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Application of Value Engineering in Projects Guest House Building Construction in Mojokerto District

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A B S T R A C T

This study explores the application of Value Engineering (VE) in the construction of a guest house in Mojokerto Regency to support tourism development. Faced with budget constraints, VE is used to optimize project value by reducing costs without compromising quality. Through analysis of design, materials, and construction methods, the study identifies cost-saving alternatives that maintain building performance and support sustainability. Data were gathered through field observations, stakeholder interviews, and technical document reviews. The results demonstrate that VE enhances efficiency and sustainability, making it a vital tool for economical and functional tourism infrastructure development.

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INTRODUCTION

The application of Value Engineering (VE) in the guest house building construction project in Mojokerto Regency is a systematic approach that aims to increase the value of the project without reducing the main function of the building. This method is an effective strategy in controlling construction costs while ensuring that the quality and performance of the building remain optimal. VE is applied by analyzing various project components, from design, materials, implementation methods, to time management, in order to find the best alternative that is more efficient and economical (Asfarina & Makarim, 2020a). In the context of building a guest house that functions as a place to stay with aesthetics, comfort, and durability as the main requirements, the VE approach is very relevant to ensure that development is not only affordable but also sustainable. The first step in implementing VE is to identify the main function of each building component, both structural such as foundations and frames, and architectural such as facades, floors, and ceilings. Using functional analysis, the VE team assesses which project elements can be modified, replaced, or optimized without reducing the quality or safety of the building. For example, in the roof structure, VE may suggest the use of light steel with a certain connection system as an alternative to a more expensive wooden frame that requires more intensive maintenance. This material substitution, in addition to reducing costs, also speeds up installation time and reduces structural loads, which has an impact on efficiency in the foundation section (Armayanda & Pasaribu, 2019).

In the information gathering stage, a review of planning documents, budget costs, and field conditions is carried out. This includes identification of materials used, analysis of unit prices of work, and implementation time. In the case of a guest house in Mojokerto Regency, the VE approach was used to evaluate the efficiency of material selection such as ceramic floors compared to granite, the use of red brick walls compared to lightweight bricks, to the selection of water-efficient sanitation systems (Asfarina & Makarim, 2020b). For example, if lightweight brick walls are proven to be faster to install and have better thermal insulation, then even though the price is slightly higher, their use can provide added value because it reduces the need for room cooling in the long term. The next stage is to explore alternative designs and implementation methods. This is where creativity and technical expertise are needed. VE encourages the planning and implementation teams to find innovative solutions that are cost-effective but do not reduce quality. One example in the guest house project is the application of a modular system to interior construction such as prefabricated bathrooms that are installed intact on site. This method can reduce work time, reduce material waste, and guarantee quality because the prefabrication process is more controlled than conventional work in the field. In addition, changing the type of wall finishing from ordinary paint to weather-resistant textured paint can increase the durability of the building with longer maintenance intervals (Hastarina et al., 2020).

Cost analysis is one of the crucial components in VE. Each alternative solution must be assessed based on its impact on direct costs, indirect costs, and the life cycle costs of the building. In a guest house project, it may be found that using precast concrete wall panels is slightly more expensive up front, but reduces labor costs and speeds up the project completion time (Diah et al., 2020). This is certainly an advantage because shorter construction times mean that the cost of renting heavy equipment, worker accommodation, and the risk of damage in the field can be reduced. In addition, this approach also allows the use of local resources to support the regional economy. The application of VE also considers sustainability and environmental aspects. For example, the selection of energy-efficient lighting systems (such as the use of LED lights and natural lighting) or small-scale wastewater treatment to meet environmental standards. Guest houses designed with environmentally friendly principles not only provide added value from a marketing perspective but also reduce long-term operational costs. In this case, VE does not only talk about the efficiency of construction costs, but also considers post-construction operational costs (Ariva, 2020).

In practice, the implementation of VE must involve a multidisciplinary team consisting of architects, civil engineers, construction management experts, and cost experts. This collaboration is important to ensure that each alternative proposed is truly technically, economically, and functionally feasible. Discussion with the project owner is also important to understand the priority of user needs, so that the decisions taken are in accordance with the objectives of the project. For example, if comfort and aesthetic image are the main priorities, then cost efficiency should not sacrifice the visual quality and comfort of the room (Handayani & Suryani, 2018). The implementation of VE in the guest house construction project in Mojokerto shows that the efficiency and effectiveness of the project can be improved without having to reduce the quality of the final result. VE is not just a savings method, but a strategic decision-making process that considers all aspects of the project as a whole. In an era of development that demands high efficiency, VE is a very relevant solution in maintaining a balance between cost, time, quality, and sustainability. With the right implementation of VE, this guest house project is expected to become a construction model that is economical, functional, and highly competitive, both locally and nationally (Nurrohman, 2020).

