



Analysis of Risk Management and Performance of SOEs in Infrastructure Services During COVID-19

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Abstract. The COVID-19 pandemic has changed corporate governance substantially. In Indonesia, which is building infrastructure, relies heavily on State-owned Enterprises (SOEs) in the service sector. This study aims to analyze the risk management function and its effect on company performance by comparing before and during the pandemic. Variables used to measure the effect are project innovation, and project life-cycle on company performance. This research uses Structural Equation Model with Partial Least Square technique. The results show that research model has a good fit with the SRMR value of 0.076 and the Normed Fit Index (NFI) showing a value of 0.627. The final result of this study is to answer all hypotheses about the performance of SOEs in the infrastructure sector before and during the pandemic. This study finds that risk management has a significant impact on project innovation, project life-cycle, company performance. As for project life-cycle, it influences innovation and company performance considerably. This study also confirms that innovation has a significant effect on company performance.

Keywords: infrastructure services · risk management · project life-cycle · project innovation · company performance

1 Introduction

The outbreak of the corona virus (covid-19) was first announced worldwide as a pandemic in March 2020, causing half of the world's population to go into lockdown and causing businesses to drastically change the way they work, produce and consume. According to the [1], in 2020 it is predicted that world real GDP growth will be around - 4.3% due to the pandemic. Even though infrastructure industry expected to contribute 13.4% to GDP in 2020 [2], however the pandemic led to a contraction in the sector in most markets around the world.

Despite the high level of uncertainty during the pandemic, economic activity could resume in early 2021 if the virus is contained and appropriate economic policies are implemented. Nevertheless, a long-term lockdown or other tight restrictions, even though temporary, could adversely affect the economic downturn, and national economy could resume as early as 2023.

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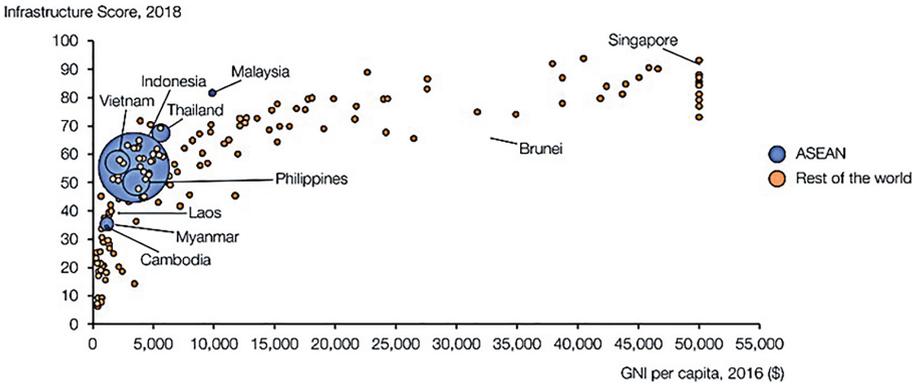


Fig. 1. Infrastructure and Economic Growth Chart

Increasing the availability and improving the quality of infrastructure can provide significant benefits for reducing operating costs for business owners and will then increase economic activity. Therefore, the relationship between infrastructure and a country’s development has been studied for decades. The concept of the correlation between investments in infrastructure and national income was reviewed [3, 4] and it was discovered that there is indeed a significant positive relation between both the infrastructure variable and economic growth [5–7] (Fig. 1).

The economic growth potential of Southeast Asian countries is limited by the lack of investment in infrastructure development. It is estimated that the world requires an estimate of 3.3 trillion United States dollars in infrastructure investment per year, of which 60% is needed by developing countries and 24% is specifically allocated to the construction sector and roadwork [8]. However, until 2019 the existing investment is still in the range of 350 billion US dollars per year.

One of the Indonesian government’s projects is the construction of a new capital city in East Kalimantan, adding about 33 billion US dollars to Indonesia’s investment needs. Getting additional budget to reduce the infrastructure gap is becoming increasingly difficult due to the economic and financial crisis caused by the pandemic. This condition clearly has an impact on infrastructure development that is being carried out by State-owned Enterprises (SOEs) in infrastructure services.

The implementation of infrastructure project construction during the pandemic faced its own challenges, such as the limited project implementation schedule due to restrictions imposed by the government, changes in construction plans due to several adjustments, and limited funds. This requires a quick response from companies and overcome various risks that may arise.

