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Risk Analysis Of Construction Planning Affecting Quality, Time, and OHS Control on Management Performance in Warehouse and Logistics Industry

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Abstract: The logistics industry in Indonesia is growing in line with the increase in online transactions. Warehouse facilities play a crucial role in the logistics industry as they are essential for ensuring smooth business operations. Warehouses used for logistics purposes generally employ steel construction. The development of steel-structured warehouses carries considerable risks that can affect project completion time, project quality, occupational health and safety (OHS), and management performance. Therefore, management must be able to identify and analyze all potential risks during warehouse construction to ensure the project is completed with planned quality, OHS control, and timing. This study aims to identify the relationships among risk factors during the planning and construction phases with quality control, time, and OHS, which can influence management performance. Additionally, it seeks to measure the impact of project control, particularly in terms of quality, time, and OHS, on management performance in warehouse and logistics industry development. The research employs a quantitative descriptive method. Data analysis was conducted using Structural Equation Modeling (SEM) with the Smart PLS application. The study found that risks have a direct positive impact on quality control, time, and OHS but an insignificant negative impact on management performance. Furthermore, the findings indicate that quality control, time, and OHS significantly and positively influence management performance.

Keyword: logistics industry, risk, quality control, time control, occupational health and safety (OHS) control, management performance.

INTRODUCTION

The construction sector plays a crucial role in developing countries, including Indonesia. Currently, Indonesia is undergoing a significant development process across various sectors, one of which is urban infrastructure development, such as constructing new buildings and maintaining existing ones. Along with this progress, various supporting elements become critical to ensuring the smooth execution of development projects. Construction projects are

expected to run successfully, characterized by meeting specified requirements, timely completion, cost efficiency, and ensuring occupational safety and health. However, failures often occur in construction project execution, marked by the inability to achieve one or more of these four indicators (Komarujjaman et al., 2023).

The construction industry is among the most high-risk and accident-prone work environments. Workers in this sector frequently face potential hazards that can result in severe injuries or fatalities. Every day, they encounter significant occupational safety and health threats (Ayenti & Kesehatan Masyarakat UIN Sumatera Utara, 2024). In Indonesia, workplace accident rates have been increasing annually. According to BPJS data, the number of workplace accidents rose from 114,235 cases in 2019 to 177,161 in 2020. This increase predominantly occurred in the construction and building sectors. The rapid growth of domestic and international industries has amplified the demand for labor and the use of industrial tools and materials. Consequently, special attention is required to reduce the rate of workplace accidents and occupational illnesses among industrial workers (Aulia, 2024).

Project execution control is essential for every project. In construction projects, three main aspects determine performance: quality, quantity, and efficiency. Generally, contractor performance is influenced by limitations in cost, time, and quality. These three factors, which are the benchmarks for the success of construction project management, are often illustrated in the "project management triangle," reflecting the interrelationship between cost, time, and quality (Maditsaraga & Pontan, 2021). Additionally, performance standards are necessary to implement control measures over resource utilization within a project (Cleland, 2007). Large-scale projects, particularly construction projects, pose significant challenges in planning and control. A project requires supervision to ensure smooth execution, achieve high-quality outcomes, and utilize costs and time efficiently and effectively (Sumantri & K Bintoro, 2020).

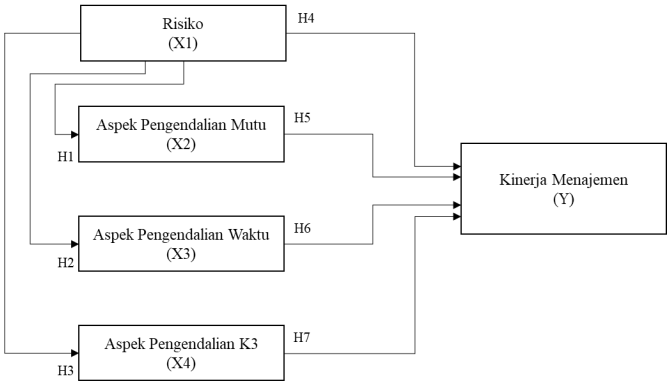
Previous research in Chile revealed that both project owners and contractors often fail to implement systematic risk management practices, leading to negative impacts on project performance (Serpella et al., 2014). Literature reviews highlight safety, quality, productivity, and cost as the main indicators determining project success. Hoonakker (2010) found that implementing quality management systems could improve safety levels. Pheng (2003) emphasized the similarities between safety management and quality management programs and proposed a framework for integrating the two systems. This integration was reported to utilize project resources more efficiently (Alkaissy et al., 2020).

