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THE APPLICATION OF VALUE ENGINEERING IN THE CONTRUCTION OF CAMPUS III UIN MALANG. (Case Study : Engineering Lecture Building 02)

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ABSTRACT

In the construction project of campus III of UIN Malang, Engineering Lecture Building 02, efficiency and management related to construction costs. One of them is the business by applying Value Engineering (VE) The data used is the Budget Plan (RAB), Work Plan and Work Plan and Terms (RKS), Labor Unit Price Analysis (AHSP) by carrying out stages starting from the information stage, creative stage, analysis stage and development and recommendation stage. This study applies the Value Engineering method to the construction project of the Engineering Lecture Building 02 on Campus III of UIN Malang, focusing on the efficiency of construction costs in door, window, wall, and wall and floor finishing. Through the stages of information, creativity, analysis, development, and recommendations, as well as using Pareto analysis, profit-loss analysis, zero-one method, and life cycle cost analysis, an evaluation of alternative work is carried out. As a result, the initial cost Rp.78,474,577,233 if presented will result in savings of 3.676% of the total original budget. The savings are equivalent to a value of Rp. 945,446,805.74, As a supporting measure, a life cycle cost calculation was carried out for all stages of operation and maintenance, which shows that the implementation of this strategy resulted in savings of Rp.1,165.720.749 or 2,839%..

Keywords : Value Engineering, Diagram Pareto, Zero-One Method, Life Cycle Cost

1. BACKGROUND

The development of an infrastructure needs to be planned appropriately and efficiently to support the development itself. One of the important planning is the calculation of the cost budget. The cost budget itself is related to resources such as funds, materials and labor. Problems related to resources will affect the development process. It is necessary to take appropriate steps to overcome the problems that occur to maintain the sustainability of a project.

Value Engineering (VE) is a creative and planned approach with the aim of identifying and efficiently that does not need to change functions or services, value engineering is used to produce costs that are better or lower than the pre-planned price so that the costs obtained are reduced.

Implementing VE and zero-zero on mtode analysis and adding supporting analysis using life cycle cost, it is hoped that a more economical and optimal solution can be obtained in the construction of the Engineering Lecture Building 02 on Campus III of UIN Malang. This approach aims to strategize the right cost efficiency, reduce waste, and increase the overall value of the project.

For this reason, the author of this final project, the researcher tries to apply value engineering to work by comparing existing data with alternatives in order to get a more efficient and economical value in the construction of campus III of UIN Malang engineering lecture building 02.

2. METODE

The stages carried out in this study can be seen in the following flowchart.
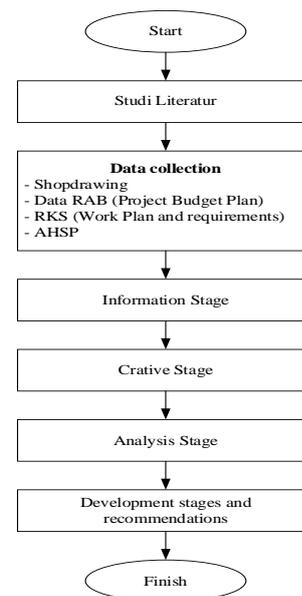
Figure 1 Flow Chart Value Engineering

3. RESULTS AND DISCUSSION

The analysis used in completing the research is :

a. Information Stage

This stage will explore project planning design information related to work items and their costs from the plan data. cost budget (RAB).

Table 1 Recapitulation cost and cumulative

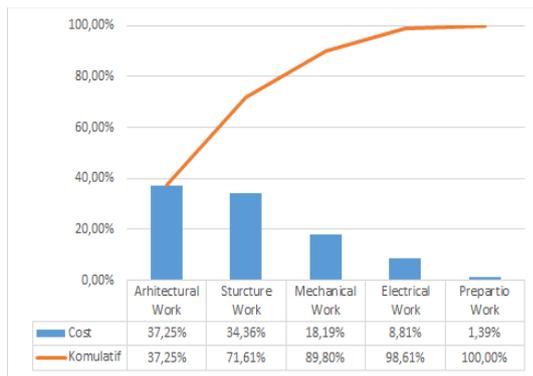| No	Work Items	Cost		Cumulative
		Rp	%	
1.	Arhitectural Work	Rp29.364.440.581	37,35%	37,35%
2.	Sturcture Work	Rp26.966.237.692	34,30%	71,65%
3.	Mechanical Work	Rp14.275.948.050	18,16%	89,81%
4.	Electrical Work	Rp6.914.409.225	8,80%	98,61%

Figure 2 Diagram Pareto

Based on the results of pareto analysis of work items ini the construction project of the Engineering Lecture Building 02 Campus III of the State Islamic University of Maulana Malik Ibrahim Malang. The largest cost component comes from architectural and structural work, this research is focused on architectural work to explore potential cost efficiency through a value engineering

