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Analysis of the Implementation of Quality Management Systems in Construction Projects *central Business Disctric* Batavia Pantai Indah Kapuk, Jakarta City

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Abstract: This research on a building construction project in the Central Business District (CBD) Batavia PIK Jakarta aims to analyze the implementation of the Quality Management System (QMS) in the project, focusing on identifying the practices of this quality management system, the challenges faced, and its impact on project quality outcomes. The method used in this research is descriptive quantitative with a survey approach. The research results show how the effective implementation of a Quality Management System (QMS) can improve the quality of construction projects, reduce the risk of errors, and increase stakeholder satisfaction. However, challenges exist, such as a lack of understanding of QMS principles among workers and resistance to change from some parties. This research also found that top management involvement and adequate employee training are key factors in the successful implementation of the Quality Management System (QMS). Recommendations include developing continuous training programs and improving communication among all stakeholders to support more effective QMS implementation in the future.

Keywords: Implementation of Quality Management System (QMS), Construction Project

INTRODUCTION

The construction industry in Indonesia is growing rapidly in line with the increasing need for high-quality infrastructure. Large-scale projects, such as the development of *Central Business Distric Batavia* Pantai Indah Kapuk Jakarta (CBD Batavia PIK Jakarta) is a key indicator in efforts to meet infrastructure standards expected by the community and stakeholders. To achieve these standards, the implementation of a Quality Management System (QMS) in construction projects is essential to ensure the quality of each stage of construction, from planning and implementation to supervision. With increasing competition and expectations in the construction sector, QMS is a crucial factor in maintaining consistent project quality.

However, the implementation of a Quality Management System (QMS) in construction projects faces various challenges, such as limited resources, time, and costs.

Often, the implementation of a Quality Management System (QMS) is faced with technical and non-technical obstacles, such as limited coordination between parties, variations in material quality, and differences in understanding of quality procedures among project workers. These challenges result in the risk of quality degradation and potential non-conformance with established standards. Therefore, it is important to evaluate the implementation of a Quality Management System (QMS) to minimize these obstacles and maintain project quality.

This research was conducted due to the implementation of Quality Management System (QMS) in construction projects such as in*Central Business Distric Batavia* (CBD Batavia PIK Jakarta) still requires special attention, especially in terms of analyzing factors that influence the final quality of the project. Several cases in the field show that not all construction projects succeed in maintaining optimal quality, which impacts the company's reputation and client satisfaction levels. Through this study, it is hoped that a clearer picture will be obtained regarding the effectiveness of implementing a Quality Management System (QMS) in construction projects and the factors that hinder its implementation.

One of the international standards widely used in the implementation of a Quality Management System (QMS) is ISO 9001, which covers quality control from design to project completion. The implementation of a Quality Management System (QMS) encompasses three main elements: quality policy, quality planning, and continuous quality improvement (Singh et al., 2021). The quality policy serves as management's commitment to achieving mutually agreed-upon quality standards, while quality planning ensures that each project stage is prepared in accordance with established procedures.. A Quality Management System (QMS) in the construction industry is defined as a set of processes and procedures used to ensure that all aspects of a construction project meet established quality requirements.

A construction project is defined as a series of organized activities to create permanent infrastructure or buildings. These projects involve multiple parties, such as project owners, contractors, consultants, and material suppliers (Akbar et al., 2022). In construction projects, quality is a crucial aspect, reflecting the level of satisfaction of all parties involved, particularly the client. Quality management in construction projects includes establishing quality standards, quality control during the construction process, and evaluating work results. Factors such as the quality of human resources, building materials, and work methods play a crucial role in achieving desired quality standards.

Quality in construction encompasses all processes aimed at meeting or exceeding standards established by contracts, technical specifications, and relevant regulations. Quality measurement is typically performed by comparing actual project results with agreed-upon specifications. These quality aspects include material quality, workmanship, safety, and client or end-user satisfaction (Li et al., 2021). In Projects *Central Business Distric Batavia*(CBD Batavia PIK), the implementation of quality control involves periodic inspections, internal quality audits, and material and structural testing to ensure that the final results are in accordance with the plan.

