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The Role of Risk Management as an Intervening Variable in the Influence of Project Manager Competence and Internal-External Factors on Project Success in Gresik, Indonesia

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ABSTRACT

This study aims to analyze the influence of Project Manager Competence, Internal Project Factors, and External Project Factors on Project Success, both directly and indirectly, through Risk Management as a mediating variable. This study employs a quantitative approach using a survey method. Data were collected through questionnaires distributed to respondents involved in project management. Data analysis was conducted using Structural Equation Modeling (SEM) based on Partial Least Squares (PLS) to examine the relationships between variables and test the research hypotheses. The results show that Project Manager Competence and Internal Project Factors do not have a significant direct effect on Project Success. However, Project Manager Competence has a positive and significant effect on Risk Management and has an indirect effect on Project Success through Risk Management. Internal Project Factors have no significant effect, either directly or indirectly. Meanwhile, External Project Factors have a positive and significant effect on both Project Success and Risk Management. Furthermore, Risk Management is proven to have a positive and significant effect on Project Success. This study concludes that Risk Management plays a strategic role in enhancing Project Success, both as an independent variable and as a mediating variable in project management

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1. Introduction

JMM17: Jurnal Ilmu Ekonomi dan Manajemen. The construction sector is one of the strategic sectors that plays an important role in driving economic growth and infrastructure development in a region [1]. In Indonesia, the development of construction projects continues to increase along with the need for the development of industrial estates, transportation, and settlements [2]. Gresik Regency, as part of the Gerbangkertasusila metropolitan area, is one of the regions experiencing fairly rapid construction growth [3]. Various construction projects, such as the development of industrial estates, ports, transportation infrastructure, and housing development, continue to grow to support economic activities and improve regional connectivity [4]. Although the construction of projects continues to increase, project implementation often faces various problems that can affect project success. Common problems include delays in project completion (time overrun), cost overruns, and work quality that

does not meet the specified specifications [5], [6]. The success of construction projects is generally measured based on the achievement of three main indicators: cost, time, and quality [7]. These three indicators serve as important parameters in assessing the effectiveness of construction project management [8]. Failure to control any of these indicators can result in a decline in overall project performance [9].

Various studies show that the success of construction projects is influenced by many factors, both managerial factors and project environmental factors [10]. One important factor determining project success is the competence of the Project Manager [11]. A Project Manager is required to possess technical, managerial, leadership, communication, and decision-making skills [7]. Adequate competence will assist the Project Manager in managing project resources, coordinating the work team, and controlling project execution to align with the established plan [8]. Several previous studies indicate that project manager competence has a significant influence on the performance and success of construction projects [12]. In addition to project manager competence, internal and external project factors also influence project success [13]. Internal project factors include the availability of resources, project management systems, team coordination, and organizational support [13]. Meanwhile, external project factors can include economic conditions, government regulations, environmental conditions, and market dynamics that can affect the implementation of construction projects [10]. Uncertainty arising from these internal and external factors can create various risks that potentially hinder project success [14].

In conditions of high uncertainty, the application of risk management becomes one of the important approaches in construction project management [15]. Risk management aims to identify, analyze, and control various potential risks that may affect the achievement of project objectives [14]. Through the effective implementation of risk management, organizations are expected to minimize the impact of uncertainty and increase the chances of project success [7]. Therefore, risk management not only serves as a control tool but also as a strategy to improve overall project performance [15]. Although various studies have discussed the factors influencing construction project success, there are still limitations in research that simultaneously examines the relationships between Project Manager competence, internal project factors, external project factors, and the role of risk management as a mediating variable in influencing project success [12], [15]. Furthermore, research on the relationships among these variables in construction projects within the Gresik Regency area is still relatively limited, even though this region is experiencing fairly rapid development growth.

Based on this condition, this study aims to analyze the influence of Project Manager competence, internal project factors, and external project factors on construction project success, both directly and indirectly, through risk management as a mediating variable. The results of this study are expected to contribute to the development of construction project management studies and serve as a reference for practitioners in improving the effectiveness of construction project management, particularly in the Gresik Regency area.

