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The Impact and Barriers of ISO 9001:2015 Implementation on Construction Project Quality in Surabaya

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Abstrak. ISO 9001:2015 merupakan standar sistem manajemen mutu yang bertujuan meningkatkan efisiensi, menjaga kualitas, dan memenuhi kepuasan pelanggan dalam proyek konstruksi. Namun, dalam penerapannya terdapat faktor pengaruh dominan serta hambatan utama yang berpengaruh langsung terhadap mutu proyek. Penelitian ini bertujuan mengidentifikasi faktor pengaruh dominan dan hambatan utama yang memengaruhi implementasi ISO 9001:2015 pada mutu proyek konstruksi di Surabaya. Teknik pengumpulan data pada penelitian ini yaitu melalui penyebaran kuesioner kepada responden yang terdiri dari Direktur Perusahaan, General Manager, Project Manager, Site Manager, Site Engineer, Pelaksana, dan Estimator pada perusahaan konstruksi di Surabaya dengan jumlah 75 responden. Metode penelitian menggunakan pendekatan kuantitatif dengan analisis Partial Least Square (PLS). Hasil analisis data menunjukkan bahwa faktor pengaruh terhadap implementasi ISO 9001:2015 sebesar 8,7%, yang berarti sebagian besar variasi dipengaruhi oleh faktor lain di luar model. Faktor pengaruh dominan yang memengaruhi implementasi ISO 9001:2015 adalah kontrol pimpinan puncak dan pemenuhan sumber daya berkualitas (X2.2) dengan bobot sebesar 0,913, khususnya melalui komitmen manajemen dalam pengawasan, penempatan tenaga kerja sesuai keahlian, pelatihan berkelanjutan, serta pemberdayaan karyawan. Hambatan utama dalam implementasi adalah hasil akhir proyek yang tidak memenuhi target waktu dan biaya (Z6.3) dengan bobot sebesar 0,965, yang mencerminkan lemahnya mekanisme pengendalian jadwal dan anggaran serta kurang optimalnya tindak lanjut evaluasi proyek.

Kata Kunci. ISO 9001:2015, Manajemen Mutu, Faktor Pengaruh, Faktor Penghambat, Partial Least Square (PLS)

Abstract. ISO 9001:2015 is a quality management system standard that aims to improve efficiency, maintain quality, and satisfy customer needs in construction projects. However, in its implementation, there are dominant influencing factors and major obstacles that directly affect project quality. This study aims to identify the dominant factors influencing the implementation of ISO 9001:2015, as well as the main obstacles affecting the quality of construction projects in Surabaya. The data collection technique in this study was through the distribution of questionnaires to respondents consisting of Company Directors, General

Managers, Project Managers, Site Managers, Site Engineers, Implementers, and Estimators at construction companies in Surabaya with a total of 75 respondents. The research method used a quantitative approach with Partial Least Square (PLS) analysis. The results of the data analysis show that the influencing factor on the implementation of ISO 9001:2015 is 8.7%, which means that most of the variation is influenced by other factors outside the model. The dominant influencing factors that affect the implementation of ISO 9001:2015 are top management control and the fulfillment of quality resources (X2.2) with a weight of 0.913, particularly through management commitment in supervision, placement of workers according to their expertise, continuous training, and employee empowerment. The main obstacle in implementation is project outcomes that do not meet time and cost targets (Z6.3) with a weight of 0.965, reflecting weak schedule and budget control mechanisms and suboptimal project evaluation follow-up.

Keywords. ISO 9001:2015, Quality Management, Influencing Factors, Inhibiting Factors, Partial Least Squares (PLS)

1. Introduction

The construction sector plays a vital role in national development and serves as a key indicator of a nation's progress [1]. The success of construction projects depends heavily on four main aspects, namely cost, quality, time, and occupational safety and health and the environment [2]. In practice, however, construction projects frequently encounter challenges such as delays, cost overruns, and quality degradation due to limited human resources and the placement of workers who are not suited to the job [3]. To overcome these problems, a structured quality management system is required to ensure that projects comply with standards and achieve the intended objectives [4]. The project quality management system covers various processes related to the establishment of quality policies, quality objectives, and responsibilities for their implementation at each stage of the project. Along with the development of the construction industry and increasing quality demands, the implementation of a quality management system has become a strategic step for companies to improve overall organizational performance and support sustainable development [5].