Table 2 Recapitulation cost and cumulative Arsitektural Work

No	Work Items	Cost	Cumulative	
		Rp	%	%
1	Façade Work	Rp8.990.871.270	30,6	30,6
2	Door and window work	Rp4.904.583.650	16,7	47,3
3	Masonry and Plastering Work	Rp4.554.630.502	15,5	62,8
4	Finishing Floor	Rp4.162.415.967	14,2	77
5	Ceiling Work	Rp1.874.888.433	6,4	83,4
6	Door and window work	Rp1.739.013.450	5,9	89,3
7	Practical Practical Column	Rp1.354.957.977	4,6	93,9
8	Paiting Work	Rp1.124.985.554	3,8	97,8
9	Excavation Work	Rp220.032.256	0,7	98,5
10	Railing and Stair Maintenance Work	Rp218.924.895	0,7	99,3
11	Canopy Covering Work	Rp122.768.982	0,4	99,7
12	Grill and Drainage Ramp Work	Rp51.087.536	0,2	99,8
13	Back drop dan meja receptionist	Rp25.923.493	0,1	99,9
14	Receptionist Desk Work	Rp19.356.616	0,1	100
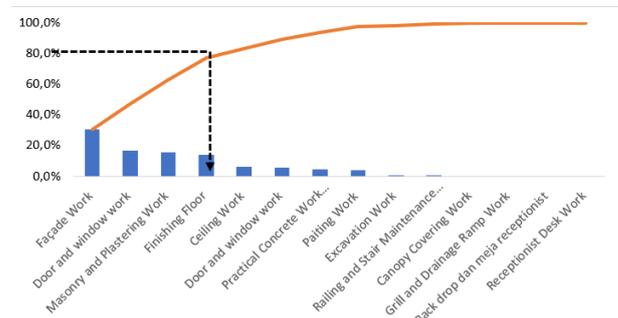
Figure 3 Diagram Pareto

Table 3 Analysis Function

No	Work item	Function Verb	Function Noun	Type Function	Cost	Worth
1.	Alumunium molding skin panel, tebal 3 mm (double coating)	Coating	Wall	B	Rp 7.366.948.428	Rp 7.366.948.428
2	Lipped Channel Main Frame	Pile up	Support Façade	B	Rp 597.465.430	Rp 597.465.430
3	5 mm thick Splice Plate	Connect	Fasteners between modules	S	Rp 21.766.875	
4	Braket Rangka Utama - Baja Siku 70x70x7	Support	Frame Joints	S	Rp 80.224.334	
5	Anchor HIlTIHAS 5.8M12X160	Install	Connection booster	S	Rp 450.670.946	
6	GRC custom thick 10 mm finish	Close	Exterior Surface	B	Rp 175.032.685	Rp 175.032.685
7	Plat Plendes thick 10 mm	Hold	Facade load bearings	S	Rp 855.547	
8	Slimstone, thick 2 mm	Install	Layer	B	Rp 297.371.515	Rp 297.371.515
9	Besi Ø 16 mm	Strengthen	Reinforcement	S	Rp 535.510	
	Total				Rp 8.990.871.270	Rp 8.436.818.058
	Total : Cost/ worth					1,07

No	Work item	Function Verb	Function Noun	Type Function	Cost	Worth
1.	Frame Frame	Coating	Wall	B	Rp 7.366.948.428	Rp 7.366.948.428
2	Door Leaf	Pile up	Support Façade	B	Rp 597.465.430	Rp 597.465.430
3	Handle	Connect	Fasteners between modules	S	Rp 21.766.875	
4	Glass	Support	Frame Joints	S	Rp 80.224.334	
	Total				Rp 4.904.583.650	Rp 3.236.480.246,00
	Total : Cost/ worth					1,52

No	Work item	Function Verb	Function Noun	Type Function	Cost	Worth
1.	Pair of river stone foundations	Support	Foundation	B	Rp 111.258.729,82	Rp 111.258.729,82
2	Rollag Bata	Pile up	Brick strip (Rollag)	B	Rp 792.157,50	Rp 792.157,50
3	Wall pairing	Restrict	Wall	B	Rp2.061.837.735,54	Rp 2.061.837.735,54
4	Plester	Binding	Wall	S	Rp 959.142.269,17	
5	Nead Plaster	Binding	Wall	S	Rp 730.395.446,26	
6	Plester Such air	Directing the flow	Plaster edges	B	Rp 74.556.834,84	Rp 74.556.834,84
7	Sponengan	Forming a profile	Angle / curve profile	B	Rp 456.832.986,75	Rp 456.832.986,75
8	Screeding roof plate	Flatten	Surface Roof Plate	B	Rp 159.814.342,56	Rp 159.814.342,56
	Total				Rp4.554.630.502,44	Rp 2.864.300.629,50
	Total : Cost/ worth					1,59