Research conducted by Setiawan and Zulfiar (2019) found that warehouse construction projects using steel structures in Yogyakarta had a job risk level with a score of 5.997. This score indicates that the potential for workplace accidents in these projects falls into the medium-risk category. This phenomenon shows that warehouse construction projects using steel structures pose significant risks that can impact project timelines, occupational safety and health (OHS), quality, and management performance. Therefore, management must identify and analyze all potential risks in warehouse construction to ensure the project is completed with planned quality, OHS control, and time management.

METHOD

The research method contains the type of research, sample and population or research subjects, time and place of research, instruments, procedures, and research techniques, as well as other matters relating to the method of research. This section can be divided into several sub-chapters, but no numbering is necessary. The population for this study consists of construction implementers involved in industrial warehouse development, and the respondents selected as samples include project managers, site engineering managers, site operational managers, and safety officers. The research sample focuses on warehouse and logistics industry development projects in three cities (Madiun, Banjarmasin, and Semarang), with a total of 60 respondents in this study. The data collection method used is to distribute an electronic

questionnaire using Google Forms and a Likert scale as a measurement scale. The five-point Likert scale ranges from "strongly agree" to "strongly disagree." The analysis technique employed is SEM with SMART PLS. Two stages of testing or measuring the model are performed in the use of SEM analysis in the SMART PLS application: the outer model and the inner model (Ghozali & Latan, 2015).



Source: Research Results

Figure 1. Conceptual Framework

H_1 : Risk will positively and significantly affect quality control
H_2 : Risk will positively and significantly affect time control
H_3 : Risk will positively and significantly affect OHS (Occupational Safety and Health) control
H_4 : Risk will positively and significantly affect management performance
H_5 : Quality control will positively and significantly affect management performance
H_6 : Time control will positively and significantly affect management performance
H_7 : OHS (Occupational Safety and Health) control will positively and significantly affect management performance

RESULTS AND DISCUSSION

The research was conducted with participants in the construction field. The total sample size in this study was 60 respondents. The majority of respondents, based on gender, were male, with 55 respondents or 91.67%, indicating that men still dominate the construction sector. Most respondents are contractors who are frequently present at construction sites, and this field is still largely dominated by men.

Outer Model Test

In evaluating each construction, convergent validity is taken into consideration. Using outer loading and AVE (Average Variance Extracted) parameters, convergence validity is determined. Individual reflective sizes are said to correlate with the structure being measured when the value is greater than 0.70. For early-stage research, however, a measurement scale with a factor load value between 0.5 and 0.6 is considered adequate (Ghozali & Latan, 2015).

Table 1. Average Variance Extraxted (AVE) Test Result

Variable	Condition	AVE
Management Performance (Y)	> 0.5	0.577
Risk (X1)	> 0.5	0.730
Quality Control (X2)	> 0.5	0.693
Time Control (X3)	> 0.5	0.705
OHS Control (X4)	> 0.5	0.642

Source: Research data

After validity testing, reliability testing is carried out by looking at alpha cronbach values as well as composite reliability. The reliability test results show that the research model is reliable.

Table 2. Reliability Test Result

Variable	Condition	Cronbach Alpha	Composite Reliability
Management Performance (Y)	> 0.6	0.895	0.916
Risk (X1)	> 0.6	0.870	0.914
Quality Control (X2)	> 0.6	0.882	0.898
Time Control (X3)	> 0.6	0.961	0.966
OHS Control (X4)	> 0.6	0.812	0.877

Source: Research data

Inner Model Test

Internal model analysis is carried out with the aim of ensuring that the built structure model is robust and accurate. The testing of the structural model is carried out by looking at the R-Square value which is the Goodness-Fit model test.