One of the most widely adopted international standards is ISO 9001:2015, which provides a systematic framework for quality management, efficiency improvement, and customer satisfaction through a risk-based and process-based approach. ISO 9001:2015 is an international standard that specifies the requirements for a quality management system, issued by the International Organization for Standardization (ISO) [6]. ISO 9001:2015 has been globally recognized and widely used in various countries to improve organizational performance and project quality [7] [8]. In the context of the construction industry, the implementation of ISO 9001:2015 has been proven to contribute to increased efficiency and project sustainability [9] [10]. However, various studies show that the implementation of quality management systems in construction companies still faces significant obstacles, such as a lack of commitment from top management, resistance to change, and limited resources [11]. Similar conditions are also found in Indonesia, where the implementation of ISO 9001:2015 is influenced by internal factors such as organizational culture, leadership, and workforce capabilities [12].

In Surabaya, where infrastructure development is becoming increasingly complex, the implementation of ISO 9001:2015 has become essential to ensure project quality. However, its successful implementation is greatly influenced by various internal organizational factors and technical obstacles in the field [5]. Therefore, research is needed to analyze the factors influencing and hindering the implementation of ISO 9001:2015 on the quality of construction projects in greater depth. Based on a literature review, most previous studies were descriptive in nature, only assessing the level of implementation of ISO 9001:2015 without analyzing the relationship between factors statistically [2]. In fact, quantitative approaches such as Partial Least Squares (PLS) are capable of identifying the relationship between latent variables and determining the dominant factors that influence the implementation of quality systems [13] [14]. Therefore, this study is innovative in quantitatively identifying the dominant factors and main obstacles that influence the implementation of ISO 9001:2015 on the quality of construction projects in Surabaya. The results of this study are expected to serve as a basis for decision-making for construction companies in improving project quality through the implementation of a more effective and sustainable quality management system.

2. Method

This study uses primary data obtained through a questionnaire survey method. The distribution was carried out directly to respondents consisting of construction service providers, including consultants and contractors operating in the Surabaya City area. Respondents who were allowed to fill out the questionnaire were limited to Company Directors, General Managers, Project Managers, Site Managers, Site Engineers, Implementers, and Estimators. The research instrument used a Likert scale with categories of 1 = strongly disagree, 2 = disagree, 3 = neutral/fair, 4 = agree, and 5 = strongly agree.

The Partial Least Squares (PLS) method was chosen because it is capable of analyzing the relationship between latent variables in complex models with a relatively small sample size, namely 75 respondents. This analysis was used to quantitatively identify the effects and obstacles of ISO 9001:2015 implementation on construction project quality. The data processing was carried out through several main stages, namely: (1) preparation and validation of research instruments, (2) data collection, (3) Outer Model evaluation, (4) Inner Model evaluation, and (5) hypothesis testing.

In the Outer Model stage, testing was conducted to assess the validity and reliability of indicators with convergent validity criteria > 0.7, appropriate discriminant validity, Average Variance Extracted (AVE) value > 0.5, composite reliability > 0.7, and Cronbach's alpha > 0.7. Indicators that did not meet the requirements were excluded from the model. Meanwhile, the Inner Model is used to analyze the relationship between latent variables through the evaluation of R-Square (R^2) and Q-Square (Q^2) values. An R^2 value > 0.05 indicates a sufficient relationship between latent variables, while a Q^2 value close to 1 indicates a better model quality. Next, hypothesis testing is carried out by looking at the t-statistic and p-value values. The hypothesis is accepted if the t-statistic value is > 1.96 and the p-value is < 0.05, which indicates a significant relationship between variables. Conversely, if it does not meet these criteria, the hypothesis is rejected.