Risk can be defined as unforeseen events that may have a positive or negative impact on the objectives of the project, such as circumstances or conditions, in all reasonable foresight, that have a negative impact through any factor of project implementation. Companies have to identify, categorize, and estimate risks before managing and controlling those. Risk management is a continual process that needs to be applied in any project

from beginning to end. In the construction industry, this entails planning, monitoring, and implementing countermeasures to prevent exposure to risk [9].

Construction projects are highly complicated and fraught with uncertainty. Risk management assists the project's key stakeholders, such as the client, contractor/developer, consultant, and supplier to meet their commitments and minimizing adverse impacts on construction project performance in terms of cost, time, and desired outcomes [9].

Each project also goes through several stages, such as initiation, planning, execution, supervision, control, and closure [10]. This stage is also known as the project life cycle (PLC). Good PLC planning includes schedules or activities to be carried out within a certain period. However, what is planned in the PLC can be different from the reality on the ground, especially in public infrastructure projects which are always influenced from the external side. One problematic stage can result in changes to the planned PLC pattern either in schedule changes or in activity changes. At the full risk stage, the project can experience challenges and even failures. The emergence of challenges indicates if the project has undergone changes in objectives, costs, timing, and specifications [11].

Furthermore, innovation and risk are strongly intertwined. Indeed, research on innovation management frequently recommends that businesses focused on innovation actively monitor, evaluate, analyze, and treat upcoming events in order to minimize risks at any time possible [12]. Risk is fundamental to innovation, although in order to be both theoretically and practically insightful, the relations between risk and innovation should be studied in more specific contexts [13].

Project innovation is the application of knowledge to the creation of renewable (or perceived new) methods for solving problems in projects in order to expedite the process. Innovation stands from several new ideas which are then implemented into something either in the form of products, processes, machines, or service renewals which contribute to the dynamic growth of achieving goals for individuals, groups or organizations.

The importance of strategically knowing project progress can provide an overview of the company's performance. Performance measurement is an important thing to do to evaluate and control within the scope of the company. The main purpose of performance appraisal is to help set standards and targets, a means for progress, motivate, communicate strategy & organization and influence behavior.

2 Methodology

This study will examine the relationship between variables based on the attitudes and behavior of respondents through a theoretical approach as well as the outcome of previous researches that provide consistency in the relations between variables. The variables studied are risk management, project performance, project life cycle, and innovation (Fig. 2).

The population in this study are important staff from state-owned companies engaged in infrastructure or construction services consisting of project managers, project engineers, and project workers with various positions or positions. The sampling technique used is the purposive method, which is a method based on certain parameters, which can be applied based on certain judgments or quotas.

A structured instrument was used to collect data (questionnaire) adopted from various previous studies that have been tested for reliability and validity. The data analysis

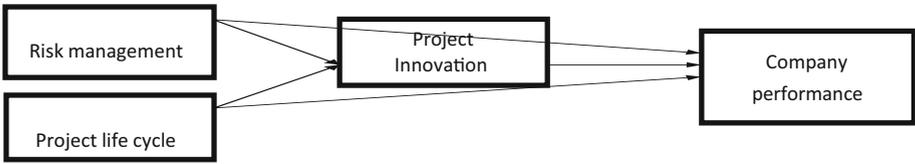


Fig. 2. Structural Research Model

technique in this paper uses the Structure Equation Model (SEM) with the help of SmartPLS software.

3 Result

Based on the results of the questionnaire, there were 100 respondents consisting of 68 male respondents and 32 female respondents. Researchers have analyzed each answer to each question posed to respondents to find out their response to an indicator. Analysis of answers to each respondent’s statement is done by finding the average of the answers given by respondents to each statement using an interval scale.

On questions regarding the Work from Home (WFH) policy, and physical distancing before the Covid-19 pandemic, respondents did not provide an answer because there was no such thing, so the graph above has an empty scale. For company performance, project innovation, and project life cycle issues, respondents on average gave the same answers both during and before the COVID-19 pandemic.

In the Project lifecycle and project innovation variables, respondents’ answers tend to be the same both during and before the pandemic. The following charts will show the details of respondents’ answers to the research instrument for each of the indicators studied (Figs. 3, 4, 5 and 6).