ISO 9001 is an international standard applied across various industries, including construction, to ensure that organizations consistently meet client needs through continuous quality improvement (González et al., 2022). In the construction sector, implementing ISO 9001 involves documentation management, internal audits, management reviews, and ongoing corrective actions throughout the project lifecycle. Implementing this standard helps construction companies identify and minimize risks, and ensures that construction projects meet all contractual, legal, and regulatory requirements.

According to the National Productivity Council (1985), quality control is a series of activities that are effectively and efficiently integrated to develop, maintain, and improve the quality of a product or service, with the ultimate goal of achieving customer satisfaction. In the construction world, this includes quality control of physical work, equipment, materials, and work implementation methods. One important point in quality control is the quality control of construction products, which is generally carried out to determine the extent to which the work results have met the project's standards and technical specifications.

Based on the formulation of the problem and previous theoretical and research studies, the hypothesis in this study is as follows:

H_0 (Null Hypothesis): The implementation of a quality management system does not have a significant effect on the effectiveness of construction project implementation.*Central Business District*(CBD) Batavia Pantai Indah Kapuk Jakarta.

H_1 (Alternative Hypothesis): The implementation of a quality management system has a positive and significant effect on the effectiveness of construction project implementation.*Central Business District* (CBD) Batavia Pantai Indah Kapuk Jakarta.

RESEARCH METHOD

The research method used in this study is a descriptive quantitative method with an approach. Descriptive quantitative research aims to provide an objective overview of the implementation of quality management systems in construction projects. *Central Business Distric Batavia*Pantai Indah Kapuk Jakarta (CBD Batavia PIK). This approach was chosen because it can describe the implementation of the quality management system in the field by utilizing statistically processed numerical data. Data in this study were collected through questionnaires distributed to respondents directly involved in the project, such as project managers, field staff, supervisors, and the quality team. The questionnaire instrument was designed on a scale*Liked*to measure aspects of quality management implementation, such as quality planning, quality control, and field quality improvement. The collected data will be processed using SPSS software to obtain in-depth statistical analysis results on the interrelationships between quality factors within the project.

The population of this research is the workforce involved in construction projects. *Central Business Distric Batavia*Pantai Indah Kapuk Jakarta (CBD Batavia PIK), such as project managers, field engineers, supervisors, and quality teams. Sample selection was carried out randomly purposive sampling with the criteria of respondents who have direct involvement in the implementation of the quality management system. The research instruments used in this study were questionnaires and structured interviews. The questionnaire was compiled based on indicators of the implementation of the quality management system that refer to the ISO 9001:2015 standard. This questionnaire consists of questions that measure respondents' perceptions and understanding of the implementation of the quality management system, satisfaction with the implemented system, and the impact of the quality management system on the quality of work results. In addition, structured interviews were conducted to obtain more in-depth information from project managers regarding obstacles and challenges in implementing the quality management system in the field. This interview used an interview guide compiled based on quality management theories and empirical experience in construction projects.

The data analysis technique used in this study is a validity test, conducted to ensure that each item in the questionnaire truly measures the aspects intended in the study. Meanwhile, a reliability test is conducted to ensure the internal consistency of the questionnaire, so that the measurement results can be relied upon if repeated. Descriptive analysis is used to provide an overview of the data obtained from the questionnaire. Data will be analyzed using frequency distribution, percentage, mean, and standard deviation. The results of this analysis will be presented in tabular and graphical form to facilitate interpretation and understanding of the data. To test the relationship between these variables, correlation *Pearson* used. This method allows us to see the extent of the relationship between quality management components and the effectiveness of the quality management system implementation. If the analysis results show a significant correlation value and a p-value less than 0.05, it can be concluded that these components are significantly related to the effectiveness of the quality management system. In addition to correlation, simple or multiple linear regression tests are also applied to measure the extent of the influence of the independent variables on the dependent variable.