3. Results

This study used a survey method by distributing questionnaires to respondents consisting of Company Directors, General Managers, Project Managers, Site Managers, Site Engineers, Implementers, and Estimators. The sampling technique used was non-probability sampling with the purposive sampling method, so that only respondents who met certain criteria were sampled, specifically individuals or parties who implemented ISO 9001:2015 in their construction activities. This was intended to make the research results more relevant and representative of the study objectives.

From the distributed questionnaires, a total of 75 questionnaires were used for the analysis process. Respondent profiles were divided into three categories based on profession, namely consultants, contractors, and a combination of consultants and contractors. Details of the percentage recapitulation of ISO 9001:2015 implementation are presented in Table 1.

Table 1. Summary of the Percentage of ISO 9001:2015 Implementation

No.	Implementation of ISO 9001:2015	Number of Respondents	Percentage
1	Yes	75	94%
2	No	5	6%
	Total Respondents	80	100%

Respondents in this study were grouped based on job type into seven categories, as shown in Table 2. The distribution of respondents shows that the largest category comes from site engineering (27%), followed by implementers (24%), project managers (17%), and site managers (17%). Meanwhile, a relatively small proportion came from company directors (7%), estimators (7%), and general managers (1%). This composition reflects the dominance of operational perspectives directly involved in the field, making it relevant to support the analysis of the level of implementation in construction project execution.

Table 2. Respondent Profile Based on Position

No.	Position	Number of Respondents	Percentage
1	Company Director	5	7%
2	General Manager	1	1%
3	Project Manager	13	17%
4	Site Manager	13	17%
5	Site Engineer	20	27%
6	Implementer	18	24%
7	Estimator	5	7%
	Total Respondents	75	100%

Hypothesis analysisin this study was conducted using the Partial Least Square (PLS) method through SmartPLS 4.0 software. The relationship between variables in the study was visualized through a structural model shown in Figure 1 below.

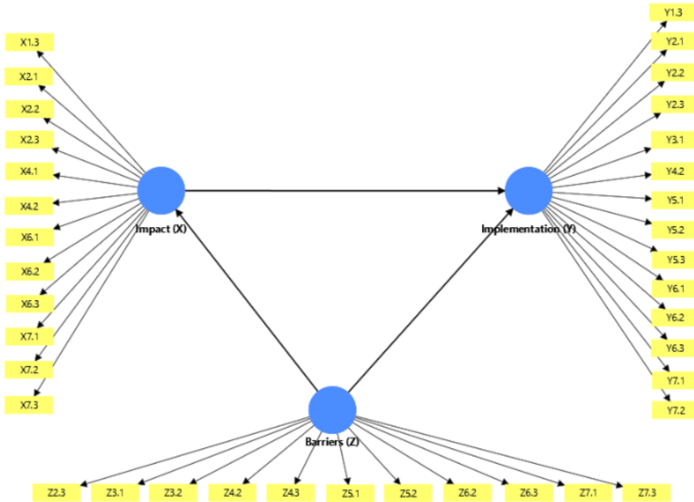

Image 1. Path Diagram

Before conducting structural model analysis using the Partial Least Square (PLS) method, a descriptive analysis of the questionnaire data was first performed. This analysis aimed to determine the mean and standard deviation of each indicator in each research variable. The mean value was used to describe the respondents' tendency to answer the questions, while the standard deviation showed the spread or variation in the respondents' answers.

3.1 Descriptive Analysis

Descriptive analysis is a method used to provide an overview of the research data. Its main purpose is to present a brief initial understanding before further analysis is carried out. Table 3 shows the results of the descriptive analysis of three factors, namely the influence factor (X), the application factor (Y), and the inhibiting factor (Z).