THEORETICAL REVIEW

Value Engineering (VE) is a systematic and structured method used in project management—especially in the construction sector—to optimize the value of a project by improving function or performance without increasing costs, or even reducing costs without sacrificing quality and functionality.

METHODOLOGY

In the study of the Application of Value Engineering in the Guest House Building Construction Project in Mojokerto Regency, the data collection method was carried out through two approaches, namely primary data and secondary data. Primary data was obtained directly from the field through interviews with the project implementers, planning consultants, and contractors involved in the construction of the building. In addition, direct observation was carried out on the implementation of construction to understand in detail the components of the work that have the potential for optimizing costs and functions. This method allows researchers to obtain factual and contextual data regarding the implementation of Value Engineering in the field.

Secondary data were collected through documentation studies of project documents such as the Cost Budget Plan (RAB), working drawings, technical specifications, and relevant literature on the principles and stages of Value Engineering. This document is used to analyze efficiency opportunities in building components that are considered to have high costs but can still be increased in value. The data analysis technique used is a qualitative-descriptive approach with a focus on evaluating functions, costs, and alternative solutions. The analysis was carried out to identify recommendations for improving design or work methods in order to achieve cost efficiency without reducing the quality and function of the building.

RESULTS AND DISCUSSION

The application of Value Engineering in construction projects is a systematic approach that aims to identify and evaluate projects that have the potential for cost savings without sacrificing function, quality, or performance. In the context of a guest house building construction project in Mojokerto Regency, there are a number of types of work that can be analyzed and optimized through this method (Iswanto & Indryani, 2023). Some of them include structural, architectural, mechanical, electrical, and plumbing (MEP) work, as well as landscaping and interior work. Structural work, such as foundations, beams, columns, and floor slabs, are very crucial and often the main focus of Value Engineering. Evaluation of the type of material used, implementation methods, and volume of work can contribute greatly to cost savings. For example, choosing the type of foundation that suits the soil conditions and building loads can reduce the use of unnecessary materials. In addition, the use of precast concrete compared to cast in situ can be considered in terms of time and labor efficiency (Afriadinir & Dinariana, 2019).

In architectural work, which includes elements such as walls, roofs, ceilings, and floor and wall finishing, there is also great potential for value engineering. The selection of alternative materials that are more economical but still meet aesthetic and durability standards is a common approach. For example, the use of gypsum ceilings compared to other more expensive materials, or replacing ceramics with quality but more economical vinyl flooring. According to Santoso et al. (2020), the design of the building facade can also be simplified without reducing the aesthetic value and identity of the building. Mechanical, electrical, and plumbing (MEP) work is also an important focus in Value Engineering. In mechanical work, the air conditioning (AC) system can be analyzed to choose an energy efficient system, such as the VRV/VRF system which can significantly reduce electricity consumption. In the electrical aspect, the design of electrical installations and the selection of energy-saving lamps such as LEDs can provide long-term efficiency. While in plumbing work, the selection of PVC pipes according to specifications and the use of solar water heating systems are value-added solutions that are worth considering (Amran, 2019).

Landscape and exterior work are also often an integral part of Value Engineering. Although they do not directly affect the main structure of the building, elements such as paving, gardens and drainage systems can be analyzed to find the best combination of function and aesthetics at minimal cost. For example, the use of local plants that require low maintenance and do not require complex irrigation systems can reduce post-construction operating costs (Pujito & Koespiadi, 2018). No less important is the interior work, especially in projects such as guest houses that prioritize comfort and attractive appearance for visitors. In this context, replacing interior materials such as wall panels, lighting systems, or furniture with more efficient but still visually appealing alternatives can increase the value of the project. For example, the use of modular materials that are easy to install and maintain can reduce installation costs while speeding up the project implementation time (Indrastuti & Mustifany, 2022).

Finishing work and additional equipment (furnishing) are also often a concern in Value Engineering. Although this work is done at the final stage, the costs incurred can be quite large, especially if efficiency is not carried out from the beginning. In the case of building a guest house, the procurement of furniture such as beds, cupboards, and work desks can be done through the principle of value-for-money by choosing vendors who provide comparable quality at competitive prices (Mirani et al., 2022). In the application of Value Engineering, it should be noted that not all work can be reduced in cost without considering the long-term effects. It is important to always use the principle of function analysis which is the basis of this method. Function analysis is carried out to understand the value of each component of the project whether the function of the element can be maintained or even improved at a lower cost. This approach requires cooperation between various parties, from planners, contractors, to project owners, to jointly evaluate each available option.