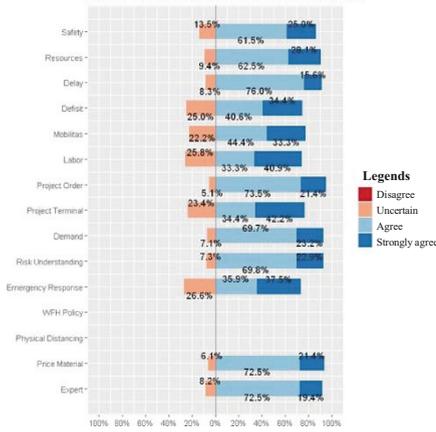
This paper also uses the Heterotrait-Monotrait (HTMT) test which serves as an advised solution method for determining discriminant validity. The principle of measurement for this method is a multitrait-multimethod matrix with a value less than 0.9 to ensure discriminant validity between the two reflective indicators [14]. As a result, the model in this study is acceptable, with sufficient confirmation of reliability, convergent validity, and a verified research model both before and during the pandemic (Tables 1 and 2).

The following step is to take measurements the Inner Structural Model, which is to analyse the relevance of model predictions and the correlation between constructions. Coefficient of determination (R2), path coefficient (β -value) dan T-statistic value, effect size (f^2), dan Goodness-of-Fit (GOF) index is the main standard for evaluating structural models.

R2 value of 0.50 is considered moderate, and R2 value of 0.25 is considered weak [14, 15]. Therefore, all R2 values in the study both before the pandemic and during the pandemic were quite large, for Project Innovation is 0.624, Company Performance is 0.757, and Project Life Cycle is 0.604.

Through the β -value, the significance of the hypothesis is tested. β -value shows the expected variation in the dependent construct for the variation of units in the independent

Aspects of risk management before the COVID-19 pandemic



Aspects of risk management during the COVID-19 pandemic

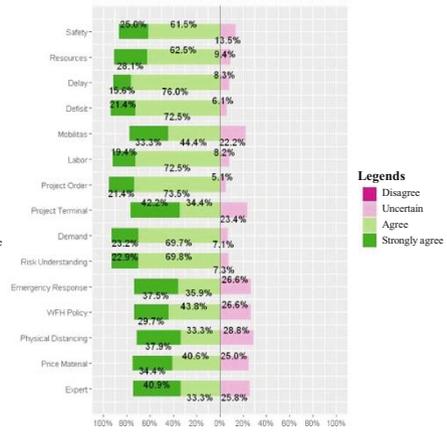
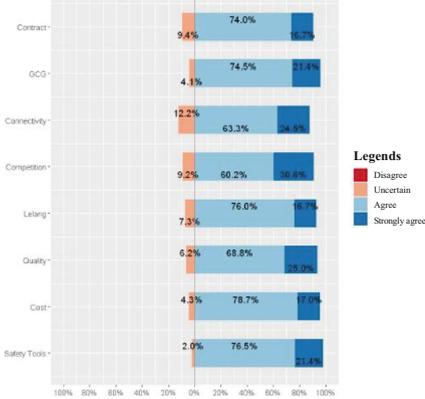


Fig. 3. The results of risk management Likert analysis, before and during the Covid-19 pandemic

Company performance before the COVID-19 pandemic



Company performance during the COVID-19 pandemic

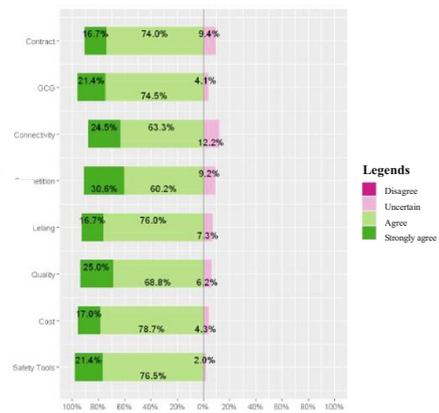


Fig. 4. The results of company performance Likert analysis, before and during the Covid-19 pandemic

contract, the greater the value, the greater the substantial effect on the endogenous latent construct. However, the β -value must be verified for significance level through T-statistic test.

