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Evaluation of Importance and Implementation of Work Quality in Building Construction

Bagas Prawiro Dwiputranto[1] M. Ruslin Anwar[2], Achfas Zacoeb[3]
[1]Magister Program of Civil Engineering, [2,3]Department of Civil Engineering,
Brawijaya University, Malang, Indonesia

Abstract:- Large-scale building construction projects are carried out to meet community needs. Required a serious management in achieving the desired goals and results. However, in practice, building construction failures are still encountered due to implementation that is not following established procedures and quality standards. An evaluation is needed regarding the importance and application of components of construction work in improving the expected quality of work. The purpose of this study is to compile a mapping and performance assessment of the quality of building construction implementation and to provide an evaluation related to the implementation of building construction work. Data collection was carried out by conducting a questionnaire survey where the respondents in this study were people who were directly involved in the implementation of building construction. Analysis of the data used in this research uses IPA analysis to find out the results of mapping related to the level of importance and application of building construction work components and SWOT analysis to formulate the evaluation that needs to be carried out. As a result of the research, the IPA analysis shows that the majority of building construction work components have a high level of importance and applicability. And for the results of the evaluation that can be done is to check the work materials, work methods, and shop drawings on building construction.

Keywords:- *Quality of work, Building Construction, IPA Method, SWOT Method, Component of Work.*

I. INTRODUCTION

In this modern era, various large-scale construction projects are carried out to meet the needs of the wider community. This could trigger the development of the construction industry in Indonesia. The construction of physical facilities and infrastructure requires serious management, due to the increasing size of the project and the increasing complexity of the dependence between one work division and other work in a project to achieve the goals and results desired by construction companies (Yurazak et al., 2022). However, in the implementation of construction in Indonesia, there are still many construction failures with one of the causes being the result of construction implementation that does not comply with established procedures and quality standards (Wahyu et al., 2021). This indicates that there is a lack of awareness of the construction implementation that meets the expected quality (Budayan & Okudan, 2022).

From these reasons, an evaluation is needed regarding the importance and application of the quality of construction work which can be used as a recommendation in improving the expected quality of work as well as compiling a mapping of the work system and making a way of assessing the performance of the quality of the work. (Hartanto, 2018).

Research related to evaluation of the importance and application of the quality of construction work has been carried out (Hartanto, 2018) which discusses the mapping of work systems in road pavement work. Then (Yurazak et al., 2022) discusses the application of quality work to the construction of high-rise buildings. And (Budihardja & Indriyani, 2019) discusses the application of quality management in building construction projects.

Based on this case, researcher want to evaluate the level of importance and application of quality work in building construction work. This study aims to compile a mapping and performance assessment of the quality of the implementation of building construction work and provide evaluations and recommendations related to the implementation of building construction work.

II. RESEARCH METHODS

This research begins with conducting a literature study related to the problems that exist in building construction projects, then making questions attached to a questionnaire based on observations and work components in building construction. Then the questionnaire was tested by several people who understood the shortcomings of this questionnaire before being distributed to respondents who were involved in building construction.

This research was conducted in a multi-story building construction project in Malang, East Java. Collecting data in this study by observing building projects which include structural, architectural, and MEP work, then interviewing the construction project leaders, as well as distributing questionnaires to the parties directly involved in the project. This questionnaire is divided into two parts, namely:

- General data of respondents that involved in the implementation of building construction projects
- Level of Importance and Application of building construction work such as:
  - ✓ Structural Work
  - ✓ Architectural Work
  - ✓ MEP Work

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Data processing begins with conducting validity and reliability tests to test the feasibility of the results of the questionnaire which will be used in the next analysis. The next step is to determine the level of application that has good or bad performance using the Importance Performance Analysis (IPA) method. And the final stage after conducting a scientific analysis is to formulate evaluations and recommendations regarding what needs to be done or avoided in a Strength, Weakness, Opportunity, Threat (SWOT) analysis method.