2. State of the Art

Various previous studies have examined the factors influencing the success of construction projects, particularly those related to project manager competence and project management. Research conducted by I Gde Eka Dharsika et al. shows that project manager experience plays an important role in determining the success of construction projects [16]. Project managers who have completed several previous projects tend to have better decision-making abilities and are able to anticipate various problems that arise during project implementation. In line with this research, a study by Rendi Vianda et al. found that factors such as knowledge, skills, attitude, competence, and behavior of project managers have a significant influence on the success of construction projects [17]. This indicates that the quality of human resources, particularly in managerial positions, is one of the important determinants in improving project performance and success.

Research conducted by Irnin Miladdyan Airyq, Aida Vitayala Sjafri Hubies, and Anggraini Sukmawati shows that competence has a positive and significant effect on organizational performance,

with professional competence as the dominant indicator [18]. The study also confirms that organizational culture has a positive and strong relationship with employee performance improvement, with innovation being the most influential indicator. Meanwhile, research related to project success measured through cost, quality, and time aspects has also been widely conducted. Research by Fahirah, Rianto B. Adihardjo, and Tri Joko Wahyu Adi shows that several factors causing project failure include high rework due to low quality, inaccurate cost estimates, high frequency of work changes, incomplete contract documents, and inappropriate subcontractor selection [19]. These factors can trigger cost overruns, time overruns, and work quality failures.

Another study conducted by Richard Apolot et al. on public sector construction projects in Uganda also showed that the main factors affecting project delays and cost overruns are changes in work scope, delays in payments to contractors, weak project monitoring and control systems, and economic conditions such as inflation and high interest rates [20]. Based on these various studies, it can be concluded that the success of construction projects is influenced by various interrelated factors, whether originating from project manager competence or from internal and external project conditions. Nevertheless, research that simultaneously examines the relationship between Project Manager competence, internal project factors, external project factors, and the role of risk management as a mediating variable in influencing construction project success is still relatively limited, particularly for construction projects in the Gresik Regency area. Therefore, this study was conducted to fill this research gap by analyzing the influence of Project Manager competence, internal project factors, and external project factors on project success through risk management as a mediating variable.

Hypothesis testing is an important step in quantitative research to determine the relationships and influences among the variables under study. Hypothesis testing aims to determine whether a variable has a significant effect on other variables, either directly or indirectly, through a mediating variable. Through hypothesis testing, researchers can draw empirical conclusions based on data obtained from research respondents. In this study, hypothesis testing was conducted to analyze the influence of Project Manager competence, internal project factors, and external project factors on construction project success by considering the role of risk management as a mediating variable. Hypothesis testing is an effort to obtain scientific conclusions regarding the relationships among the variables studied based on empirical data analyzed statistically [1]. Based on the conceptual framework of the research that has been developed, the hypotheses proposed in this study include direct relationships between variables as well as indirect relationships through mediating variables. These hypotheses were formulated to test the influence of Project Manager competence, internal project factors, and external project factors on construction project success and the role of risk management in mediating these relationships.

3. Method

This study uses a quantitative approach with a survey method to analyze the relationships between Project Manager competence, internal project factors, external project factors, project risk management, and construction project success. The quantitative approach is employed because it enables empirical hypothesis testing through statistical analysis based on data obtained from research respondents [1]. Primary data were collected through the distribution of closed-ended questionnaires to respondents who are Project Managers in the construction sector. The survey method was chosen because it allows researchers to systematically obtain information regarding respondents' perceptions of the factors influencing construction project success.

Research Variables

The variables in this study consist of exogenous variables, endogenous variables, and an intervening variable.

1) Project Manager Competence (X1):
    a. Project management knowledge

b. Project planning and control skills
c. Communication and team leadership skills
d. Project experience
e. Decision-making ability in project management [2], [3].