To test the significance of the path coefficients and T-statistical values, the procedure uses 500 bootstrap samples (Table 3 and Table 4).

This study found that risk management had a significant effect on innovation both during and before the pandemic ($\rho_{value} < 0,025$). Likewise, risk management has a substantial impact on the project life-cycle. The impact of the project life-cycle on innovation was significant both during and before the pandemic. Risk management has

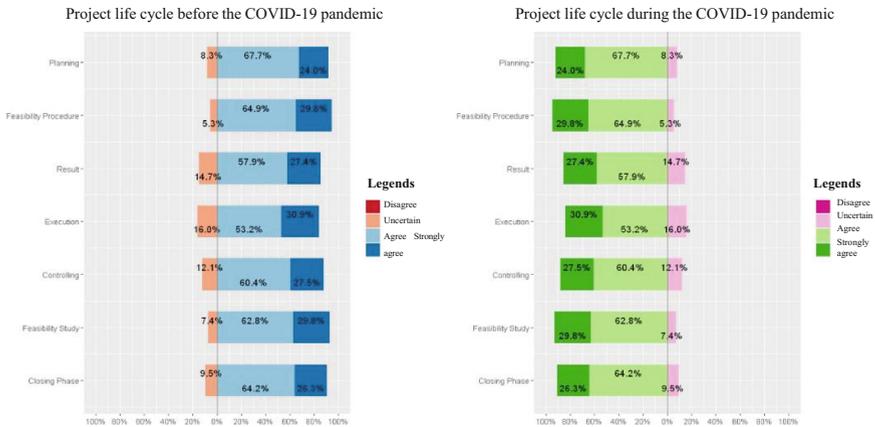


Fig. 5. The results of project life cycle Likert analysis, before and during the Covid-19 pandemic

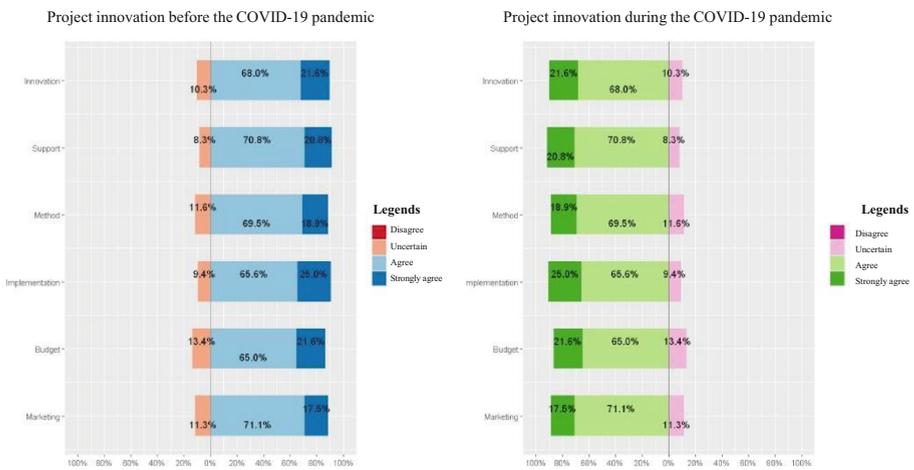


Fig. 6. The results of project innovation Likert analysis, before and during the Covid-19 pandemic

Table 1. HTMT test results, before the Covid-19 Pandemic

	Project Innovation	Company Performance	Project Life-cycle	Risk Management
Project Innovation		0.852	0.818	0.787
Company Performance	0.852		0.871	0.858
Project Life-cycle	0.818	0.871		0.834
Risk Management	0.787	0.858	0.834	

Table 2. HTMT test results, during the Covid-19 Pandemic

	Project Innovation	Company Performance	Project Life-cycle	Risk Management
Project Innovation		0.856	0.818	0.787
Company Performance	0.856		0.878	0.863
Project Life-cycle	0.818	0.878		0.834
Risk Management	0.787	0.863	0.834	