Table 3. Descriptive Statistics of Research Data

Variable	Indicator	Code	Mean	Standard Deviation
	Company commitment to fulfilling stakeholder requirements	X1.1	4.31	0.686
	Understanding of customer needs and suitability of products/services to expectations	X1.2	4.26	0.717

Variable	Indicator	Code	Mean	Standard Deviation
Impact Factors (X)	Company service and follow-up on customer complaints	X1.3	4.27	0.652
	Management's responsibility in communicating the importance of quality management	X2.1	4.26	0.717
	Top management control and fulfillment of quality resources	X2.2	4.21	0.744
	Reporting quality management system performance and improvement opportunities to top management	X2.3	4.23	0.75
	Coordination between involved parties/stakeholders	X3.1	4.32	0.667
	Optimization of human resources to work within the organization	X3.2	4.34	0.739
	Contribution of personnel at every level in the company	X3.3	4.23	0.705
	Identification of quality aspects and control of project data/documents	X4.1	4.27	0.7
	Implementation in accordance with SOPs with understanding and consistency in meeting requirements	X4.2	4.23	0.705
	Actions to address risks and opportunities	X4.3	4.23	0.771
	Internal audit and periodic employee performance evaluation	X5.1	4.21	0.765
	Improvement of supporting equipment and training to enhance human resource quality	X5.2	4.27	0.744
	Updating work implementation methods	X5.3	4.26	0.739
	The person responsible for implementation documents and reviews issues	X6.1	4.23	0.771
	The company creates a report	X6.2	4.26	0.782
	The company improves its products/services based on test results	X6.3	4.15	0.78
	Contractors involve and direct external parties (subcontractors) with an interest in contributing to quality management	X7.1	4.27	0.744
	The organization ensures that external product/service providers (subcontractors) have the required capabilities and capacity	X7.2	4.27	0.766
	Skills of subcontractor experts	X7.3	4.15	0.78

Variable	Indicator	Code	Mean	Standard Deviation
Impementation Factors (Y)	Organizational understanding in internal and external contexts	Y1.1	4.36	0.721
	Understanding of customer needs and expectations	Y1.2	4.29	0.705
	Establishing a quality management system and its processes	Y1.3	4.19	0.715
	Determination of the scope of the quality management system as well as leadership and commitment	Y2.1	4.29	0.749
	Establishing policies and improving the quality management system	Y2.2	4.23	0.771
	Capability for quality improvement	Y2.3	4.24	0.776
	Actions to address risks and opportunities	Y3.1	4.27	0.722
	Quality objectives and planning for achieving planning changes	Y3.2	4.42	0.708
	Planning for changes in the quality management system	Y3.3	4.31	0.709
	Organizational roles, responsibilities, authority, and resources	Y4.1	4.31	0.686
	Competence and awareness	Y4.2	4.31	0.686
	Internal and external communication	Y4.3	4.27	0.766
	Planning, operational control, and product/service requirements	Y5.1	4.21	0.744
	Design, development, production, and provision of products/services	Y5.2	4.26	0.717
	Document control and product/service quality control, including external, release, and handling of non-conforming output	Y5.3	4.19	0.737
	Monitoring, measurement, analysis, and evaluation	Y6.1	4.23	0.812
	Internal audit	Y6.2	4.23	0.791
	Management review	Y6.3	4.18	0.794
	Nonconformities and corrective actions	Y7.1	4.29	0.77
	Continuous improvement	Y7.2	4.29	0.77
	Lack of active control over customer satisfaction	Z1.1	4.19	0.78
	Ineffective feedback management	Z1.2	4.44	0.612
	Limited understanding of customer needs	Z1.3	4.18	0.684