2) Internal Project Factors (X2):
   a. Availability of labor
   b. Management support
   c. Organizational communication
   d. Project work structure
   e. Company operational systems
3) External Project Factors (X3):
   a. Government regulations
   b. Economic conditions
   c. Vendor or subcontractor performance
   d. External stakeholder support
   e. Social and environmental conditions that may affect the implementation of construction projects
4) Project Success (Y):
   a. Timeliness
   b. Cost accuracy
   c. Quality compliance
   d. Stakeholder satisfaction
   e. Achievement of project scope
5) Project Risk Management (Z):
   The process of identifying, analyzing, evaluating, and controlling project risks

The research population consisted of Project Managers handling construction projects in the Gresik Regency area, with a total population of 80 individuals. The sampling technique used was purposive sampling, with the respondent criteria being Project Managers working in the construction sector in the Gresik area who have at least one year of experience in managing construction projects. The research data consisted of primary data obtained through questionnaires and secondary data obtained from various literature sources such as books, scientific journals, previous research, and documents relevant to the research topic [1]. Variable measurement used a five-point Likert scale reflecting the level of respondent agreement with each statement in the questionnaire.

The data analysis technique used was Structural Equation Modeling (SEM) based on Partial Least Squares (PLS) with the assistance of SmartPLS software. The PLS method was chosen because it can analyze relationships between latent variables simultaneously and can be used in complex research models with relatively small sample sizes [6]. The analysis was conducted through two main stages: the evaluation of the measurement model (outer model) to test the validity and reliability of the constructs using indicators such as loading factors, Average Variance Extracted (AVE), and composite reliability, as well as the evaluation of the structural model (inner model) to test the relationships between variables through the coefficient of determination (R^2), path coefficients, and significance testing using bootstrapping procedures. Through this approach, the study aims to empirically explain the influence of Project Manager competence, internal project factors, and external project factors on construction project success by considering the role of risk management as a mediating variable.

4. Results and Discussion

This research was conducted on construction projects in Gresik Regency, East Java Province, covering various types of projects such as infrastructure development, building construction, industrial facilities, as well as mechanical, electrical, and plumbing (MEP) works. Gresik Regency was selected as

the research location because it is one of the developing industrial areas in Indonesia with a high intensity of infrastructure and industrial facility development. These conditions make this region a relevant environment for analyzing the dynamics of construction project management, particularly related to Project Manager competence, internal and external project factors, and the application of risk management in supporting project success. The research subjects consisted of 80 respondents who are Project Managers directly involved in the management of construction projects in the area, so that the information obtained is considered representative in describing the real conditions of project management practices in the field.

The characteristics of the respondents show that the majority are in the productive age group, with the age range of 30–39 years accounting for 59%, reflecting a sufficient level of experience and professional maturity in construction project management. In terms of gender, respondents were predominantly male at 70%, while females accounted for 30%, reflecting the general characteristics of the construction industry which is still dominated by male workers, although the role of women in project management is increasingly developing. In terms of work experience, the majority of respondents had experience between 5–10 years (36.25%) and 10–15 years (28.75%), so it can be said that the respondents have adequate professional experience in understanding the dynamics of project implementation. Furthermore, the education level of respondents was dominated by undergraduate degree (S1) holders at 60%, indicating that most respondents have sufficient academic capacity to understand project management concepts and the research instruments used.

Validation and Reliability Testing

Table 1. Reliability Test Results

Variabel	Cronbach's Alpa
X1	0,911
X2	0,833
X3	0,848
Y	0,866
Z	0,889

The evaluation results of the measurement model (outer model) indicate that the indicators used in this study have met the criteria for construct validity and reliability. The outer loading values of the retained indicators are above 0.70, thus satisfying the requirements for convergent validity. Furthermore, the Average Variance Extracted (AVE) values for all constructs are above 0.50, indicating that the latent variables are able to adequately explain the variance of the indicators. Construct reliability testing also shows that the Composite Reliability values are above 0.70 and the Cronbach's Alpha values fall within the reliable to very reliable categories. These results indicate that the research instrument has good internal consistency, so the measurement model can be declared valid and reliable for use in structural model analysis.