A. Research Indicators For Building Construction Work Components

The research indicators (Ali et al., 2022), (Yana et al., 2020), (Cianfrani & West, 2016) for the Components of Building Construction Work which include structural work, architectural work, and MEP work based on the results of the questionnaire part 2 in Table 1, 5, 9:

Table 1: Structural Work Components

No.	Structural Work (Column, Beam, Floor Plate)
I.	**Preparation Structure Work**
1.	Structural work location has been inspected
2.	Person in charge stand by at the work site
3.	HSE Officers stand by at the work site
4.	Personal Protective Equipment (PPE) for workers and supervisors are available
5.	Shop drawings have been checked and approved
6.	Material approval, work tools and methods of work have been approved

Table 2: Reinforcing Work

II.	Reinforcing Work
1.	Steel reinforcement material is in accordance with technical specifications
2.	Tensile strength of steel reinforcement is in accordance with technical specifications
3.	Brand of steel reinforcement is in accordance with technical specifications
4.	Amount required equipment is available
5.	Installation reinforcement is in accordance with shop drawing
6.	Binding of reinforcement using bendrat wire
7.	Giving concrete decking on the reinforcement to keep concrete ducking

Table 3: Formwork Work

III.	Formwork Work
1.	Formwork material used is in accordance with technical specifications
2.	Formwork dimensions are in accordance with shop drawing, technical specifications
3.	Prepare reinforcement frame for formwork
4.	Prepare the support poles to support the formwork
5.	Amount required equipment is available
6.	Use of theodolite to determine formwork elevation
7.	Survey/marking elevation of formwork installation
8.	Installation of formwork is in accordance with the shop drawing
9.	Installation of support poles to hold the formwork

Table 4: Casting Work

IV.	Casting Work
1.	Quality of concrete used is in accordance with technical specifications
2.	Concrete strength test is in accordance with the technical specifications
3.	Concrete slump test is in accordance with the technical specifications
4.	Amount required equipment is available
5.	Vibrator for casting execution
6.	Cleaning and lubricating formwork
7.	Conduct a slump test prior to casting
8.	Making test sample on concrete for laboratory tests.
9.	Using a vibrator while casting is in progress
10.	Curing the concrete after the casting is carried out

Table 5: Architectural Work Components

No.	Architectural Work (Wall, Ceiling, Floor)
V.	Preparation Architecture Work
1.	Architecture work location has been inspected
2.	Person in charge stand by at the work site
3.	HSE Officers stand by at the work site
4.	Personal Protective Equipment (PPE) for workers and supervisors are available
5.	Shop drawings have been checked and approved
6.	Material approval, work tools and methods of work have been approved

Table 6: Wall Work

VI.	Wall Work
1.	Material used is in accordance with technical specifications
2.	Brand of material used is in accordance with technical specifications
3.	Equipment for work as needed
4.	Marking the elevation of the wall installation according to shop drawing
5.	Installation of walls according to shop drawing and technical specifications
6.	Plastering work is in accordance with technical specifications
7.	Finishing work (ceramics or paint) is in accordance with technical specifications

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Table 7: Ceiling Work

VII.	Ceiling Work
1.	Material used is in accordance with technical specifications
2.	Brand of material used is in accordance with technical specifications
3.	Equipment for work as needed
4.	Marking the elevation of the ceiling installation according to shop drawing
5.	Installation of the ceiling frame according to technical specifications
6.	Installation of gypsum board according to technical specifications
7.	Finishing work (ceiling paint) according to technical specifications

Table 8: Floor Work

VIII.	Floor Work
1.	Material used is in accordance with technical specifications
2.	Brand of material used is in accordance with technical specifications
3.	Equipment for work as needed
4.	Marking the elevation of floor work according to shop drawing
5.	Floor screed work according to technical specifications
6.	Finishing work (floor tiles, floor parquet) according to technical specifications

Table 9: MEP Work Components

No.	MEP Work (Mechanical, Electrical, Plmbing)
IX.	Preparation MEP Work
1.	Architecture work location has been inspected
2.	Person in charge stand by at the work site
3.	HSE Officers stand by at the work site
4.	Personal Protective Equipment (PPE) for workers and supervisors are available
5.	Shop drawings have been checked and approved
6.	Material approval, work tools and methods of work have been approved

Table 10: MEP Work

X.	MEP Work
1.	Material used is in accordance with technical specifications
2.	Brand of material used is in accordance with technical specifications
3.	Equipment for work as needed
4.	MEP's work elevation survey is in accordance with the shop drawings
5.	Mechanical installation according to shop drawings and technical specifications
6.	Plumbing installation according to shop drawings and technical specifications
7.	Electrical installation according to shop drawings and technical specifications
8.	Checking the MEP installation is installed correctly or not