RESULT AND DISCUSSION

Validity testing is conducted to determine whether the questionnaire used is valid or not. An instrument is considered valid if it is able to measure what it is intended to measure. The criterion used is comparing the Sig. value (2-tailed) with a significance level of $\alpha = 0.05$. If the Sig. value is < 0.05, the questionnaire item is declared valid. The following is a summary of the validity test results for each variable:

Table 1. Validity Test Results (processed data, 2025)

Question Items	Pearson Correlation (r)	Sig. (2-tailed)	Information
x1.1	0.845	0.000	Valid
x1.2	0.893	0.000	Valid
x1.3	0.755	0.000	Valid
x1.4	0.939	0.000	Valid
x1.5	0.460	0.000	Valid
x2.1	0.865	0.000	Valid
x2.2	0.935	0.000	Valid
x2.3	0.588	0.000	Valid
x2.4	0.955	0.000	Valid
x2.5	0.627	0.000	Valid
x3.1	0.872	0.000	Valid
x3.2	0.908	0.000	Valid
x3.3	0.600	0.000	Valid
x3.4	0.942	0.000	Valid
x3.5	0.716	0.000	Valid
y.1	0.946	0.000	Valid
and.2	0.921	0.000	Valid
and.3	0.947	0.000	Valid
y.4	0.921	0.000	Valid
and.5	0.265	0.008	Valid

Based on the results of the validity test that has been carried out, it is concluded that all variables in this study are valid and can be used to contribute to the results of this study.

Table 2. Reliability Test Results (processed data, 2025)

Question Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Information
x1.1	0.730	0.808	Reliable
x1.2	0.804	0.786	Reliable
x1.3	0.629	0.835	Reliable
x1.4	0.886	0.760	Reliable
x1.5	0.309	0.895	Reliable
x2.1	0.762	0.820	Reliable
x2.2	0.875	0.787	Reliable
x2.3	0.442	0.890	Reliable
x2.4	0.914	0.774	Reliable
x2.5	0.505	0.880	Reliable
x3.1	0.774	0.828	Reliable
x3.2	0.830	0.813	Reliable
x3.3	0.450	0.897	Reliable
x3.4	0.894	0.793	Reliable
x3.5	0.615	0.871	Reliable
y.1	0.920	0.758	Reliable
and.2	0.854	0.739	Reliable
and.3	0.907	0.729	Reliable
y.4	0.854	0.739	Reliable
and.5	-0.012	0.971	Reliable

Based on the results of the validity test that has been carried out, it is concluded that all variables in this study are valid and can be used to contribute to the results of this study.

Table 3. Normality Test Results (processed data, 2025)

Statistics	Mark
Asymp. Sig. (2-tailed)	0.200

Based on the results of the normality test analyzed, the Asymp. Sig. (2-tailed) value is 0.200, so it can be concluded that the research data is normally distributed.

Table 4. Normality Test Results (processed data, 2025)

Durbin-Watson
2.792

Based on the data provided, the Durbin-Watson value of 2.792 indicates that there is no autocorrelation problem in the regression model. Thus, the regression model meets this important assumption, strengthening the validity of the analysis results.

Table 5. Multicollinearity Test Results (processed data, 2025)

Variables	Tolerance	VIF
x1	0.831	1.204
x2	0.986	1.015
x3	0.827	1.209

Based on the test results, all independent variables (x1, x2, and x3) showed tolerance values above 0.10 (0.831, 0.986, and 0.827) and VIF values below 10 (1.204, 1.015, and 1.209). This clearly indicates that there is no significant multicollinearity problem in the regression model.