Variable	Indicator	Code	Mean	Standard Deviation
Barrier Factors (Z)	Lack of commitment, motivation, and consistency of management in implementing the quality management system	Z2.1	4.15	0.839
	Management is slow to respond to employee complaints and needs	Z2.2	3.98	0.813
	Lack of clarity regarding SMM among partners and poor internal and external communication	Z2.3	4.29	0.77
	Lack of resources, expertise, and discipline that meet standards	Z3.1	4.16	0.787
	Work not in accordance with procedures and low worker motivation	Z3.2	4.18	0.752
	Lack of cooperation and communication between personnel	Z3.3	4.47	0.665
	Work not in accordance with SOP and document requirements not met	Z4.1	4.23	0.682
	Lack of proper risk control	Z4.2	4.24	0.734
	Lack of good opportunity control	Z4.3	4.29	0.681
	Uncertainty in auditor procedures	Z5.1	4.36	0.698
	Resistance to change	Z5.2	4.21	0.744
	Lack of follow-up on evaluation results	Z5.3	4.40	0.729
	SMM quality documents are provided only to fulfill audit reports or project owner requests	Z6.1	4.23	0.75
	Construction products do not comply with the specifications in the contract	Z6.2	4.18	0.794
	Final project results (construction products) did not meet time and cost targets	Z6.3	4.16	0.787
	Lack of collaboration and communication between relevant parties	Z7.1	4.16	0.787
	Subcontractors, suppliers, consultants, and other contractors lack competence in their respective tasks	Z7.2	4.26	0.761
	Low level of supplier involvement	Z7.3	4.31	0.774

3.2 Convergent Validity

Convergent validity testing is used to assess the extent to which indicators in a construct have a strong correlation with the latent variables they represent. Convergent validity testing is conducted by looking at the factor loading value. An indicator is considered to meet convergent validity if it has a factor loading value ≥ 0.7. The results of the convergent validity test of on the research variables were analyzed using SmartPLS 4.0. The test produced factor loading values for each indicator representing the research construct as presented in Table 4.

Table 4. Outer Loading Measurement Model

Variable	Indicator	Loading Factor
Impact Factor (X)	X1.3	0.725
	X2.1	0.897
	X2.2	0.913
	X2.3	0.798
	X4.1	0.774
	X4.2	0.837
	X6.2	0.764
	X6.3	0.863
	X7.1	0.877
	X7.2	0.769
	X7.3	0.820
Implementation Factors (Y)	Y1.3	0.890
	Y2.1	0.879
	Y2.2	0.909
	Y2.3	0.901
	Y3.1	0.853
	Y4.2	0.809
	Y4.3	0.718
	Y5.1	0.791
	Y5.2	0.887
	Y5.3	0.805
	Y6.1	0.784
	Y6.2	0.786
	Y6.3	0.758
	Y7.1	0.728
	Y7.2	0.732
Barrier Factors (Z)	Z2.3	0.926
	Z3.1	0.905
	Z3.2	0.879
	Z4.2	0.741
	Z4.3	0.806
	Z5.1	0.736
	Z5.2	0.904

Variable	Indicator	Loading Factor
	Z6.2	0.917
	Z6.3	0.965
	Z7.1	0.929
	Z7.3	0.866

The results show that the indicators of top management control and fulfillment of quality resources (X2.2) have the highest loading factor value (0.913). This indicates that leadership and commitment from top management are key to the successful implementation of ISO 9001:2015. Meanwhile, the biggest obstacle came from Project outcomes that did not meet time and cost targets (Z6.3) with a loading value of 0.965, which illustrates weak schedule and cost control in the field. These findings are in line with studies [12] and [5], which also emphasize the importance of resource management and time-cost control on the quality of construction projects.

Table 4 shows that all research indicators have met the convergent validity criteria with an outer loading value > 0.7. Thus, the indicators are valid and can be used to represent latent constructs.

Further analysis focused on latent variables as constructs that cannot be measured directly. The relationship between latent variables and their forming indicators can be seen through the correlation values in the latent variable, as shown in Table 5. These correlation values are the basis for assessing the extent to which indicators are able to reflect the constructs they represent.