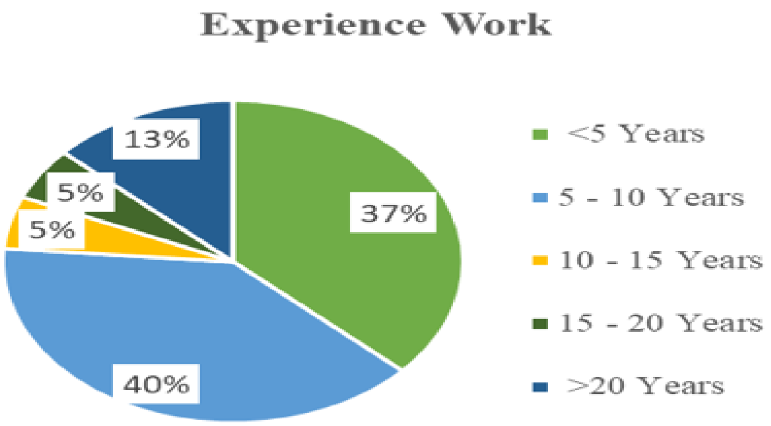

Fig. 1: Percentage of Respondent's Experience Work

The level of work experience of respondents with the highest number is at 5-10 years with a total of 40% (15 respondents). Then at less than 5 years with a total of 37% (14 respondents), more than 20 years with a total of 13% (5 respondents) and 10-15 years, and 15-20 years with each amount of 5% (2 respondents).

B. Validity Test

This validity test was carried out to determine the accuracy of the research instrument r_{table} with r_{count} at a significance level of 5%. If $r_{table} < r_{count}$ can be declared valid, otherwise if $r_{table} > r_{count}$ can be declared invalid (Santoso, 2018). In this study, the r table value is 0.329 with a value of N = 38.

Table 11: Invalid Variable Validation Test Result

Work Item	Notation	Indicator	R Count	Information
Preparation Structure Work (I)	I.3	HSE Officers stand by at the work site	0,319	Invalid
Formwork Work (III)	III.5	Amount required equipment is available	0,195	Invalid
Preparation Architecture (V)	V.3	HSE Officers stand by at the work site	0,309	Invalid
Wall Work (VI)	VI.3	Equipment for work as needed	0,260	Invalid

III. RESULT AND DISCUSSION

A. Data Respondent

Respondents in this study referred to the characteristics of being directly involved in the implementation of building construction projects. Respondents in this study amounted to 38 respondents consisting of executors, supervising consultants and project owners.

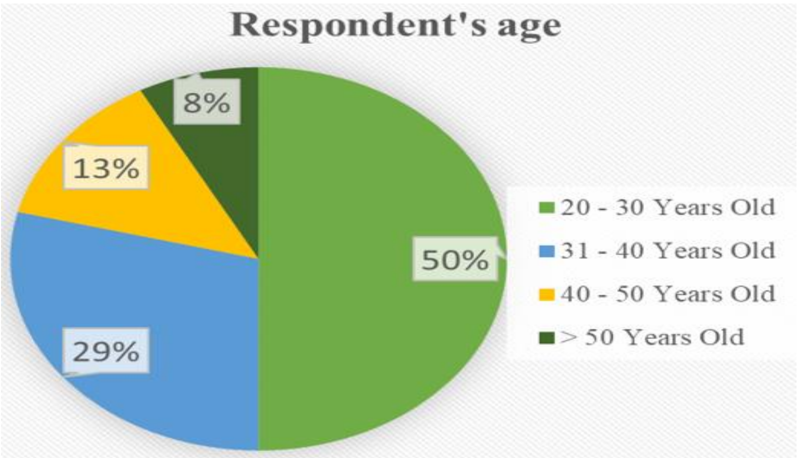

Fig. 2: Percentage of Respondent's Age

The age level of the respondents with the highest number was at the age of 20-30 years with a total of 50% (19 respondents). Then there is the age level of 31-40 years with a total of 29% (11 respondents), an age level of 40-50 years with a total of 13% (5 respondents), and an age level of more than 50 years with a total of 8% (3 respondents).

B. Reliability Test

This reliability test is used to test the consistency of the research instrument if the measurement of the research instrument is carried out more than once. It can be said to be reliable if the Cronbach Alpha value is more than 0.600 (Santoso, 2018).

Table 12: Reliability Test Result

No.	Work Item	Cronbach's Alpha	Information
I.	Preparation Structure Work	0,953	Reliable
II.	Reinforcing Work	0,953	Reliable
III.	Formwork Work	0,955	Reliable
IV.	Casting Work	0,955	Reliable
V.	Preparation Architecture Work	0,953	Reliable
VI.	Wall Work	0,953	Reliable
VII.	Ceiling Work	0,954	Reliable
VIII.	Floor Work	0,953	Reliable
IX.	Preparation MEP Work	0,953	Reliable
X.	MEP Work	0,953	Reliable

C. IPA Method on Building Construction Work Components

In this analysis, the mapping of the value of interest and the application of the Components of Building Construction work to the quality of the work uses the IPA analysis method. To get the value of importance and application, use the results of the average score of the questionnaire assessment, then put it on the Cartesian diagram (Algifari, 2016).

