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Value Engineering in Mutiara Gading Bekasi City Housing Project

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ABSTRACT

Value Engineering is a method or technique of cost control. This technique uses an approach by analyzing the value with its function where the process taken is to reduce cost reduction while still paying attention to its position. Housing prices have increased drastically yearly in the Mutiara Gading City housing project. Therefore, selecting construction materials is critical to efficient project planning. In the Mutiara Gading City housing project, there are several construction works, wall work, floor work, and sill and window work, one of the jobs with the highest cost so that it can do value engineering. This study aims to obtain alternative proposed materials and the best choices for wall, floor, sill, and window work. Therefore, Value Engineering is needed to eliminate unnecessary costs and effort. So that the value or price of the project can be reduced, in its application, Value Engineering consists of 4 stages, namely the information stage, the creative stage, the analysis stage, and the recommendation stage. The results showed that for wall masonry work, a savings of Rp. 369,203,509.67 or 24.31% of the initial cost was obtained for floor work, a savings of Rp. 39,304,125.00 or 8.60% of the initial cost, and obtained cost savings of Rp for work sills and windows. 22,082,604.07 or 6.51% of the initial cost. Of all the selected work items, a total savings of Rp. 430,590,238.74 or 7.01% of Rp. 6,139,876,202.60 total project cost, which includes 35 housing units.

Keywords: *Value engineering, housing project, cost model.*

Introduction

The need for proper housing is, of course, a must for every Indonesian citizen. Currently, the house not only functions as a place to live and shelter but has also become a symbol of social status. With the population, of course, the need for housing or housing also increases[1][2]. With the increasing demand for dates, many property developers are building housing estates. Housing prices have increased drastically yearly in the Mutiara Gading City housing project[3][4]. Therefore, selecting materials in building construction is essential for efficient project planning. In the Mutiara Gading City housing project, there are several construction works, wall work, floor work, and sill and window work is one of the jobs that need to be done. It has the highest cost so that it can do value engineering[5][6][7].

This study aims to obtain alternative proposed materials and the best choices for wall, floor, sill, and window work. Therefore, Value Engineering is needed to eliminate unnecessary costs and effort[8][9]. So that the value or price of the project can be reduced, in its application, Value Engineering consists of 4 stages, namely the information stage, the creative stage, the analysis stage, and the recommendation stage[10].

Research Methods

Research Methods

The method used in the research of the application of value engineering to this project uses quantitative and qualitative types of research. Quantitative research is an effort of a researcher to find knowledge by giving Data in the form of numbers. Put, quantitative research is scientific research systematically compiled against parts to find the causality of interrelationships[11][12][13].

Qualitative research can be understood as a research procedure that utilizes descriptive data in the form of written or spoken words from people and actors who can be observed and selected case study research, case study research is a research method to reveal a particular case that is more leads to the results of the study. Case study data can be obtained from all parties through interviews, observation, participation, or documentation[14][15].

Research Location

This research is located in Perumahaan Mutiara Gading City in Setia asih Village, Tarumajaya District, Bekasi Regency, West Java

Data Collection

Based on the source and how to obtain data, the data collection in this study is divided into 2, namely:

1. Primary Data

Primary Data is the original data in the field, and only researchers have it. Primary data is obtained by asking directly to related parties, or it can be by interviewing. It can be in the form of opinions /suggestions of people individually or in groups.

2. Secondary Data

Secondary Data that is, data that is not obtained directly from the source data but is obtained directly from the related company. This data is in the form of technical drawings of the project, such as drawings of project plans in the format of Autocad and hardcopy and RAB data.

Research Phase

The research stage is the level, which often can also be called the level of research activity. Where the steps exist, have processes carried out in a structured, sequential, standard, logical, and systematic manner[16][17][18].

Research Analysis Phase

In researching the application of value engineering to this project, a method or technique of Value Engineering Work Plan (Value Engineering) based theory is used, namely a value engineering work plan consisting of the information stage, creative stage, analysis stage, and stage Recommendations[19][20][21].

Flow Research

The method used in the research on applying value engineering in this project uses quantitative and qualitative research types. Quantitative research is an attempt by a researcher to find knowledge by providing data in the form of numbers. In simple terms, quantitative research is scientific research arranged systematically in parts to find causality[22].

Qualitative research can be understood as a research procedure that utilizes descriptive data in the form of written or spoken words from people and actors who can be observed and selected case study research, case study research is a research method to reveal specific cases that are more directed at research results. Case study data can be obtained from all parties through interviews, observation, participation, or documentation[23], [24].

