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Factor Affecting Construction Quality On Construction Projects In Central Java With Analytical Hierarchy Process (AHP) Method

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ABSTRACT
Improvement in project construction should follow increasing quality construction so that project construction can be interpreted as successful if the project construction is the appropriate time, cost, and quality by planning. Research This aims To identify possible factors that influence quality construction using the Analytical Hierarchy Process (AHP), especially in construction projects in Central Java. Using questionnaires and Analytical Hierarchy Process (AHP) analysis for respondents who are experts in the construction sector, it was found that the factors that influence construction quality are money, materials, man, methods, and machines. Developing and implementing project construction: The project must already follow quality and proper construction quality in planning. Existence coordination and work are needed to carry out project construction so that quality construction is achieved by planning. Analysis with the AHP method is carried out for all respondents from each criterion, sub-criteria, and alternative, as well as to get a goal from quality construction. With Analysis of the Analytical Hierarchy Process, the results of each factor influencing construction quality from the highest to the lowest are man at 0.262, materials at 0.253, money at 0.231, methods at 0.142, and machines at 0.112.

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INTRODUCTION

Quality construction in the field over time is followed by improvement in quality work and completion of implementation projects. So that efficient and effective project construction located in Central Java can be handled well and done according to the plan. Service construction: Enough capacity to manage project construction in Central Java, in particular, and Indonesia, in general. Every construction work always puts quality as essential; with the proper quality work, construction can be finished according to the plan. Principle management quality construction emphasizes effort to reach quality construction by the requirements of moment planning. So, management quality in project construction can be interpreted as guarding quality work construction by the required standards so that customer satisfaction grows to bring power to the competition long-term.

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Implementation project construction is an essential thing that has been noticed and known, especially by the implementer construction in Central Java and Indonesia in general. Based on the survey and questionnaire results, many factors were found that cause quality construction not yet to be maximum or not enough by what was planned.

Literature Review

Construction

Project construction is a series of activities carried out only once, and its implementation is done in enough time . So, in a series of activities, there is a process of determining the source of existing power in the project that will result from activities in the form of buildings (Ervianto, 2005). Construction is the order/arrangement of elements of a building whose parts are positioned in a particular position by its function. So that construction can imagined like building multi-story, bridge , dam , dam, road highway , building irrigation , airports , etc. (Hafnidar , A. Rani, 2016).

Quality Management

In principle, management quality in service construction is achieved by conforming the work results submitted by the provider service contractors to the desired *owner* or owner project. Factors that become material considerations For guard quality construction in project construction area lack of mastery power experts, the quality of the material is not good, wrong estimate or not enough right, and less appropriate in management project time implementation. One of the causes of quality construction is a lack of work experience in procedures, materials, and equipment that are not adequate (Sari, 2011).

Analytical Hierarchy Process (AHP)

Analytical Hierarchy Process is the method used To finish a condition that level of complexity No regular, not structured in a number of the components with arrangement hierarchy, with give a mark in a way subjective about importance every variable, as well as determine which variables have the highest priority, so that it can be obtained maximum results. The Analytical *Hierarchy Process* is a good alternative in determining alternatives, variables, and assessors for results validation. Alternatives are implemented, but base comparison limitations will always shape single criteria. As for the advantages of the method *Analytical Hierarchy Process*:

a. Structure hierarchy as selected criteria until with the deepest sub-criteria and sub-sub-criteria.
b. Consider calculation validation to the tolerance limit of each criterion limit and alternative used.
c. Consider the calculation of the power stand from *the output* from validation.

So, the method *of Analytical Hierarchy Process* (AHP) is a method of Decision Support Systems (*Decision Support Systems*) that was developed (Thomas L. Saaty, 1994).

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Principle Work *Analytical Hierarchy Process* (AHP)

In completion of the method, there is There are three principles that need to be noted:

a. Compilation hierarchy

Hierarchy This is done with identification knowledge and also current information observed. Compilation This starts with complex problems parsed at each criterion until the hierarchy problem is arranged. Hierarchy problem formed with scheme picture following:

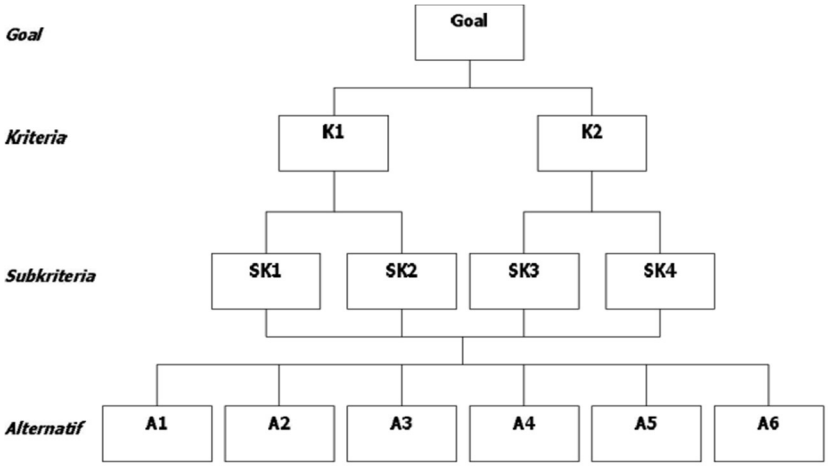

Figure 2. Structure Hierarchy in *Analytical Hierarchy Process*
Source. Thomas L. Saaty, 1994

Assessment at each hierarchy level is graded through pair comparison, with a scale rating from 1 to 9. Slaka 1 to with 9 sets as consideration and comparison partner elements at each level of the hierarchy; some elements are at the top level. This is a table scale evaluation to distinguish between relationships in elements and I of each level.

Table 1. Assessment Scale

Intensity of Interest	Information
1	Second element: The same importance
3	The one element is more critical than the other elements
5	The one element more important than the other
7	One element is more critical than the other
9	One element is more essential than the other
2, 4, 6, 8	Values between two values adjacent considerations.

Source : Thomas L. Saaty, 1994

Comparison in pairs This is done in an A matrix, and the matrix is a table for comparing element One with element other in every specified criterion. Matrix This describes in a way unique in prioritizing each other dominate between One element and element other.

b. Determination priority

At each level of the hierarchy, it is necessary to compare in pairs (*pairwise comparisons*). Determine priority. To determine comparison in pairs in each element in each criterion at

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level hierarchy set with determining element in pairs. Calculation comparison in pairs starts with the element level lower to the top hierarchy (*goal*) for comparison.

c. Validation sensitivity.
Every element is grouped logically and appropriately with logical criteria, whereas validation sensitivity is determined to obtain valid results using the *Analytical Hierarchy Process* (AHP) method.

METHODS

Research methods

Research data used To analyze factors that influence quality construction on the project construction in Central Java is using the *Analytical Hierarchy Process*. Questionnaire This is done For exact respondents in his field. Identification factors that influence quality construction in project construction in Central Java are with distribution questionnaire then processed and studied literature based on the results study previous—processed data from the questionnaire using the *Analytical Hierarchy Process,* which then validation test was conducted.

Data Analysis Techniques

Analysis conducted in the study This is an analysis of descriptive and *Analytical Hierarchy Process (AHP)* methods. A descriptive analysis was used to present the summary results *survey*, while *the analytical hierarchy process* was used to determine priority policy in influencing factors of quality construction.

RESULTS AND DISCUSSION

The results and discussion can display data in tables and images. Related references must support results or can be compared with previous research. In the analysis, factors affecting quality construction in research are based on criteria *such as money, materials, men, methods, and machines*. The stages of the AHP usage process generally consist of 5 stages, including:

1. Structure the problem into a hierarchy. Complex issues can be adequately resolved by structuring decision criteria into a hierarchy.
2. Incorporating the opinions of the parties involved into a pairwise comparison of the level of importance of the factors into a hierarchy. For this reason, the involvement of various parties is necessary in the decision-making process through:
   a. Consensus means encouraging a group to produce an opinion through a group discussion.
   b. Calculate the geometric mean to bring individual opinions together against group opinions.
   c. Calculating a weighted average combines the opinions of contributing parties with different weights.

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3. Assigning a numeric value to each subjective consideration. This is done as a benchmark for quantifying the consideration using a rating scale for pairwise comparison between activities.
4. Synthesizing the results. Opinions given numerical figures will be used as material to be processed with a specific procedure to become weights between factors.
5. Conduct sensitivity analysis of results to changes in considerations.

