood of risks occurring while minimizing negative impacts that could harm the organization. This allows the institution to maintain optimal performance, trust, and business sustainability (Royyan, 2023).

A company's risk management can protect its assets, policies, and resources from potential threats that could hinder the achievement of its objectives. When implemented based on sound principles and procedures, risk management not only serves as a protective mechanism but also positively contributes to improving the company's overall quality (M. Sari et al., 2022).

These results align with research by (Dewi & Wessiani, 2021), which explains that risk management in infrastructure project investment feasibility decisions, taking uncertainty into account, indicates that the main risk variables identified include the inflation rate, forecast error in LHR volume, initial LHR volume, construction costs, and O&M costs. From the risk management process, the inflation rate is the most significant factor because it can directly affect the project's rate of return. Mitigation measures include transferring risk to the government by setting a fixed rate of 3%, which has been shown to reduce the average standard deviation of NPV and lower the inflation risk level from a high-risk to a low-risk category.

Thus, the implementation of risk management has been shown to significantly impact the investment feasibility of infrastructure projects. The better the risk management strategy implemented, the higher the project's chances of achieving optimal feasibility because potential losses and uncertainty can be minimized. This is not only relevant for infrastructure projects but also crucial for financial institutions and other organizations facing various risks, whether financial, business, or systemic. Structured risk management enables companies to maintain stability, protect assets and resources, and strengthen organizational governance.

The Impact of Schedule Performance on the Investment Feasibility of Infrastructure Projects

The research results show that the Schedule Performance variable also has a positive and significant effect on the feasibility of infrastructure project investments, with a coefficient value of 0.148 and a significance level of <0.001. This means that the better the project schedule is achieved according to plan, the higher the investment feasibility. Timely project implementation will reduce delays, reduce additional costs, and increase work process efficiency, thus contributing to investment success.

Project schedules can be structured visually, making it easier to monitor work progress and helping to identify potential delays early. Visual representations, such as Gantt charts or network diagrams, allow all parties involved to clearly see the flow of activities, the interrelationships between tasks, and established deadlines. This enables project managers to exercise more effective control, make quick corrective decisions, and ensure each stage is on target, thus supporting smooth project completion (I. L. Sari et al., 2025).

Every project also requires thorough investment planning to ensure its feasibility and future profitability. An investment feasibility study remains crucial even if similar projects have been built before, given that every development involves significant funding requirements, making decisions difficult to make based on estimates alone. Project investment itself is an effort to invest limited production factors, including capital, natural resources, expertise, skilled labor, and technology, in new projects or the expansion of existing projects, with a medium to long-term timeframe (Nugraha et al., 2023).

At PT. Agrindo Sumber Harum, assessments are conducted using several financial indicators, namely Return on Investment (ROI), Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP). Meanwhile, financial performance evaluations are conducted to assess the company's condition over a specific period by reviewing aspects of liquidity, solvency, and profitability (Wiejaya et al., 2023).

Thus, schedule performance plays a crucial role in determining the investment feasibility of infrastructure projects. Achieving a schedule that meets the plan can minimize potential delays, reduce cost overruns, and increase project implementation efficiency, thus positively

impacting investment success. Investment feasibility assessments encompass not only technical aspects but also financial indicators such as ROI, NPV, IRR, and PP, as well as the company's financial performance in terms of liquidity, solvency, and profitability.

The Influence of Cost Efficiency on the Investment Feasibility of Infrastructure Projects

Based on the research results, it was found that the Cost Efficiency variable has the largest positive and significant influence on the Feasibility of Infrastructure Project Investment, indicated by a coefficient value of 0.348 and a significance level <0.001. This indicates that effective cost management, such as budget control, optimizing resource use, and reducing waste, significantly determines investment feasibility. The more efficient the costs used, the greater the chance of the project being feasible and providing economic benefits.

One method for assessing investment feasibility is to examine the level of effectiveness and cost efficiency incurred in supporting an organization's business processes. A viable investment not only generates financial returns but also ensures that every use of resources provides optimal benefits for the company's sustainability and growth (Adnan et al., 2025).

Efficiency is a crucial indicator in assessing investment feasibility, as lower operational costs mean greater potential profits. By applying capital budgeting methods, investment feasibility analysis can be conducted objectively to assess the long-term benefits of the decision. Savings in operational costs not only demonstrate efficiency but also strengthen evidence that the investment is worthwhile, as it can increase the company's profitability and sustainability (Rabbani et al., 2025).

Thus, cost efficiency is a key factor that significantly influences the investment feasibility of infrastructure projects. The more effectively a company manages its budget, optimizes resource utilization, and reduces waste, the greater the investment's potential to generate profits and positively impact business sustainability. Cost efficiency is not merely a cost-saving strategy but also a crucial basis for objective investment decision-making through capital budgeting methods. Therefore, sound cost control will strengthen the investment's feasibility while ensuring the project's future sustainability and profitability.

CONCLUSION

The research results show that the investment feasibility of infrastructure projects is significantly influenced by three main aspects: risk management, schedule performance, and cost efficiency. Good risk management implementation enables companies to anticipate uncertainty, reduce potential losses, and maintain project stability and sustainability. Meanwhile, schedule performance that is in accordance with planning will minimize delays, reduce additional costs, and increase implementation efficiency, thus positively impacting investment success. On the other hand, cost efficiency is the most dominant factor because budget management, resource optimization, and waste reduction have been proven to strengthen project profitability and value. Implementation of these three aspects can be achieved through the preparation of a structured project schedule, the systematic application of risk management procedures, and the use of capital budgeting methods to assess cost efficiency and potential long-term benefits. Thus, the integration of risk management, schedule performance, and cost efficiency provides a strong foundation for ensuring that infrastructure projects are not only financially viable but also sustainable and strategically valuable for the company and its stakeholders.

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