Table 3. Goodness-Fit Test Result

Variable	R^2	Q^2	f^2
Management Performance	0.840	0.398	
Risk → Quality Control			0.648
Risk → Time Control			0.701
Risk → OHS Control			1.499
Risk → Management Performance			0.010
Quality Control → Management Performance			0.140
Time Control → Management Performance			0.358
OHS Control → Management Performance			0.805

Source: Research data

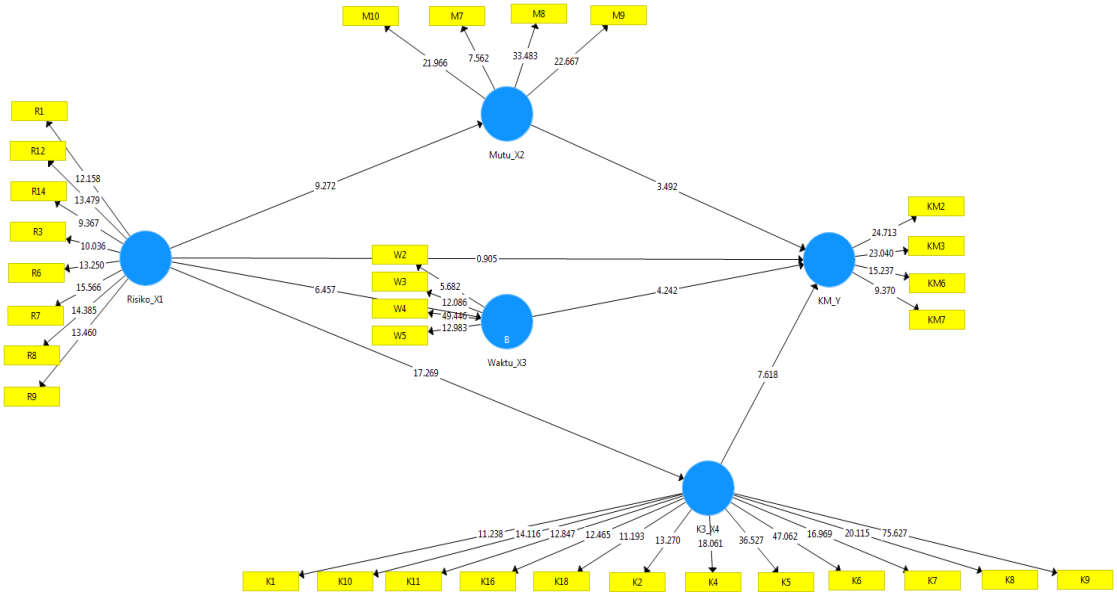
Inner model tests are performed to determine relationships between constructs. The first test, R^2, indicates how much of the variance of the dependent variable is explained by all independent variables. Whereas the of R^2 values ranges from 0 – 1. R^2 values 0.75, 0.5, and 0.25 classified as strong, medium, and weak models. Goodness of Fit Test Result show that R^2 value of management performance is 0,840 or 84.0%, indicating that risk, quality, time and ohs control can influence management performance, while 16.0% can be influenced by other variables not examined.

The f^2 (effect size) test was conducted to assess how the removal of the selected exogenous construct affects the R^2 of the endogenous construct. The result of f^2 test show the impact of risk on OHS control have the strongest relationship. Meanwhile risk on management performance have the weakness relationship. Therefoe, this research model is already good to have a medium to strong size effect.

The construct cross-validation redundancy test result shows the test result of the value of Q^2 = 0.398 on the management performance variable. The computed results show predictions with associated values > 0, so the model is viable and has associated predictors.

Hypothesis Testing Result

The tests conducted include: The next test is to assess the significance of the influence between variables by examining the parameter coefficient values and the significance of the t-statistic, using the bootstrapping method (Ghozali & Latan, 2015). The significance testing is based on the bootstrapping standard error as the basis for calculating the t and p values for the path coefficients.