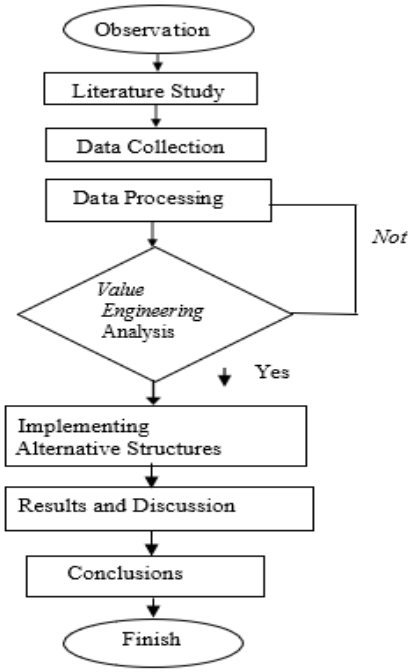

Figure 1 Research Flow

Results and Discussion

Identification of high-cost work items information stage. Identifying high-cost work items determines which work items have high costs. In this case, the method is to create a project cost chart (cost model). Follow the rules of prohibition in this journal, which 1. Introduction, 2. Research Methods, 3. Results and Discussion, 4. Conclusion.

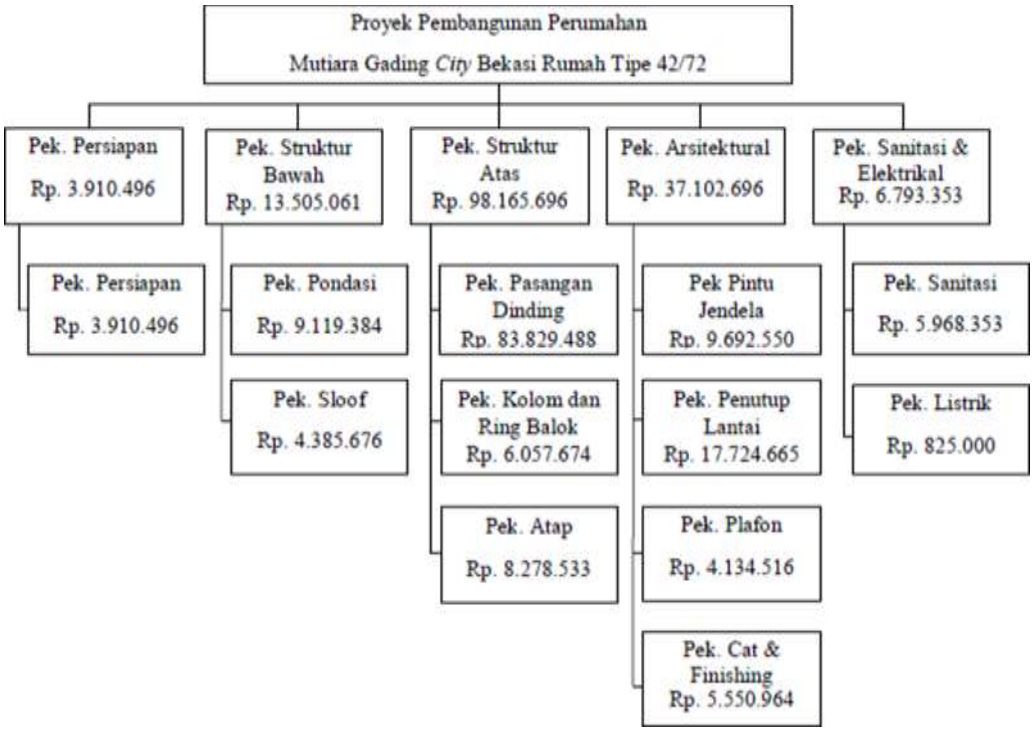

Figure 2 Costmodel

Furthermore, it uses a breakdown cost model by sorting work items from the highest cost to the lowest level and then presenting cooperatively.

Table 1 Breakdown

No	List of Structural Works and Architectural	Price (Rp)		Percentage (%) Price	80 % Border
1	Pek. Wall Pairs	IDR	83,829,488.83	56,35%	80
2	Pek. Floor Coverings	IDR	17,724,665.78	11,91%	80
3	Pek. Sills & windows	IDR	9,692,550.00	6,51%	80
4	Pek. Foundation	IDR	9,119,384.95	6,13%	80
5	Pek. Roof	IDR	8,278,533.60	5,56%	80
6	Pek. Columns and Beams	IDR	6,057,674.14	4,07%	80
7	Pek. Sloof	IDR	4,385,676.69	2,95%	80
8	Pek. Ceiling	IDR	4,134,516.00	2,78%	80
9	Pek. Paint	IDR	3,201,880.00	2,15%	80
10	Pek. Finishing	IDR	2,349,084.60	1,58%	80
	Total Cost	**IDR**	**148,773,454.59**	100,00%	

From the breakdown cost model, an analysis was carried out to determine the limit of the highest-cost items using the legal basis of the Pareto distribution.