Analytical Hierarchy Process Model

Based on the 20 identified factors that influence construction quality in construction projects in Central Java, the following are:
M1 = tribe high bank interest
M2 = inflation
M3 = transparency of funds
M1 = quality power expert
M2 = facilities obtained For support work
M3 = amount of power Work
M4 = selection power Work
M5 = experience Work
M1 = material quality
M2 = schedule material delivery
M3 = nature special For material application
M4 = needs design
M5 = material availability as per planning
M1 = consider factor security
M2 = selection of the method used
M3 = consider cost and time
M4 = characteristics location project
M1 = selection equipment
M2 = availability tools used
M3 = price rent high tool
Identification results of the design questionnaire were then done using 20 factors as material questions. Here is the normalization matrix comparison with the method *Analytical Hierarchy Process* in Table 2.

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Table 2. Normalization Matrix Comparison

Kriteria	*money*									*man*									*materials*									*methods*									*machines*								
	Rs1	Rs2	Rs3	Rs4	Rs5	Rs6	Rs7	Rs8	Rs9	Rs1	Rs2	Rs3	Rs4	Rs5	Rs6	Rs7	Rs8	Rs9	Rs1	Rs2	Rs3	Rs4	Rs5	Rs6	Rs7	Rs8	Rs9	Rs1	Rs2	Rs3	Rs4	Rs5	Rs6	Rs7	Rs8	Rs9	Rs1	Rs2	Rs3	Rs4	Rs5	Rs6	Rs7	Rs8	Rs9
money	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	2,000	2,000	1,000	3,000	0,333	1,000	0,500	0,333	0,333	1,000	2,000	2,000	2,000	1,000	0,333	0,500	0,500	1,000	5,000	0,170	3,000	3,000	0,500	2,000	2,000	0,500	2,000	3,000	3,000	2,000	5,000	2,000	2,000	2,000	2,000	2,000
man	0,500	0,500	1,000	0,333	3,000	1,000	2,000	3,000	3,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	3,000	0,140	2,000	3,000	3,000	3,000	3,000	3,000	3,000	0,500	0,500	3,000	3,000	4,000	2,000	3,000	4,000	4,000
materials	1,000	0,500	0,500	0,500	1,000	3,000	2,000	2,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	3,000	0,170	2,000	3,000	3,000	3,000	3,000	3,000	3,000	0,500	0,500	3,000	2,000	3,000	3,000	3,000	3,000	3,000
methods	0,200	6,000	0,333	0,333	2,000	0,500	0,500	2,000	0,500	0,333	6,000	0,500	0,333	0,333	0,333	0,333	0,333	0,333	0,333	6,000	0,333	0,333	0,333	0,333	0,333	0,333	0,333	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	0,500	6,000	3,000	0,500	3,000	0,333	3,000	3,000	0,500
materials	0,333	0,333	0,500	0,200	0,500	0,500	0,500	0,500	0,500	2,000	2,000	0,333	0,333	0,250	0,500	0,333	0,250	0,250	2,000	2,000	0,333	0,333	0,500	0,333	0,333	0,333	0,333	2,000	0,170	0,333	2,000	0,333	3,000	0,333	0,333	0,333	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

Source: Data Processing, Author, 2024

Based on the results calculation ratio consistency (CR), you get a CR of 0.7% (CR = CI/RI), so the CR is more minor, 0.1 or 10%, then conclude that the data is consistent and accounted for. Next, the calculation matrix is made for every criterion and matrix. The alternative Data processing results will use the *Analytical Hierarchy Process,* and then we can get order, not criteria and sub-criteria.

Validation of Analysis Method *Analytical Hierarchy Process* (AHP)

Validation results analysis factor affecting quality construction on the project construction with the use of method analysis *Analytical Hierarchy Process* (AHP) is carried out by representative Respondents. Validation This is done to know results from data analysis that has been done using the method The *Analytical Hierarchy Process* (AHP), which has more approach conditions. This data validation is carried out with method interview, from analysis criteria. The applied conditions are *money, man, methods, materials,* and *machines to determine implementation project construction.*

CONCLUSION

Based on data analysis and discussion, it can be concluded that the criteria used to determine the project construction quality in a way common in Central Java are *money, man, methods, materials,* and *machines*. Result of analysis *Analytical Hierarchy Process*, with order weight taken into account in factor determinant quality construction as follows: *man* as big as 0.262, *materials* of 0.253, *money* of 0.231, *methods* of 0.142, and *machines* of 0.112. Analysis results in *Analytical Hierarchy Process* The choice for quality construction is still awake in project construction according to planning. Validation results sensitivity For factors affecting quality construction, project construction is a matter of quality construction. It is essential to care for it, so quality construction must be quality-moment planning.

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