Table 3. Path Coefficient and T-statistics, before the Covid-19 Pandemic

Hypothesized Path	<i>B</i>	T-stat.	ρ -value
Risk Management → Project Innovation (H ₁)	0.122	2,715	0.007
Risk Management → Project Life-cycle (H ₂)	0,047	16,682	0.000
Project Life-cycle → Project Innovation (H ₃)	0,102	4,941	0.000
Project Life-cycle → Company Performance (H ₄)	0,090	3,704	0.000
Risk Management → Company Performance (H ₅)	0,079	3,830	0.000
Project Innovation → Company Performance (H ₆)	0,064	4,876	0.000

Table 4. Path Coefficient and T-statistics, during the Covid-19 Pandemic

Hypothesized Path	β	T-stat.	ρ -value
Risk Management → Project Innovation (H ₁)	0.117	2,844	0.005
Risk Management → Project Life-cycle (H ₂)	0,046	16,999	0.000
Project Life-cycle → Project Innovation (H ₃)	0,098	5,140	0.000
Project Life-cycle → Company Performance (H ₄)	0,089	3,861	0.000
Risk Management → Company Performance (H ₅)	0,072	4,235	0.000
Project Innovation → Company Performance (H ₆)	0,061	5,029	0.000

a significant impact on company performance as well. The impact of project life-cycle on company performance, and innovation on company performance is also very significant (Figs. 7 and 8).

The f^2 value can be used to analyze the contribution of exogenous variables to the value of R^2 endogenous variables. Changes in the value of R^2 when exogenous variables can be left out of the model used to evaluate whether the omitted variables have a substantive effect on the endogenous variables. This measure is referred to as the effect size (f^2) [16]. Depending on the value, the effect size of each variables has

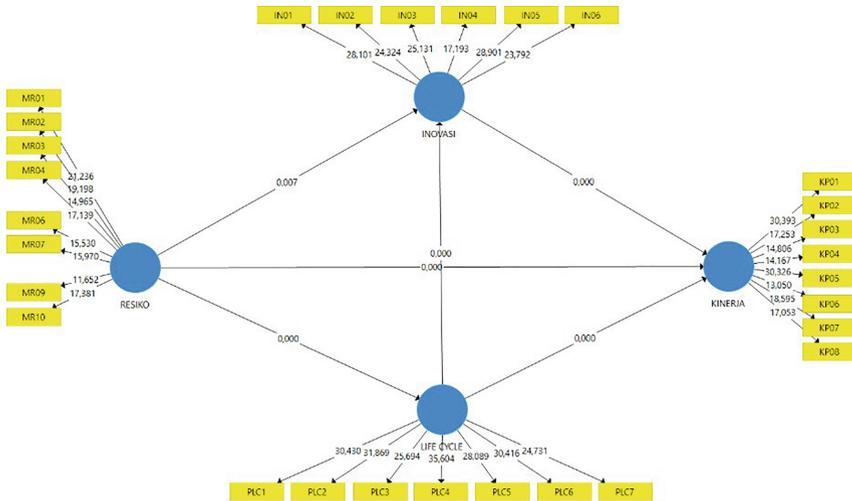


Fig. 7. Research Structural Equation Model (before the Covid-19 pandemic)

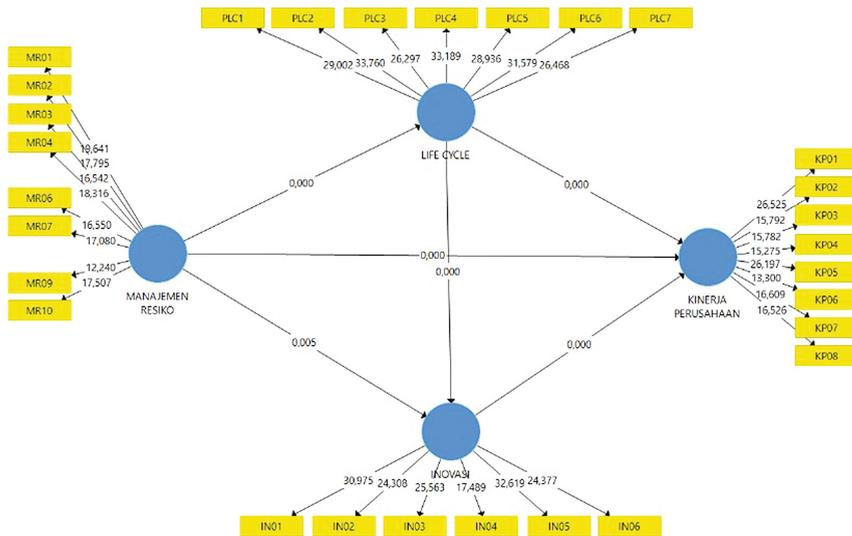


Fig. 8. Research Structural Equation Model (during the Covid-19 pandemic)

the potential to be represented as weak (0.02), moderate (0.15), and strong (0.35), and a value less than 0.02 indicates that there is no definite effect.

