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Evaluation of the Accuracy of Cost Estimates of High-Rise Building Rehabilitation Projects Using Activity-Based Costing (ABC)

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Abstract: Multi-storey building rehabilitation projects have unique characteristics that differ from new construction projects, including the uncertainty of the existing building conditions, the complexity of activities, and the potential for design changes during implementation. In the context of projects that use public budgets, such as the East Kalimantan Provincial BAZNAS and MUI Building Rehabilitation Projects funded through the 2023 Provincial Budget, accurate cost management is very important to ensure efficiency, transparency, and accountability in the use of the budget. However, the commonly used cost estimation method is still volume-based, which is less able to represent the complexity of the actual cost in rehabilitation projects. Therefore, this study aims to evaluate the accuracy of estimated costs for multi-storey building rehabilitation projects using the Activity-Based Costing (ABC) method, which is able to allocate costs based on activities. This study uses a quantitative descriptive approach, with the main data in the form of an engineer estimate document worth Rp 952,982,000.00. Project activities are classified into nine main categories: SMK3, preparation, demolition, architectural work & finishing on each floor, concrete & leatering, and MEP (addition of generator and electrical installations). The results of the analysis show that the architecture & finishing activities absorb almost 70% of the total costs, while MEP contributes about 10-12%, and additional structural work by 11%. The application of the ABC method provides a more accurate and transparent picture of the distribution of costs between activities, so that it can help project managers in developing more realistic budget planning, identifying high-risk activities, and optimizing cost control. In addition, the ABC method also supports accountability in regional budget management, in accordance with the mandate of Government Regulation No. 12 of 2019. Thus, this method is recommended to be applied more widely to government building rehabilitation projects.

Keywords: Cost Estimation; Activity-Based Costing (ABC); Building Rehabilitation; Cost Management; Budget Accountability

1. Introduction

In the construction industry, cost management is a crucial element that determines the success of a project, especially in multi-storey building rehabilitation projects that have unique characteristics compared to new developments. Rehabilitation projects are faced with various challenges such as the uncertainty of existing building conditions, potential design changes, and the complexity of inter-disciplinary coordination (Ayu et al., 2022; Prahasto et al., 2021). In the government environment, such as the BAZNAS Building Rehabilitation project and the East Kalimantan Provincial MUI, accurate cost management is becoming

increasingly important because the use of public funds must meet the principles of efficiency, effectiveness, and accountability (Government Regulation No. 12 of 2019). However, studies show that many rehabilitation projects still use traditional cost estimation methods which have the potential to result in bias in budget planning ((Duverlie & Castelain, 1999; Shrestha et al., 2025; Sutrisno et al., 2021).

Traditional cost estimation methods are generally based on the volume of work without considering the actual activities that occur in the field (Abizar et al., 2025; Wibowo, 2025), so they tend to be less accurate for dynamic projects such as rehabilitation (Kerzner, 2019). This can lead to cost deviations between planning and realization, leading to overbudgeting or declining quality (Project Management Institute, 2021). Activity-Based Costing (ABC) offers a more adaptive approach, by allocating costs based on actual activities, thus providing a more transparent and measurable picture of the composition of project costs (Cooper & Kaplan, 1991; Aljohani et al., 2017). Although this method has been widely applied to manufacturing industrial projects and the construction of new buildings, research on the application of ABC in government building rehabilitation projects in Indonesia is still relatively limited.

Based on this background, this study aims to apply the ABC method to the BAZNAS and MUI Building Rehabilitation projects of East Kalimantan Province, as a case study of multi-storey building rehabilitation projects funded by the Provincial Budget. This research is expected to make a practical and theoretical contribution by: 1) evaluating the accuracy of cost estimates based on activities; 2) identify dominant activities that have the potential to cause cost deviations; and 3) provide recommendations for improved planning and cost control on similar projects in the future. Thus, this study is expected to strengthen the literature on the application of Activity-Based Costing in construction project cost management, especially in the government building rehabilitation sector (Radujković & Sjekavica, 2017; PMI, 2021).

2. Materials and Methods

2.1. Research Location

This research was carried out on the East Kalimantan Province BAZNAS and MUI Building Rehabilitation project located on Harmonika Street, Samarinda City. This project is funded through the 2023 East Kalimantan Provincial Revenue and Expenditure Budget (APBD), with a total budget of IDR 952,982,000.00.

2.2. Data Source

Data Sources The main data used in this study is the project engineer estimate document which consists of details of the cost of each type of work, including preparation, demolition, architecture, finishing, mechanical-electrical (MEP) work, as well as supporting activities such as SMK3 and general preparation. In addition, a literature review was conducted to support the validity of the analysis. The data used in this study include:

1. Primary Data
   - Official engineer estimate document of the rehabilitation project.
   - Structure the details of the work based on the planning documents.
2. Secondary Data
   - A literature review on the Activity-Based Costing (ABC) method in the context of construction cost management.
   - References from books and journals on project management, building rehabilitation, and cost estimation.

2.3. Activity-Based Costing (ABC)

Activity-Based Costing (ABC) is a cost calculation method that allocates costs directly to the activities that occur in the project (Rexhepi et al., 2024; Wahidi et al., 2021). In contrast to traditional estimation methods that are based on the volume of work, the ABC calculates costs based on actual activities, making it more accurate in reflecting the cost needs of complex projects such as the rehabilitation of multi-storey buildings (Cooper & Kaplan, 1991; Elhegazy et al., 2022; Grecchi, 1863).

The steps to implement ABC in this study include (Galingging et al., 2025):

1. Identify Key Activities
   Determine the main activities of the project based on the engineer estimate document (e.g. demolition, architectural work, finishing, MEP, support work).
2. Cost Allocation per Activity
   Allocate costs from the engineer estimate to each of the identified activities.