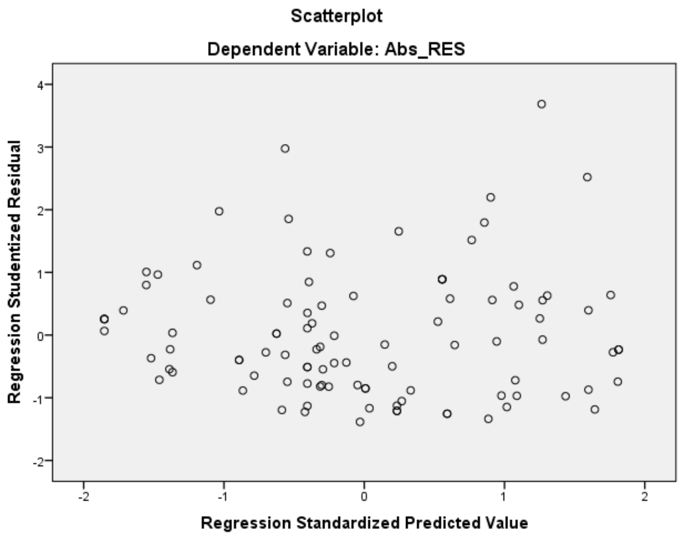

Figure 1. *Scatterplot* Heteroscedasticity (processed data, 2025)

Based on *scatterplot*analyzed, it is clear that the distribution of data points is random and does not form a particular pattern, confirming that the assumption of homoscedasticity has been met.

Table 6. Results of the Determination Coefficient Test (processed data, 2025)

R	R Square	Adjusted R Square
0.644	0.415	0.397

From the analysis results, the R value was obtained as 0.644, indicating a fairly strong linear relationship between all independent variables simultaneously with the dependent variable. Furthermore, the R Square value (R^2) is 0.415, which indicates that 41.5% of the variation in the dependent variable can be explained by the independent variables in the model, while the remaining 58.5% is explained by other factors outside the research model. Meanwhile, the Adjusted R Square value of 0.397 provides a more accurate indication of the model's explanatory power, namely 39.7% of the variation in the dependent variable is explained after adjusting for the number of predictors and sample size, confirming that this regression model has a fairly moderate predictive ability even though there are still significant variations that need to be explained by other variables.

Table 7. F-Test Results (processed data, 2025)

F	Say.
22.728	0.000

Based on the analyzed data, the calculated F value is 22.728 with a significance value (Sig.) of 0.000. Considering that the Sig. (0.000) value is much smaller than the threshold of 0.05, it can be concluded that the independent variables simultaneously and significantly influence the dependent variable.

Table 6. t-Test Results (processed data, 2025)

Variables	t	Say.	Information
x1	2.852	0.005	Significant Influence
x2	0.343	0.732	No effect
x3	5.835	0.000	Significant Influence

From the analyzed results, Variable X1 with a t-value of 2.852 and Sig. 0.005 (less than 0.05) indicates that it has a partial significant effect on variable Y. Similarly, Variable X3 with a t-value of 5.835 and Sig. 0.000 (also less than 0.05) is proven to have a very significant partial effect on variable Y. On the other hand, Variable X2 which has a t-value of 0.343 and Sig. 0.732 (greater than 0.05) indicates that it does not have a partial significant effect on variable Y. These findings collectively provide a deeper understanding of the specific role of each predictor in explaining variations in the dependent variable.

Implementation of Quality Management System (QMS) in the Construction Project of Central Business District Batavia Pantai Indah Kapuk Jakarta (CBD Batavia PIK Jakarta)

Analyzing the implementation of a Quality Management System (QMS) on a construction project as large as the Central Business District Batavia Pantai Indah Kapuk Jakarta (CBD Batavia PIK Jakarta) requires a comprehensive approach. While quantitative data processed through validity and reliability tests do not explicitly contain in-depth qualitative descriptions such as interviews with project management or direct observations at the construction site, the statistical analysis provides a strong indication of how the QMS aspects are interpreted and measured by the respondents.