Source: Research Results

Figure 2. Hypothesis Testing Results

Table 4. Hypothesis Testing Result

	Hypothesis	*Original Sample*	*Standard Deviation*	*T-Statistics*	P *Values*	Result
H1	*Risk → Quality Control*	0.627	0.068	9.182	0.000	**Significant Positive**
H2	*Risk → Time Control*	0.642	0,097	6.592	0.000	**Significant Positive**
H3	*Risk → OHS Control*	0.775	0.047	16.607	0.000	**Significant Positive**
H4	*Risk → Management Performance*	-0.070	0.082	0.850	0.396	**Negative and not significant**
H5	*Quality Control → Management Performance*	0.197	0.055	3,596	0.000	**Significant Positive**
H6	*Time Control → Management Performance*	0.332	0.077	4.287	0.000	**Significant Positive**
H7	*OHS Control → Management Performance*	0.592	0.080	7.426	0.000	**Significant Positive**

Source: Research data

Effect of Risk on Quality Control

The t-statistic for the relationship between risk and quality control is 9.182 (> 1.96), which is statistically significant. The original sample estimate value is positive, 0.627, indicating that the relationship between risk and quality control is in a positive direction. This study's H1 hypothesis that risk has a positive and statistically significant effect on quality control can therefore be accepted. The results of testing the hypothesis indicate that risk has a positive and statistically significant effect on quality control. This indicates that the higher the level of risk that may occur, the higher the level of quality control required. Risks during the planning and construction phases can lead to difficulties in controlling the quality of work. Changes in design, work standards, and material specifications can cause challenges in

obtaining the right materials that meet the specifications. Good planning and construction execution will reduce risks in a construction project. If issues arise during planning and discrepancies occur in execution related to construction, it will certainly be difficult to maintain project quality. This research aligns with the study conducted by Sumantri et al. (2020), which shows that construction planning risks have a positive and significant impact on quality control. Nurlela and Suprapto (2014) explain that the most dominant risk faced in construction is the procurement process and rescheduling.

Effect of Risk on Time Control

The t-statistic for the relationship between risk and time control is 6.592 (> 1.96), which is statistically significant. The original sample estimate value is positive, 0.642, indicating that the relationship between risk and time control is in a positive direction. This study's H2 hypothesis that risk has a positive and statistically significant effect on time control can therefore be accepted. The results of testing the hypothesis indicate that risk has a positive and statistically significant effect on time control. Efforts to minimize risks in construction projects can yield benefits in terms of time accuracy. The higher the level of construction planning risk faced by a project, the greater the likelihood of project delays. This study is consistent with research by Iribaram and Huda (2018), which indicates that risk has a positive and significant effect on time control. Riyanto (2014) explains that job control and risk have a significant impact on project timelines.

Effect of Risk on OHS Control

The t-statistic for the relationship between risk and OHS control is 16.607 (> 1.96), which is statistically significant. The original sample estimate value is positive, 0.775, indicating that the relationship between risk and OHS control is in a positive direction. This study's H3 hypothesis that risk has a positive and statistically significant effect on OHS control can therefore be accepted. Risks occurring in a project are closely related to OHS control at the construction site. Training and OHS equipment at the site are expected to reduce project execution risks. This research aligns with a study by Andriani et al. (2022), which shows that construction risks have an impact on OHS control. The higher the risk level in a construction project, the greater the need for effective OHS control. Management of personal protective equipment and engineering controls are key aspects of this study. Suroso and Yanuar (2020) state that workplace accidents and other risks at construction sites cause significant issues when workers neglect the use of personal protective equipment (PPE).

Effect of Risk on Management Performance

The t-statistic for the relationship between risk and management performance is 0.850 (< 1.96), which is statistically insignificant. The original sample estimate value is negative, -0.070, indicating that the relationship between risk and management performance is in a negative direction. This study's H4 hypothesis that risk has a negative and statistically insignificant effect on management performance can therefore be not accepted or rejected. Risks occurring in a construction project do not significantly affect management performance. This is because, in field implementation, planning and construction risks do not directly influence management performance. This result is in line with the study conducted by Alomari et al. (2018), which indicates no significant differences in worker-related risks. The lack of risk perception differences among workers leads to an insignificant impact of risk factors on management performance. This is supported by the research of Defi and Alrizal (2022), which states that risk factors negatively affect the implementation of projects in rural areas for sustainable construction. Prabawani (2012) conducted a study on the impact of project risks on project performance, finding that operational risks negatively affect project performance.