Tabel 5. Correlative of Latent Variable

	Barrier (Z)	Implementation (Y)	Impact (X)
Barrier (Z)	1.000	0.133	-0.294
Implementation (Y)	0.133	1.000	-0.114
Impact (X)	-0.294	-0.114	1.000

The correlation results in Table 5 show the relationship between the observed latent variables to determine the extent to which these variables are related. The correlation value ranges from -1 to 1, where a value of 1 indicates a perfect positive relationship, while a value of 0 indicates no relationship. Based on the analysis results, the correlation value between Constraints (Z) and Implementation (Y) is 0.133, which indicates a positive but very weak relationship. Meanwhile, the relationship between Constraints (Z) and Influence (X) is -0.294, which means there is a negative correlation with a weak level of strength. The relationship between Application (Y) and Influence (X) is -0.114, indicating a very weak negative relationship. Overall, the relationship between latent variables in this study can be categorized as weak to very weak, so that the correlation is not very strong.

3.3 Discriminant Validity

The Discriminant Validity test was conducted to ensure that each construct was truly different from the other constructs. This test used the cross loading value parameter, where an indicator was considered appropriate if it had a higher loading value on the construct it measured compared to other constructs. Indicators with cross loading values above 0.7 are considered valid (meeting the criteria), while those with values below 0.7 are considered invalid (not meeting the criteria). In addition, the assessment can also be conducted by comparing the square root value of the Average Variance Extracted (AVE), which should be greater than the correlation between constructs. The discriminant validity test for the research variables was analyzed using SmartPLS 4.0, with the results presented in Table 6.

Table 6. Cross Loading Values

Code	Impact Factors (X)	Implementation Factors (Y)	Barrier Fctor (Z)
X1.3	**0.725**	-0.090	-0.150
X2.1	**0.897**	-0.064	-0.189
X2.2	**0.913**	-0.053	-0.269
X2.3	**0.798**	-0.128	-0.185
X4.1	**0.774**	-0.200	-0.178
X4.2	**0.837**	-0.265	-0.321
X6.1	**0.764**	-0.157	-0.163
X6.2	**0.863**	0.012	-0.264
X6.3	**0.877**	-0.021	-0.280
X7.1	**0.769**	-0.043	-0.293
X7.2	**0.820**	-0.001	-0.250
X7.3	**0.890**	-0.049	-0.269
Y1.3	-0.081	**0.879**	0.028
Y2.1	-0.146	**0.909**	0.080
Y2.2	-0.108	**0.901**	0.053
Y2.3	-0.044	**0.853**	0.104
Y3.1	-0.058	**0.809**	0.098
Y4.2	-0.023	**0.718**	0.106
Y5.1	-0.031	**0.791**	0.141
Y5.2	-0.179	**0.887**	0.126
Y5.3	-0.099	**0.805**	0.166
Y6.1	0.063	**0.784**	0.061
Y6.2	-0.045	**0.786**	-0.030
Y6.3	-0.009	**0.758**	0.070
Y7.1	-0.102	**0.728**	0.121
Y7.2	0.067	**0.732**	0.022
Z2.3	-0.344	0.091	**0.926**
Z3.1	-0.237	0.097	**0.905**
Z3.2	-0.258	0.074	**0.879**
Z4.2	-0.180	0.215	**0.741**

Code	Impact Factors (X)	Implementation Factors (Y)	Barrier Fctor (Z)
Z4.3	-0.285	0.240	**0.806**
Z5.1	-0.174	0.191	**0.736**
Z5.2	-0.240	0.078	**0.904**
Z6.2	-0.193	0.011	**0.917**
Z6.3	-0.237	0.097	**0.965**
Z7.1	-0.252	0.079	**0.929**
Z7.3	-0.327	0.051	**0.866**

Based on the cross-loading test results in Table 6, all indicators show values greater than 0.7 in the construct measured compared to other constructs. This indicates that each indicator has been able to accurately represent its respective construct and does not overlap with other constructs, so that discriminant validity can be declared fulfilled.

3.4 Average Variance Extracted (AVE) & Composite Reliability

In testing with SmartPLS 4.0, Average Variance Extracted (AVE) used to measure how well the indicator explains the latent variable. A variable can be said to have good validity if the AVE value is > 0.5. Thus, the discriminant validity test can be considered fulfilled if the AVE value is > 0.5, indicating that the construct has adequate convergent validity. The results of the AVE value calculations for each research variable using SmartPLS 4.0 are presented in Table 7.