The validity of this instrument is a very strong foundation, because it means that each question in the questionnaire accurately measures the concept or dimension of the QMS that it is supposed to measure. This implies that the QMS concepts that are the focus of the study are relevant and well understood by respondents in the project environment, indicating that these aspects of the QMS are indeed recognized and exist in practice in the Batavia PIK Jakarta CBD project. Item x1.4 with a Pearson Correlation value of 0.939 and x2.4 with 0.955 are very strong indicators, indicating that the questions are very representative of the QMS dimensions they represent. Although some items such as x1.5 (Pearson Correlation 0.460) and x2.3 (Pearson Correlation 0.588) have more moderate correlations, they are still valid and contribute positively to internal consistency.

The results of this validity and reliability on the implementation of the QMS are that the perception and practice of QMS in the Batavia PIK Jakarta CBD project can be measured consistently and validly through the dimensions studied. This indicates the existence of a structured system or practice related to quality management that is recognized and implemented. The success of the instrument in measuring these aspects of the QMS implies that concepts such as quality planning, quality control, and/or continuous improvement (as designated by the researcher as X1, X2, and X3) have become part of the project's operational framework.

The Relationship Between the Implementation of Quality Management Systems (QMS) and Project Quality

The relationship between Quality Management System (QMS) implementation and project quality is the core of this study. The results of multiple linear regression analysis provide comprehensive answers regarding the relationship, both simultaneously and partially. The analyzed data clearly demonstrates a significant and positive correlation between QMS and project quality in the Batavia PIK Jakarta CBD, although the nuances require further exploration.

The F-Test result with a significance value (Sig.) of 0.000, which is far below the threshold of 0.05, the F-Test definitively shows that the implementation of the Quality Management System (QMS) represented by variables X1, X2, and X3 together, has a significant and positive influence on project quality (Y). This finding is very important because it confirms the fundamental hypothesis that the QMS, as an integrated system, does play a crucial role in determining the quality output of a construction project. In the context of the Batavia PIK Jakarta CBD project, this means that the investment and effort in implementing various aspects of the QMS collectively are not in vain, but rather provide a real contribution to achieving the expected quality standards. The more effectively the QMS is implemented holistically, the greater the likelihood that the project will produce higher quality outputs.

Regarding the contribution of QMS, researchers looked at the Coefficient of Determination (R Square) value. The R Square value of 0.415 (and Adjusted R Square of 0.397) indicates that approximately 41.5% of the total variation in project quality (Y) can be explained by a regression model that includes variables X1, X2, and X3. This figure is quite substantial; it means that QMS has significant explanatory power on project quality. More than two-fifths of the variation in project quality can be attributed to the implemented QMS practices. However, it is important to note that the remaining 58.5% of the variation in project quality cannot be explained by this model. This indicates that there are other factors outside the scope of QMS that also play a significant role in influencing project quality. These factors could include team experience, economic conditions, project complexity, external regulations, or even environmental factors not included in the research model. This finding opens up opportunities for future research to identify these additional variables to achieve a more comprehensive understanding.

The t-test analysis provides more granular insights into the partial influence of each QMS dimension. The t-test results indicate that X1 (the first QMS dimension) and X3 (the third QMS dimension) have a significant and positive influence on project quality (Y). For X1, a significance value of 0.005 (less than 0.05) with a positive regression coefficient (B = 0.190) indicates that an improvement in the QMS aspect represented by X1 will be followed by an improvement in project quality. Similarly, for X3, a significance value of 0.000 (well below 0.05) with a larger positive regression coefficient (B = 0.344) indicates a very strong and significant influence. The higher coefficient on X3 implies that the QMS dimension represented by X3 is a more dominant driver of project quality compared to X1. This is an important finding for project management, as it identifies which areas of the QMS have the most impact.