Based on the above results (Table 5 and Table 6), it demonstrates that there is a strong link between risk management and the project life cycle, this is because respondents who work in the project sector involve a lot of uncertainty. Companies that work on projects

Table 5. Effect size analysis, before the Covid-19 Pandemic

Hypothesized Path	f square	Relationship
Risk Management → Project Innovation (H ₁)	0,116	moderate
Risk Management → Project Life-cycle (H ₂)	1,527	strong
Project Life-cycle → Project Innovation (H ₃)	0,267	moderate
Project Life-cycle → Company Performance (H ₄)	0,143	moderate
Risk Management → Company Performance (H ₅)	0,135	moderate
Project Innovation → Company Performance (H ₆)	0,152	moderate

Table 6. Effect size analysis, during the Covid-19 Pandemic

Hypothesized Path	f square	Relationship
Risk Management → Project Innovation (H ₁)	0,116	moderate
Risk Management → Project Life-cycle (H ₂)	1,528	strong
Project Life-cycle → Project Innovation (H ₃)	0,267	moderate
Project Life-cycle → Company Performance (H ₄)	0,154	moderate
Risk Management → Company Performance (H ₅)	0,140	moderate
Project Innovation → Company Performance (H ₆)	0,152	moderate

will typically divide each project into several phases to provide better management control and appropriate relationships with ongoing operations within the company. Finally, the project's successful implementation will boost the company's performance.

The GOF is calculated using the geometric mean of the communality average (AVE value) and the R² average value, to verify that the model adequately explains the empirical data. The GOF value is between 0 and 1, where the values are 0.10 (small), 0.25 (medium), and 0.36 (large) indicating global validation of the path model (Tables 7 and 8).

In relation to those values, the GOF index for this research model is 0.664, indicating that the empirical data fits the model and has significant predictive power when compared to the baseline value. SRMR is also an approximate measure of model fit, if the value is less than or equal to 0.08, then the research model has a good fit, the lower the more appropriate. The table above shows that the SRMR value in this study is 0.076 which indicates that this research model has a good fit. NFI or Normed Fit Index values range from zero to one. The closer to 1 the model is said to be fit. In the table above, the NFI shows a value of 0.627.

Table 7. Calculation of Goodness-of-Fit index

Constructs	AVE	R ²
Risk Management	0.602	
Company Performance	0.626	0,764
Project Life-cycle	0.714	0,604
Project Innovation	0.710	0,624
Average	0.663	0.662
AVE x R ²	0.438	
GOF = SQRT (AVE x R ²)	0.662	

Table 8. Model Fit Summary

	Before Covid-19 Pandemic	During Covid-19 Pandemic
SRMR	0,076	0,076
d_ULS	2,533	2,499
d_G	4,050	3,108
NFI	0,594	0,627

4 Conclusion

According to the findings of study on risk management analysis on the performance of state-owned enterprises in the infrastructure services sector during the Covid-19 pandemic it can be established that, (1) Risk management has a significant effect on project innovation; (2) Risk management has a significant effect on the project life-cycle; (3) Project life-cycle has a significant effect on innovation; (4) Risk management has a significant effect on company performance; (5) Project life-cycle has a significant effect on company performance; (6) Innovation has a significant effect on company performance; (7) The coefficient of determination (R²), it is known that risk management has an effect of 76.4% on company performance, 60.4% on project life-cycle, and 62.4% on project innovation; and (8) GOF index for this research model is 0.664, which indicates that the empirical data is in accordance with the model. This shows that the empirical data obtained have similarities with the theory that has been built.

However, this study still leaves a gap that can be studied further in the future. Through a different approach or method may provide more comprehensive and in-depth results regarding the variables studied, or other variables that have not been studied in this study.

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