Table 7. Average Variance Extracted (AVE) Values

Variable	AVE	Description
Impact	0.688	Valid
Implementation	0.660	Valid
Barrier	0.763	Valid

To complete the outer model testing stage, composite reliability analysis was conducted as the final step. This test aims to assess the consistency of the reliability of indicators in each variable. A variable can be considered reliable if it has a composite reliability and Cronbach's alpha value greater than 0.70. The results of the composite reliability and Cronbach's alpha calculations for each research variable using SmartPLS 4.0 software are presented in Table 8.

Table 8. Cronbach's Alpha and Composite Reliability Values

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Description
Impact	0.958	0.973	0.963	Valid
Implementation	0.963	0.976	0.964	Valid
Barrier	0.968	0.976	0.972	Valid

Based on Table 8, it was found that all research variables had composite reliability and Cronbach's alpha values > 0.70. This indicates that each variable met the reliability requirements, so that the instruments used could be declared consistent in measuring the constructs under study.

3.5 R-Square

R-Square is one of the components of the inner model used to assess the model coefficient by showing the amount of variation that occurs in the endogenous construct. The R-Square value is used to measure the extent to which independent variables (exogenous constructs) can explain the variation in dependent variables (endogenous constructs). The R-Square value ranges from 0 to 1, where the closer it is to 1, the better the model's ability to explain the variables under study. The R-Square value of the study based on calculations using SmartPLS 4.0 is shown in Table 9.

Table 9. R-Square Values

Dependent Variable	R-square
Impact	0.087
Implementation	0.024

Based on Table 9, the R-Square value obtained was 0.087 for the Influence variable and 0.024 for the Application variable. These results indicate the ability of independent variables to explain the variation in dependent variables in this study. Overall, these relatively low R-Square values indicate that the model's ability to explain the variation in the Influence and Application variables is still limited, suggesting that there may be other factors that influence the dependent variables but have not been included in the research model.

3.6 Hypothesis

After the model is evaluated, the next step is to test the hypothesis. This test is conducted to determine the relationship between variables in the study. This testing process uses the path coefficient output value as a reference. A hypothesis can be accepted if the t-statistic value is > 1.96 and the p-value is < 0.05. The path coefficient values (original sample estimate) and t-statistic values in the inner model can be seen in Table 10.

Table 10. Hypothesis Test Results

Hypothesis	Impact of Variable	Original sample	T-Statistics	P values	Description
H1	Impact (X) -> Implementation (Y)	-0.082	0.379	0.705	Not Accepted
H2	Barrier (Z) -> Impact (X)	-0.294	2.102	0.036	Accepted
H3	Barrier (Z) -> Implementation (Y)	0.109	0.506	0.613	Not Accepted

Basedon the results of hypothesis testing shown in Table 10, it can be explained as follows: (1) Hypothesis 1 (Influencing Factors (X) -> Implementation (Y)), On the path connecting the influencing factor with the implementation of ISO 9001:2015, P-Value of 0.705 and a T-Statistic of 0.379 were obtained, with a negative path coefficient (-0.082). Based on the hypothesis testing criteria (P-Value < 0.05 or T-Statistic > 1.96), the results show that the P-Value (0.705) is greater than 0.05 and the T-Statistic value (0.379) is less than 1.96. Thus, the relationship between influencing factors and the implementation of ISO 9001:2015 is declared insignificant, so Hypothesis 1 cannot be accepted. (2) Hypothesis 2 (Inhibiting Factors (Z) -> Influencing Factors (X)) In the path connecting the inhibiting factors with the influencing factors, a P-Value of 0.036 and a T-Statistic of 2.102 were obtained, with a negative path coefficient (-0.294). Based on the hypothesis testing criteria (P-Value < 0.05 or T-Statistic > 1.96), the results show that the P-Value (0.036) is less than 0.05 and the T-Statistic (2.102) is greater than 1.96. Thus, the relationship between inhibiting factors and influencing factors is significant, so Hypothesis 2 is accepted. (3) In the path connecting inhibiting factors with the implementation of ISO 9001:2015, a P-Value of 0.613 and a T-Statistic of 0.506 were obtained, with a positive path coefficient (0.109). Based on the hypothesis testing criteria (P-Value < 0.05 or T-Statistic > 1.96), the results show that the P-Value (0.613) is greater than 0.05 and the T-Statistic (0.506) is less than 1.96. Thus, the relationship between inhibiting factors and the implementation of ISO 9001:2015 is declared insignificant, so Hypothesis 3 is rejected.