For X2 (the second QMS dimension), the significance value of 0.732 (well above 0.05) indicates that X2 does not have a significant partial effect on project quality (Y) in this model. This is a critical discussion point. Why does X2, as part of the QMS, not show a significant effect when the QMS as a whole does? There are several possibilities. First, it could be that the QMS aspect represented by X2 has been implemented at a very high level in this project, so it is no longer a significant differentiating factor in improving project quality. That is, X2 may have become a mandatory "hygiene factor" but is no longer an additional "motivator" for quality. Second, it could be that X2's effect on quality is indirect, mediated by other variables you did not include in the model. Third, there may also be problems in the measurement of X2 that cause a weak correlation with Y, even though the items are valid and reliable. These findings suggest the need for further exploration, perhaps through qualitative methods, to understand the role of X2 in this project.

The relationship between QMS implementation and project quality in CBD Batavia PIK Jakarta is positive and significant. QMS simultaneously contributes significantly to project quality. Focusing on dimensions X1 and X3 is crucial as both have been shown to be significant drivers of quality. Practically, efforts to improve or strengthen QMS in this project should be prioritized on aspects represented by X1 and X3 to achieve the most effective project quality improvement.

What Factors Influence the Effectiveness of Implementing a Quality Management System (QMS) on a Project?

To identify factors that influence the effectiveness of the implementation of the Quality Management System (QMS) in the Batavia PIK Jakarta CBD project. The effectiveness of the QMS here is measured by its ability to significantly influence project quality (variable Y). Based on the analyzed results, researchers can draw conclusions about the main driving factors and also factors that do not show a significant impact. Key Factors Influencing the Effectiveness of the QMS (Partially Significant).

Variable X1 is proven to have a positive and significant influence on project quality. This means that the QMS aspects contained in X1 are crucial factors in driving the effectiveness of the QMS. If X1 is assumed to represent "Quality Planning" (such as the establishment of quality standards, procedures, and documentation), then this finding implies that thorough and systematic planning is the key to the effectiveness of the QMS. The existence of clear procedures, well-defined quality standards, and neat documentation will greatly support the achievement of project quality (Hairuddin, et al., 2022). Improvements in area X1 will directly increase the effectiveness of the QMS in producing better project quality. In the context of a large construction project such as the Batavia PIK CBD, thorough quality planning from the beginning (including material specifications, work methods, and inspection schedules) is vital to minimize errors and rework later on, thus directly contributing to the effectiveness of the QMS.

Variable X3 shows a very strong, positive, and significant influence on project quality. With a higher regression coefficient than X1, this indicates that the factors represented by X3 are the most dominant drivers of QMS effectiveness in this model. If X3 is assumed to represent "Continuous Improvement" or "Evaluation and Corrective Action" (such as internal audits, nonconformity analysis, management review, and learning from failure), then this finding is highly relevant. It suggests that an adaptive system, which regularly evaluates its performance, identifies root causes, and implements corrective and preventive actions, is a key factor in QMS effectiveness (Jarek & Nugroho, 2023). A project's ability to learn from experience, continuously identify areas for improvement, and implement positive changes will fundamentally improve the quality of output. In construction projects, this could mean a responsive defect reporting system, an ongoing training program for personnel, or an integrated client feedback mechanism for future process improvement (Bria, et al., 2017). These factors not only ensure current quality but also build a foundation for future quality improvement.

CONCLUSION

Based on the analysis and discussion of the implementation of the Quality Management System (QMS) in the Batavia Pantai Indah Kapuk Jakarta CBD construction project, it can be concluded that the QMS simultaneously has a significant and positive effect on project quality. This is reflected in the F-test significance value which is far below 0.05 and the R^2 value of 0.415, which indicates that the QMS explains almost half of the variation in project quality. Partially, dimensions X1 and X3 are proven to be the factors that most influence the effectiveness of the QMS. X1, which represents the quality planning aspect, provides a structural foundation for project quality control and achievement, while X3, which is associated with continuous evaluation and improvement, shows a dominant role in driving continuous quality improvement. In contrast, dimension X2 does not show a significant effect partially, which may be caused by the high level of implementation that is no longer a differentiating variable, or because its influence is indirect and involves other mediating variables. In general, these results emphasize the importance of implementing a QMS that is not only administrative, but also adaptive and reflective in the context of large-scale projects.

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