- *Structural Work*

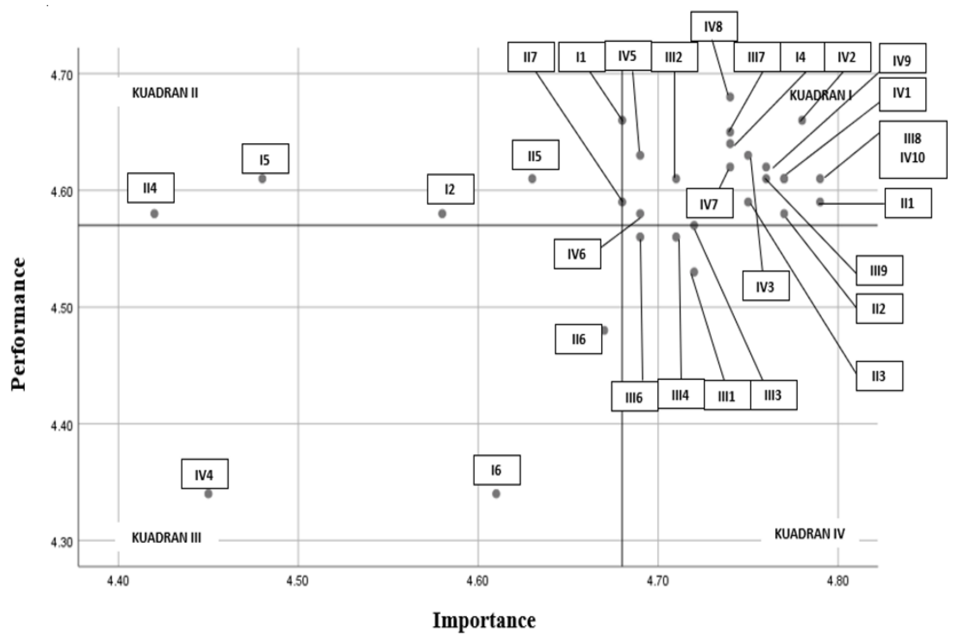

Fig. 3: Cartesian Diagram Structural Work

Based on these outputs, it shows that the majority of the subcomponents of the structural work component have good performance (Quadrant I). Meanwhile for subcomponents that have weaknesses (Quadrant IV), namely: (III1) Material specifications, (III4) Formwork support pillars, and (III6) Theodolite for formwork elevation.

➢ *Architectural Work*

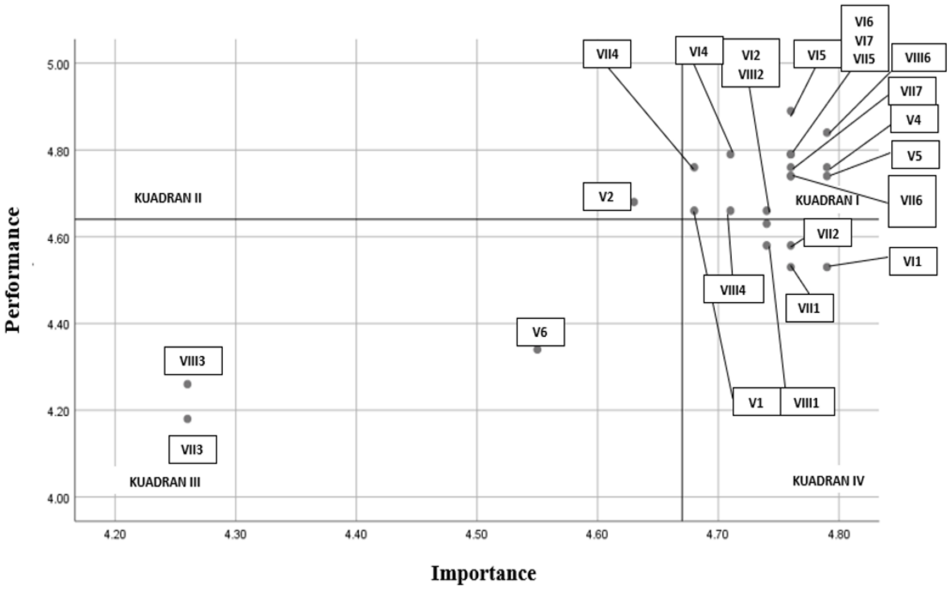

Fig. 4: Crtesian Diagram Architectural Work

Based on these outputs, it shows that the majority of the subcomponents of the architectural work component have good achievements (Quadrant I). Meanwhile for the subcomponents that have weaknesses (Quadrant IV), namely: (VI1; VII1; VIII1) Specifications for architectural work materials, (VI2; VII2) Brands of architectural work materials.