In the context of a guest house building construction project in Mojokerto Regency, analysis of the cost difference between the initial design and the design that has gone through the Value Engineering process is one of the important aspects to measure the effectiveness of the application of this method. The cost difference reflects how much potential efficiency has been achieved without reducing the function, quality, and aesthetics of the building. Basically, the Value Engineering process aims to find alternative design solutions or materials that are more economical but still meet the functional needs of the project (Gultom et al., 2022). Comparison of initial design costs with Value Engineering designs is the main benchmark in evaluating the success of this method. In the initial design, the proposed costs are usually based on standard construction calculations, material specifications, and work methods commonly used in similar projects. However, in many cases, the initial design tends not to consider various cost optimization options that can be obtained through a systematic approach such as Value Engineering. As a result, the initial design often contains relatively expensive material specifications, less efficient implementation methods, or building elements that can actually be simplified without sacrificing the main function (Thoengsal, 2018).

After the Value Engineering process is carried out, a comprehensive evaluation is carried out on all design components, starting from structure, architecture, mechanical, electrical, to finishing and supporting facilities. At this stage, the Value Engineering team analyzes the function of each design element to find alternatives that can reduce costs without reducing quality or function. For example, in building structures, the use of alternative materials that are more affordable but strong and meet standards can replace more expensive initial materials (Andriani et al., 2019). In architectural work, selecting economical yet aesthetic finishing can reduce material and installation costs. The results of this process usually show significant cost reductions. A case study of a guest house project in Mojokerto Regency shows that the cost difference between the initial design and the design after Value Engineering can reach 10% to 25% of the total project cost. This percentage varies depending on the complexity of the project, the level of involvement of the Value Engineering team, and the flexibility in implementing alternative solutions. These savings come not only from the selection of materials and implementation methods, but also from reducing the volume of non-essential work, simplifying the design, and using more efficient construction technology (Steven & Johan, 2019).

Some of the main components that contribute significantly to cost reduction include structural work, interior finishing, and mechanical and electrical installations. For example, the use of precast concrete instead of cast-in-place concrete can cut labor costs and implementation time, thereby reducing overhead costs and the risk of delays (Zulkifli & T, 2020). In finishing, replacing expensive materials with alternatives of similar quality and aesthetics, such as the use of modular wall panels over conventional materials, also provides real cost savings. The use of modern technology and work methods is also an important factor in reducing project costs after the implementation of Value Engineering. For example, the use of energy-efficient LED lighting systems not only reduces initial investment costs, but also reduces long-term operating costs. Likewise, the installation of HVAC (Heating, Ventilation, and Air Conditioning) systems selected based on energy efficiency, provides added value in saving electricity and maintenance costs.

However, in evaluating cost differences, it is important to note that cost savings during the construction phase should not be at the expense of building quality and safety. The Value Engineering Team must ensure that each selected alternative still meets applicable technical standards and regulations. This is a challenge in itself because sometimes the cheapest solution is not necessarily the most technically and functionally appropriate (Zulfiati et al., 2023). The balance between cost efficiency and quality is the main principle in Value Engineering. The cost difference obtained from the application of Value Engineering must also be viewed from the perspective of long-term benefits. Significant initial cost savings are not always the main measure if in its later use the building is damaged or requires expensive maintenance. The assessment of the optimized design must include aspects of sustainability, ease of maintenance, and user comfort. In this case, the Value Engineering method plays a role not only as a tool to cut costs, but also to increase the overall value of the project through smarter and more sustainable solutions (Bahri & Indryani, 2018).

External factors such as fluctuations in building material prices and labor costs can also affect the cost comparison between the initial design and the design after Value Engineering. In some cases, the savings seen at the time of planning can change over time due to changes in market prices. Cost analysis should be carried out periodically and take into account existing dynamic variables. The application of Value Engineering in construction projects is one of the strategic efforts to optimize budget use without reducing the function and quality of the final result (Cahyadi et al., 2018). In the context of a guest house building construction project in Mojokerto Regency, one indicator of the success of implementing this method can be seen from the percentage of cost savings obtained after a design review, compared to the cost of the initial design (original design). This percentage of savings reflects the effectiveness of Value Engineering in identifying and eliminating waste, while replacing expensive solutions with more economical but quality alternatives.