3. Cost Contribution Percentage Calculation
   Calculate the percentage of contribution of each activity to the total project budget, with the formula: Activity Cost Percentage = (Total Project Budget Activity Cost)×100%
4. Cost Distribution Analysis
   Analyze the results of the cost distribution to evaluate:
   a. Conformity of the initial estimate
   b. Potential cost deviations
   c. Activities that are at high risk of overbudget

The ABC method was chosen in this study because of its ability to provide more transparent and accurate cost information, which is urgently needed in the cost management of multi-storey building rehabilitation projects.

3. Results

This study analyzes the accuracy of the estimated cost of the BAZNAS and MUI Building Rehabilitation Projects in East Kalimantan Province with the application of the Activity-Based Costing (ABC) method. The engineer estimate data of IDR 952,982,000.00 is classified into nine main activities. The results of the cost distribution are shown in Table 1. and visualized in Figure 1.

Table 1. Distribution of Costs By Activity

No	Main Activities	Estimated Cost (Rp)	Percentage (%)
1	SMK3	8.850.000	0,93 %
2	Preparation	6.725.000	0,71 %
3	Demolition	5.520.660,50	0,58 %
4	Frames, Partitions, Sanitation, Electrical 1st Floor	202.444.307,43	21,23 %
5	1st Floor Painting	112.645.277,21	11,82 %
6	2nd Floor Work (all items)	202.831.655,45	21,28 %
7	3rd Floor Work (all items)	147.858.267,39	15,52 %
8	Concrete and Slag	107.035.637,94	11,23 %
9	Addition of Generator Installation	64.852.000	6,81 %
	Total	**Rp 952.982.000**	**100 %**

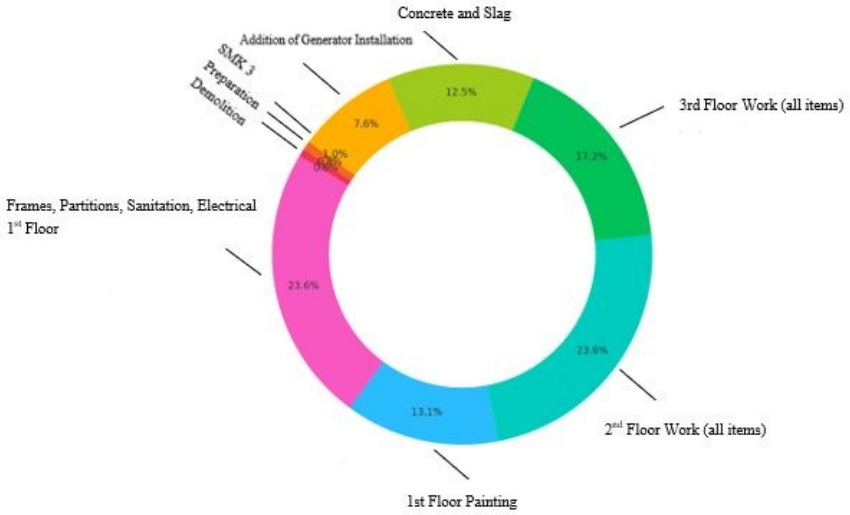

Figure 1. Project Cost Distribution by Activity (ABC Method)

From the results of the analysis, it can be seen that the architecture & finishing work (1st, 2nd, 3rd floors, painting) cumulatively absorbs about 69.85% of the total project cost. Meanwhile, structural work (concrete & letering) contributed 11.23%, and MEP (addition of generator & electrical installations) accounted for about 10-12%. As for supporting activities such as SMK3, preparation, and dismantling, although the portion is small (<2%), it remains a mandatory cost component for compliance and smooth project management.

4. Discussion

The results show that the Activity-Based Costing (ABC) method is able to provide a more accurate picture of the cost composition of high-rise building rehabilitation projects, where architecture & finishing activities absorb almost 70% of the total cost, while MEP contributes about 10-12%, and supporting activities still have a strategic role despite a small portion. These findings are consistent with the literature (Ayu et al., 2022; Sutrisno et al., 2021; Cooper & Kaplan, 1991; PMI, 2021) which states that rehabilitation projects have a high cost complexity between activities, so that an activity-based approach is more appropriate than traditional volume-based estimates. The application of ABC in this study has been shown to assist project managers in identifying dominant and risky activities, as well as providing a solid foundation for more realistic budget planning, proportionate contingency allocation, and more effective cost control. In addition, the implementation of ABC also supports the principle of accountability in the use of regional budgets, in line with the mandate of Government Regulation No. 12 of 2019, so this method is recommended as an approach that can increase transparency and efficiency of cost management in future government building rehabilitation projects.

5. Conclusions

This study aims to evaluate the accuracy of cost estimates in multi-storey building rehabilitation projects using the Activity-Based Costing (ABC) method. The application of the ABC method in the BAZNAS Building Rehabilitation Project and MUI of East Kalimantan Province succeeded in revealing that architecture & finishing activities were the dominant cost component, followed by MEP and additional structural work.

These results suggest that traditional volume-based estimation approaches tend to be insufficiently accurate for rehabilitation projects that are complex and dynamic in nature. With ABC, project managers can identify high-cost activities, prioritize cost control, and craft more realistic and accountable budget planning.

In addition, the implementation of ABC also supports the principle of good governance in regional budget management as stipulated in Government Regulation No. 12 of 2019. Therefore, the ABC method is recommended to be adopted more widely in the cost management of government building rehabilitation projects, in order to improve efficiency, transparency, and financial accountability in the construction sector.

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