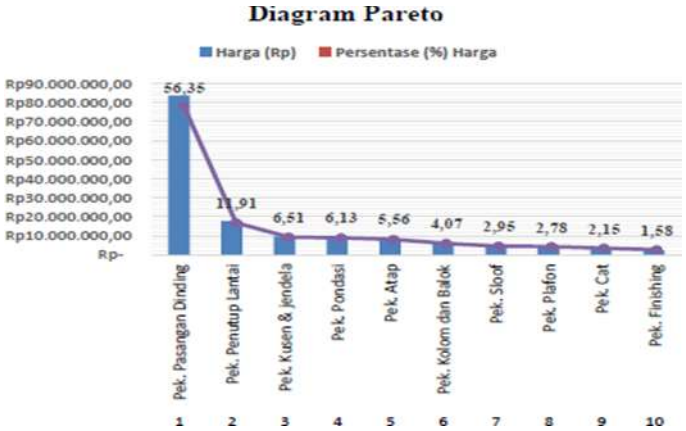

Figure 3 Pareto diagram

Pareto law applies that 80% of the total cost is contained by 20% of its components. From the distribution of the expenses in figure 4.2 above, the work sorted is work with a weight close to 80% of the total project cost, namely wall pair work, floor work, sills and window work. The job was chosen because it weights 74.77% of the weight of other jobs.

Based on the Pareto Chart Analysis, it can be concluded that the high-cost work items of the type 42/72 m² house are:

1. Wall Pair Occupation : 56.35 %
2. Floor Work : 11.91 %
3. Sills & Window Work : 6.51 %

Table 2 Analysis of Wall Pair Work Functions

No	Description	Verbs	Noun Functions	Kind	Cost (Rp)	Worth (IDR)
1	Brick	Hold	Burden	B	251.516,50	174.652,78
2	Plastering	Strengthen	Wall	S	138.600,00	138.600,00
Kind	B = Basic S = Secondary			∫	390.116,50	313.252,78

Function analysis aims to clarify the main functions and supporting roles (secondary function) and compare cost and benefit value so that from the sequence of processes, it can be known which items have potential costs that do not Need. Furthermore, it performs a function analysis based on the price / worth principle. Determine the cost/worth ratio. Cost/ Worth if > 1 is feasible for Value Engineering. Analysis of the job function can be seen in the following Table:

The cost value is obtained from the initial existing cost plan

Based on existing technology, the value of worth is obtained from the most minor (minimum) cost to perform essential functions most simply. Worth= 390,116.50/313,252.78= 1.25>1 feasible for Value Engineering.

Table 3 Analysis of Floor Work Functions

No	Description	Verbs	Noun Functions	Kind	Cost (Rp)	Worth (IDR)
	1	2	3	4	5	6
1	Ceramics	Beautify your	Floor	B	271.745,00	261.704,61
2	Mortar	Bind	Floor	S	127.500,00	127.500,00
Kind	B = Basic S = Secondary			∫	399.245,00	389.204,61

The cost value is obtained from the initial existing cost plan. The value of worth is obtained from the most minor (minimum) cost to perform essential functions in the simplest way, based on existing technology. (Tjaturono, 2007;37) Cost/Worth = 502,372.92/413,185,007= 1.22 > 1 feasible for Value Engineering.

Table 4 Analysis of the Work Function of sills and Windows

No	Description	Verbs	Noun Functions	Kind	Cost (Rp)	Worth (IDR)
	1	2	3	4	5	6
1	Door and window leaves	Channel	Circulation	B	387.744,37	298.556,52
2	Frame	Limit	Wall	S	114.628,55	114.628,55
Kind	B = Basic S = Secondary			∫	502.372,92	413.185,07

The cost value is obtained from the initial existing cost plan. The value of worth is obtained from the smallest (minimum) cost to perform basic functions, most simply, based on existing technology. (Tjaturono, 2007;37) Cost/Worth = 502,372.92/413,185,007= 1.22 > 1 feasible for Value Engineering

Alternative Value Engineering Analysis (Creative Stage)

Alternative Value Engineering Analysis is a stage of creative thinking to develop alternatives that will be used in conducting Value Engineering analysis on the construction components, namely components produced in the previous step.