Effect of Quality Control on Management Performance

The t-statistic for the relationship between quality control and management performance is 3.596 (> 1.96), which is statistically significant. The original sample estimate value is positive, 0.197, indicating that the relationship between quality control and management performance is in a positive direction. This study's H5 hypothesis that quality control has a positive and statistically significant effect on management performance can therefore be accepted. This finding proves that proper quality control helps maintain management performance. The quality of resources and materials acts as a quality control tool in a project. This research is in line with the study by Sumantri et al. (2020), which shows that quality control has a significant impact on management performance. Quality management helps ensure the project is completed on time and without cost overruns. Juliana (2014) mentions that a fast and accurate monitoring system can assist in project control.

Effect of Time Control on Management Performance

The t-statistic for the relationship between time control and management performance is 4.287 (> 1.96), which is statistically significant. The original sample estimate value is positive, 0.332, indicating that the relationship between time control and management performance is in a positive direction. This study's H6 hypothesis that time control has a positive and statistically significant effect on management performance can therefore be accepted. This indicates that management's ability to control the project timeline plays a crucial role in enhancing management performance. Project delays occur because contractors fail to control the project timeline. The research by Iribaram and Huda (2018) shows that time control has a significant effect on management performance. Sumantri et al. (2020) demonstrate that project time control significantly influences management performance.

Effect of OHS Control on Management Performance

The t-statistic for the relationship between OHS control and management performance is 7.426 (> 1.96), which is statistically significant. The original sample estimate value is positive, 0.592, indicating that the relationship between OHS control and management performance is in a positive direction. This study's H7 hypothesis that OHS control has a positive and statistically significant effect on management performance can therefore be accepted. Proper implementation of OHS guidelines and the availability of OHS equipment greatly assist management in improving its performance. A reduction in workplace accidents ensures that construction activities proceed on schedule, thereby enhancing management performance. The research conducted by Arafat et al. (2018) shows that good OHS planning and management can improve management performance. Djaelani dan Retnowati (2023) mention that the implementation of health and safety programs helps improve work productivity.

CONCLUSION

In conclusion, this study is assessing several factors that influence management performance in Warehouse And Logistics Industry Development. The results show that risk positively influence quality, time and OHS control but has negatively affect and insignificant to management performance. In this study, it was also found that the factors most significantly influencing management performance are quality, time, and occupational safety and health (OHS) control.

Project practitioners must raise awareness about the importance of more proactive risk management. Although increased risk is associated with enhanced quality, time, and OHS control, better risk management from the planning phase can help prevent larger issues on-site. Therefore, it is recommended to utilize more advanced risk management tools and techniques to predict and mitigate risks that may affect quality, time, and OHS in a project. Given that

time and quality control positively impact management performance, practitioners need to develop more efficient systems for monitoring and managing project schedules. The use of more effective project management software and new technologies for time risk analysis, can enhance time management capabilities, thus avoiding delays and reducing the negative impact on managerial performance. There is also a need to improve Occupational Safety and Health (OHS) standards. It is crucial for practitioners to continue improving OHS training programs and introduce innovations in safety monitoring on-site. Attention should also be given to managing risks that do not have a direct impact on managerial performance. Although the research shows that increased risk does not always affect managerial performance, this still requires attention. Practitioners should evaluate whether other factors can explain the insignificance of the effect of risk on management.

Finally, the application of effective managerial practices is crucial for improving managerial performance. Given the positive relationship between quality, time, and OHS control with managerial performance, practitioners should develop systems that integrate these three aspects holistically. To that end, training programs for project managers in quality control, time management, and OHS management should be provided to improve their skills in managing these aspects simultaneously.

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