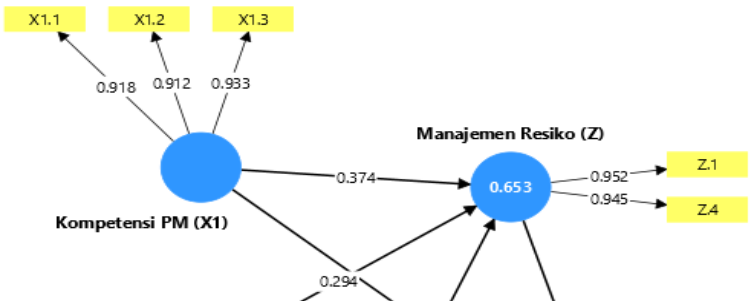

Figure 1. Conceptual Research Model

Coefficient of Determination (R Square) Test

Table 2. Coefficient of Determination (R Square) Test Results

Variabel	R Square	R Square Adjusted
Project Success Level (Y)	0,783	0,771
Risk Management (Z)	0,653	0,639

The evaluation of the structural model (inner model) shows that the Project Success variable (Y) has an R^2 value of 0.783 and an Adjusted R^2 value of 0.771. These values indicate that approximately 77.1%–78.3% of the variance in project success can be explained by the constructs of Project Manager Competence (X1), Internal Project Factors (X2), External Project Factors (X3), and Risk Management (Z). Based on the evaluation criteria for models in PLS-SEM, an R^2 value above 0.75 indicates a strong level of explanatory power, thus the model has good predictive capability in explaining construction project success. The coefficient of determination (R^2) is used to evaluate the ability of the structural model to explain the variance of the endogenous construct. The R^2 value indicates the proportion of variance in the dependent variable that can be explained by the exogenous constructs in the research model.

Furthermore, the Risk Management variable (Z) has an R^2 value of 0.653 and an Adjusted R^2 value of 0.639. This indicates that approximately 63.9%–65.3% of the variance in risk management can be explained by the variables of Project Manager Competence (X1), Internal Project Factors (X2), and External Project Factors (X3). Based on the guidelines for evaluating structural models in PLS-SEM, this value falls into the moderate to substantial category, indicating that the exogenous constructs in the model have a fairly strong contribution in explaining the variance in risk management. The relatively high R^2 and Adjusted R^2 values for both endogenous constructs also indicate that the proposed structural model has adequate explanatory power. This suggests that the relationships between Project Manager competence, internal project factors, external project factors, and risk management provide a significant contribution in explaining construction project success.

Path Coefficient Testing

Table 3. Path Coefficient Test Results

Variabel	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
$X_1 \rightarrow Y$	- 0,112	- 0,103	0,068	1,644	0,103
$X_1 \rightarrow Z$	0,374	0,310	0,140	2,678	0,009
$X_2 \rightarrow Y$	0,020	0,025	0,160	0,125	0,901
$X_2 \rightarrow Z$	0,294	0,357	0,183	1,610	0,110
$X_3 \rightarrow Y$	0,175	0,180	0,087	2,023	0,046
$X_3 \rightarrow Z$	0,269	0,271	0,123	2,196	0,030
$Z \rightarrow Y$	0,825	0,804	0,098	8,405	0,000

The results of the path coefficient analysis show that Project Manager competence (X1) does not have a significant direct effect on project success (Y), with a path coefficient of −0.112, a t-statistic of 1.644, and a p-value of 0.103 (>0.05). This indicates that an increase in Project Manager competence does not directly improve project success in the research model. However, Project Manager competence has a positive and significant effect on risk management (Z), with a coefficient of 0.374, a t-statistic of 2.678, and a p-value of 0.009 (<0.05). Furthermore, the indirect effect shows that Project Manager competence has a significant effect on project success through the mediation of risk management ($\beta = 0.309$; $t = 2.840$; $p = 0.005$). This finding indicates that risk management acts as a mediator that strengthens the relationship between Project Manager competence and project success.