4. Discussion

The results of this study indicate that the implementation of ISO 9001:2015 in construction projects in Surabaya contributes relatively little to the influence variable, namely 8.7%. Through processing using Partial Least Square (PLS) with the help of SmartPLS 4.0 software, it was found that the variation in the ISO 9001:2015 implementation variable could only be explained by 8.7% by factors within the model, while the remaining 91.3% was influenced by other factors outside the research model. This condition indicates that although the implementation of ISO 9001:2015 has an influence, its contribution to improving the quality of construction projects is still limited if it is not supported by other supporting factors.

The dominant factors influencing the success of ISO 9001:2015 implementation on construction project quality are top management control and fulfillment of quality resources (X2.2) with a weight of 0.913. This finding confirms the importance of top management's commitment to in ensuring the implementation of quality control processes and the provision of competent human resources. The placement of personnel according to their expertise, continuous training, and workforce empowerment have proven to be the main keys to the effective and sustainable implementation of the ISO 9001:2015 quality standard. This support not only improves the effectiveness of the quality management system but also strengthens the quality culture within the company.

However, the main obstacle in the implementation of ISO 9001:2015 was found in the final project results, particularly related to the non-conformity of construction products with time and cost targets (Z6.3), with a weight value of 0.965. This obstacle reflects the weak schedule and budget control mechanisms and the suboptimal evaluation of project follow-ups. This shows that the successful implementation of ISO 9001:2015 requires more than just compliance with documentation and procedures; it must also be supported by effective project management in maintaining quality, time, and cost targets.

This finding is in line with research conducted by [1], which confirms that the main obstacles to the implementation of ISO 9001:2015 originate from limited human resources and a low level of understanding of the quality system in the field, thus requiring continuous training and evaluation programs. These results are also reinforced by research [7], which identifies the low quality of the workforce as a significant factor affecting the effectiveness of quality system implementation. Furthermore, the studies [6] and [11], emphasize that top management commitment and human resource involvement are crucial factors in determining the success of ISO 9001:2015 implementation. Thus, the findings of this study reinforce the view that the successful implementation of ISO 9001:2015 in construction projects is greatly influenced by managerial commitment, human resource quality, and effective project control mechanisms.

Overall, this study provides an overview that the implementation of ISO 9001:2015 in the Surabaya construction sector still faces challenges, especially in controlling project schedules and costs. However, with the full support of top management and good human resource management, these obstacles can be minimized so that the implementation of quality standards can run more optimally and contribute significantly to improving the quality of construction projects.

5. Conclusion

Based on the results of the analysis and discussion, it can be concluded that the implementation of ISO 9001:2015 in construction projects in Surabaya has a relatively small contribution to the quality of construction projects, with an influence value of 8.7%. This shows that most of the variation in project quality is more influenced by factors outside the research model.

The dominant factors supporting the implementation of ISO 9001:2015 are top management control and the fulfillment of quality resources, which indicate that management commitment and the provision of competent human resources play an important role in the successful implementation of quality standards. Conversely, the biggest obstacle is found in the aspect of construction product non-conformity with time and cost targets, which reflects the still weak control of project schedules and budgets.

The results of this study are in line with previous studies that emphasize the importance of top management and human resource quality as key factors in the implementation of ISO 9001:2015. Further research needs to consider external aspects such as company policy, technological innovation, and stakeholder involvement to support the more optimal implementation of ISO 9001:2015.

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