➢ *MEP Work*

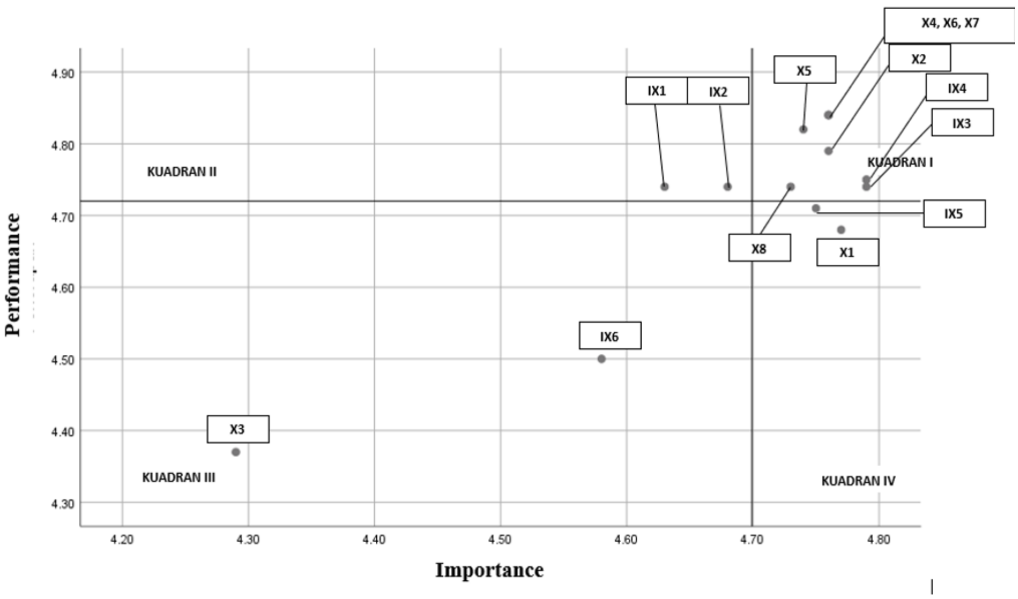

Fig. 5: Cartesian Diagram MEP Work

Based on these outputs, it shows that the majority of the subcomponents of the MEP Work component have good achievements (Quadrant I). Meanwhile, the subcomponents that have weaknesses (Quadrant IV), namely: (X1) MEP work materials.

D. SWOT Analysis

From the results of the IPA analysis, then make evaluations and recommendations related to the level of importance and application of building construction work to the quality of the work. The purpose of this analysis is to manage work indicators or subcomponents related to success and failure rates (David, 2014). Internal results (Strengths and Weaknesses) were derived from the analysis of IPA quadrants I and quadrant IV, while external results were obtained from the result of interviews with the respondents.

Table 13: SWOT Analysis

Internal / External	Strength	Weakness
	Personal protective equipment available. The implementation of structural, architectural, and MEP work is following procedures.	Structural, architectural, and MEP work materials
Opportunity	**SO Strategy**	**WO Strategy**
Structural, architectural & MEP work methods. Shop drawings have been checked.	Ensuring workers use PPE in carrying out work. Ensure shop drawings have been checked so that work can be carried out according to procedures	Check work materials, work methods, and shop drawings to prevent unwanted things from happening
Threat	**ST Strategy**	**WT Strategy**
Location of Structure, Architecture & MEP Work Number of Equipment available	Checking the location of the work before the execution of the work Ensure the required tools are available	Material checking can be mobilized to the job site without material damage

IV. CONCLUSION

- Based on the results of the IPA analysis, the majority of the work subcomponents have good performance (Quadrant I). While the sub-component of work that has weaknesses based on indicators (Quadrant IV) is the sub-component "Work materials used"
- Evaluation and recommendations related to the implementation of structural, architectural and MEP work components are as follows:
- ✓ SO Strategy: Ensuring workers use PPE in carrying out work.
- ✓ ST Strategy: Checking the location of the work before the execution of the work.
- ✓ WO Strategy: Check work materials, work methods, and Shop drawings to prevent unwanted things from happening.
- ✓ WT Strategy: Material checking can be mobilized to the job site without material damage.

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