Table 5 Selection of Wall Works Alternatives

No	Respondents	Status	Alternative	Comments and Feedback
1	Respondent 1	Project Manager	I	Cheaper, fast installation, good resistance to earthquakes
2	Respondent 2	Site Manager	II	Price Even cheaper, Lightweight, and very suitable for commercial houses
3	Respondent 3	Architecture	I	Cheaper, quick installation, Easier wall finishing
4	Respondent 4	Field Supervisor	I	Cost-effective, installation Fast, more soundproof, and water-resistant material

Table 6 Selection of Floor Work Alternatives

No	Respondents	Status	Alternative	Comments and Feedback
1	Respondent 1	Project Manager	II	Cheaper than alternative I, Motif is more in line with home design Simple and Simple
2	Respondent 2	Site Manager	I	Ceramic colors tend to be neutral, so they are suitable for every room, in terms of strength, somewhat better than an alternative to II
3	Respondent 3	Architecture	I	The price is more affordable, for the quality of the product is also good, as well as for the plain Motif is more straightforward but still elegant

4	Respondent 4	Field Supervisor	I	Besides the affordable price, the installation of ceramics is more straightforward and not easily broken

Table 7 Selection of Alternative Sills and Window Jobs

No	Respondents	Status	Alternative	Comments and Feedback
1	Respondent 1	Project Manager	I	Aluminum sills are easy to maintain, very high durability. The price of aluminum sills is lower than wooden sills
2	Respondent 2	Site Manager	I	All-weather resistant aluminum sills are not easily weathered
3	Respondent 3	Architecture	I	When it comes to home design, aluminum is a material that symbolizes contemporary architecture, so it looks more trendy
4	Respondent 4	Field Supervisor	II	Sills made of aluminum color look more natural. It can be adjusted to the color of the room

Life Cycle Cost Analysis

Analysis Life Cycle Cost is a plan regarding the proposed expenditure of a construction project throughout the life of the project. The implementation of development, from ideas, feasibility studies, planning, and performance, to maintenance and demolition operations, requires various costs grouped into several components.

1. Capital cost/construction cost:

Cost capital is the total amount of expenses required from pre-study to completion of the project, which can be seen in Table

No	**Cost Budget** Plan		**Sub Total**
1	Pek Preparation	Rp	3.910.496,00
2	Pek. Lower Structure	Rp	13.505.061,64
3	Pek. Upper Structure	Rp	98.165.696,57
4	Pek. Architectural	Rp	37.102.696,38
5	Pek. Sanitation and Electrical	Rp	6.793.353,38
Sub Total		Rp	159.477.303,96
VAT 10%		Rp	15.947.730,40
Grand Total		**Rp**	**175.425.034,36**

Conclusion

From the Results of Value Engineering Analysis on the Mutiara Gading City Bekasi Housing project by reviewing in terms of material use in wall pair work, floor work, and sills and window work, the following conclusions can be drawn:

The savings from the results of the Value Engineering Analysis of each work item are as follows :

a. For Wall Pairs amounting to Rp 369,203,509.67 or 24.31% of the initial design cost.
b. For Floor Work of Rp 39,304,125.00 or 8.60% of the initial design cost.
c. For Sills and Windows Work of Rp. 22,082,604.07 or 6.51 % of the initial design cost.

Cost Efficiency that can be obtained by using Value Engineering is Rp. 430,590,238.74 or 7.01% of Rp. 6,139,876,202.60 total project costs.

The most efficient and effective alternative to the Value Engineering solution in the Mutiara Gading City Housing project is:

a. For wall work from the initial design of the red brick was selected into a light masonry with a size of 60x20x10 cm.
b. For ceramic flooring work from the initial design of the Emperor brand, 50x50 was selected to be the 40x40 ceramic of the Hercules brand.
c. For the work of sills and windows from the initial design of the 4" Powder Coating Alexindo white and HpL+List Door were selected to be the Aluminium Door Frame (3" Natural ex. Alexindo), Door Leaf Hpl+List

Suggestion

Based on the conclusions above, the author conveys several suggestions related to the application of the Value Engineering method in a project, namely as follows:

1.The application of the Value Engineering method and its development is not only limited to controlling cost but can also optimize the control of time and labor. For this reason, a team is needed that concentrates on the stage of carrying out the work.

2.To get optimal savings, the application of Value Engineering is carried out through a thorough review of all work items.

3.In planning a project, the owner needs to include a value engineering consultant to obtain high savings in the budget preparation.

4.The application of value engineering will be better done at the development planning stage to provide more optimal results.

Write down the conclusions of your paper and further research suggestions in the form of narratives and not in *bullet* or *numeral form.*

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