Next, internal project factors (X2) show no significant effect on either project success (Y) or risk management (Z). The test results show a path coefficient of 0.020 on project success ($t = 0.125$; $p = 0.901$) and 0.294 on risk management ($t = 1.610$; $p = 0.110$). Testing of the indirect effect through risk management also shows no significant effect ($\beta = 0.243$; $t = 1.580$; $p = 0.117$). This indicates that internal project factors have not yet made a significant contribution to improving project success in the research model. In contrast, external project factors (X3) show a positive and significant effect on project success (Y), with a path coefficient of 0.175 ($t = 2.023$; $p = 0.046$). External project factors also have a positive and significant effect on risk management (Z), with a coefficient of 0.269 ($t = 2.196$; $p = 0.030$). The indirect effect through risk management is also proven to be significant ($\beta = 0.222$; $t = 2.256$; $p = 0.026$). These findings indicate that external project conditions, such as the business environment, regulations, and stakeholder support, play an important role in improving project success both directly and through the enhancement of risk management practices.

Regarding the test results, risk management (Z) has a positive and significant effect on project success (Y), with a path coefficient of 0.825, a t-statistic of 8.405, and a p-value <0.001. This high coefficient value indicates that risk management is a dominant factor in determining project success. Thus, the implementation of effective risk management can improve project success through uncertainty control, risk mitigation, and enhancing the project's ability to achieve time, cost, and quality targets.

Overall, based on the hypothesis testing results using the PLS-SEM approach, it is found that risk management plays a dominant role in improving project success. The analysis results show that several independent variables do not have a significant direct effect on project success but exert influence through the mediating mechanism of risk management. Project success is not directly determined by Project Manager competence or internal project conditions but is more influenced by the organization's ability to implement risk management systematically and effectively. Therefore, strengthening risk management practices becomes a key factor in improving project performance and success. This indicates that risk management acts as a key variable mediating the relationship between managerial and environmental project factors on construction project success. The effective implementation of risk management enables project organizations to identify uncertainties from the planning stage, conduct systematic risk mitigation, and enhance the project's ability to achieve time, cost, quality, and stakeholder satisfaction targets. Consequently, strengthening risk management practices within project organizations becomes a strategic factor that can increase the probability of construction project success, especially in complex and dynamic project environments such as the industrial area in Gresik Regency.

5. Conclusions

This study aims to analyze the influence of Project Manager competence, internal project factors, and external project factors on construction project success, with risk management as a mediating variable. The results show that Project Manager competence does not have a significant direct effect on project success but has a positive and significant effect on risk management. This finding indicates that Project Manager competence will contribute to project success when implemented through effective risk management practices. Furthermore, risk management is proven to have a positive and significant effect on project success. This shows that the systematic implementation of risk identification, analysis, mitigation, and control processes can improve the achievement of project targets in terms of time, cost, quality, and stakeholder satisfaction.

The results of this study also indicate that internal project factors have no significant effect on either project success or risk management. This suggests that management support, organizational structure, and work culture have not been optimally integrated with risk management practices in projects. In contrast, external project factors are proven to have a positive and significant effect on both risk management and project success. External factors such as material availability, stakeholder involvement, environmental conditions, and project industry dynamics play an important role in determining project success when managed proactively through appropriate risk management mechanisms. Furthermore, the mediation analysis results show that risk management acts as an important mediator in the relationship between Project Manager competence and external project factors on project success. These findings confirm that the implementation of effective risk management can optimize the capabilities of Project Managers and manage the influence of external factors, thereby improving construction project success. Thus, the integration of human resource competence and the management of external factors through a systematic risk management system becomes the key to improving construction project performance and success.

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