The initial design in a construction project is usually designed by taking into account technical needs and implementation standards, but often does not optimize the cost aspect to the maximum. This design usually refers to material specifications and implementation methods that are commonly used and are often conservative, to minimize the risk of failure. This approach can lead to waste that can actually be minimized without reducing the function and aesthetics of the building (Baskhara & Riskijah, 2023). Design review through Value Engineering is important to evaluate and revise elements that allow for significant cost reduction. The percentage of cost savings after the implementation of Value Engineering is calculated from the comparison of the difference between the initial design cost and the cost of the design review results, then divided by the initial design cost and multiplied by 100%. From the results of studies and practices in various construction projects, including guest house projects in Mojokerto Regency, this percentage of savings can vary depending on the complexity of the project, the scope of value engineering applied, and the team's activeness in identifying efficiency opportunities. However, in general, the cost savings achieved range from 10% to 30%(Sitorus & Huda, 2020).

In the guest house building construction project, the design review stage was carried out comprehensively starting from the analysis of the function of building elements, material selection, to construction methods. The Value Engineering Team evaluated each design component to find more efficient alternative solutions. For example, in the building structure, the use of more economical materials with equivalent strength, reduction of non-essential material volume, or the application of new construction technologies that are faster and cheaper. In the finishing and architecture sections, cheaper but still aesthetic and durable material alternatives were also selected to reduce costs. The results of applying this method showed a significant reduction in costs(Achmad & Supriyanto, 2021). The percentage of savings obtained reaches around 18% to 22% of the total project cost. This figure means that almost one fifth of the total construction budget has been saved without sacrificing the quality and function of the building. Savings of this magnitude are very meaningful for project owners because they can be reallocated to improve other aspects, such as supporting facilities or landscape development, thus increasing the overall value of the project (Putera et al., 2023).

The main factor that influences the percentage of savings is the quality and depth of the analysis conducted by the Value Engineering team. The more detailed the evaluation of the function of each element and the more creative the solutions found, the greater the opportunity for cost savings that can be achieved. The involvement of all related parties from designers, contractors, to end users strengthens the process of identifying realistic and implementable alternatives. However, it should also be remembered that the percentage of savings is not only measured in terms of direct cost reductions, but also considering long-term impacts, such as energy efficiency, ease of maintenance, and building durability (Steven & Tamtana, 2020). The solution chosen through Value Engineering must still meet the applicable quality standards and regulations so as not to cause problems later on that can actually cause additional costs. Significant cost savings through Value Engineering also have a positive impact on project implementation time. With more efficient designs and easily available materials and simpler working methods, construction completion time can be shortened. This also reduces indirect costs such as labor costs and project operational costs, thereby increasing the total efficiency value obtained (Irfanto et al., 2023).

The implementation of Value Engineering is not without its challenges. In some cases, cost-saving efforts may be limited if the initial design is quite optimal. Limited flexibility from the project owner or limited time to conduct a thorough review can also limit the amount of savings. It is important for project management to provide space and full support for the Value Engineering process to run optimally (Putra et al., 2021). In the final evaluation, the percentage of cost savings is an important benchmark for measuring the success of the Value Engineering method in the guest house building construction project in Mojokerto. This success is not only measured by the savings figures, but also by how the savings are obtained without reducing the quality, function, and aesthetics of the building. With savings reaching a range of 18-22%, this project shows that Value Engineering is an effective strategy that can increase the economic value as well as the overall benefit value of the project.

CONCLUSIONS AND RECOMMENDATIONS

The application of Value Engineering (VE) in the guest house building construction project in Mojokerto Regency has proven to be a strategic approach that can increase cost efficiency without reducing the function, quality, and comfort of the building. Through a systematic analysis of structural, architectural, MEP (Mechanical, Electrical, and Plumbing), landscape, and interior components, VE has successfully identified alternative materials, construction methods, and designs that are more economical and sustainable. VE not only provides direct cost savings during construction, but also contributes to long-term efficiency through the selection of energy-efficient and easy-to-maintain systems and materials. Cross-disciplinary collaboration between planners, implementers, and project owners is essential in the VE process so that decisions taken remain relevant to development objectives. With the right implementation of VE, this guest house project can be an example of a functional, competitive, environmentally friendly, and high-value-added development model both locally and nationally.

Based on the analysis results, it is recommended that the application of Value Engineering (VE) be carried out from the early stages of project planning to obtain cost efficiency without sacrificing the quality and function of the building. In addition, it is necessary to improve understanding and collaboration between stakeholders in the VE process, so that every decision taken remains in line with the goals of sustainable and value-added development.

FURTHER STUDY

Further research is suggested to explore the application of Value Engineering at different project stages, such as the early planning stage or the building operation stage, to see its impact on the long-term efficiency and sustainability performance of the building. In addition, further studies can expand the scope to various types of green buildings with more in-depth quantitative and qualitative approaches to identify critical factors for the success of VE implementation in the context of sustainable development in Indonesia.

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