No	Work item	Function		Type Function	Cost		Worth	
		Verb	Noun					
1	Finishing Wall	To coat	Wall	B	Rp	581.649.958	Rp	581.649.958
2	Floor Finishing	To coat	Floor	B	Rp	2.953.599.372	Rp	2.953.599.372
3	Plint	Install	Floor	B	Rp	239.543.469	Rp	239.543.469
4	Expocy	Protect	Pucuk Tangga	S	Rp	88.765.560		-
5	Travertine with hole	Install	Floor	B	Rp	40.219.716	Rp	40.219.716
6	Mamer	To coat	Floor	S	Rp	61.549.270		-
7	Granit	Install	Utility Line	S	Rp	10.810.650		-
8	Finishing floorhardener	Cover	Wall	B	Rp	688.270	Rp	688.270
9	Stepnoxing	Reinforce	Floor	S	Rp	51.718.500		-
		Total			Rp	4.028.544.764	Rp	3.815.700.785
		Total : Cost/ worth				1,06		

b. Creative Stage

Proposed alternatives to the jobs selected in the previous stage:

Table 4 Creative Stage

Code	Alternative
A0	Plate Steel 5mm, Brangket Rangka Utama Bja siku 70x70x7, Angkur HIlTIHAS 5.8M12X160
A1	perforated steel plate 5 mm, L bracket of 75 x 75 x 6 mm thick steel plate,Hilti HAS-UX160 5.8 anchor
A2	Plate steel St37 5 mm, Bracket aluminium cor (casting) 70 x 70 x 8 mm,Angkur Kimia (Chemical Anchor M12)
A3	Plate steel a Q235 5 mm, Profil C 75x35x15x1.6 mm, ANGKUR HILTI HAS U M12 x 160 Grade 5

Code	Alternative
B0	YKK brand Aluminum Frame with 5 mm glass thickness
B1	Jaya brand Aluminum Frame with 4 mm glass thickness
B2	Dacon brand Aluminum frame with glass thickness 8 mm
B3	Alcoxindo brand Aluminum frame 8 mm thick glass

Code	Alternative
C0	Plesteran 1PC :3 Acian Semen Portland
C1	Plesteran dan acian semen Instan Demix
C2	Plesteran dan acian semen GU 650
C3	Plesteran dan Acian semen Instan Mortar Utama

Code	Alternative
D0	HT 60x60 Valentino Blunt Ivory Cahaya Lestari, Stepnoxing PNJ
D1	HT 60x60 Valentino Gress – Plate Ivory, Stepnoxing Niro
D2	HT 60x60 merk Valentino Gress – Classic, Stepnoxing KIA
D3	HT 60x60 merk Valentino Gress, Infiniti, Stepnoxing Viva

c. Analysis Stage

The stage of analyzing each alternative obtained from the previous stage

- Metode Zero-Zero one

Penerapan metode zero-zero one dari analisa kreteria biaya, kulitas, dan pelaksanaan sebagai berikut:

Table 5 Evaluasi Metode Zero-Zero one Façade

No	Alternative	Creiteria			Total
		I	II	III	
	Bobot	40	35	25	
1	A0	.1/6	.2/6	.1/6	.5/8
	Bobot	6,67	11,67	4,17	22,5
2	A1	.2/6	.1/6	.1/6	.5/
	Bobot	13,34	5,83	4,17	23,33
3	A2	.3/6	.2/6	.2/6	.8/8
	Bobot	20	11,67	8,33	40
4	A3	0	.1/6	.2/6	.4/8
	Bobot	0	5,83	8,33	14,17

Table 6 Evaluasi Metode Zero-Zero one Door and Window

No	Alternative	Creiteria			Total
	Bobot	I .1/6	II .2/6	III .1/6	
1	B0	6,67	11,67	4,17	22,5
	Bobot	.2/6	.1/6	.1/6	.5/
2	B1	13,33	5,83	4,17	23,33
	Bobot	.3/6	.2/6	.2/6	.8/8
3	B2	20	11,67	8,33	40
	Bobot	0	.1/6	.2/6	.4/8
4	B3	0	5,83	8,33	14,17
	Bobot	.1/6	.2/6	.1/6	.5/8

Table 7 Evaluasi Metode Zero-Zero one Door and Window

No	Alternative	Creiteria			Total
	Bobot	I 40	II 35	III 25	
1	C0	0	.2/6	.1/6	3/6
	Bobot	0	11,67	4,17	15,83
2	C1	.1/6	.1/6	.1/6	3/6
	Bobot	6,67	5,83	4,17	16,67
3	C2	.1/6	.2/6	.2/6	5/6
	Bobot	6,67	11,67	8,33	26,67
4	C3	.3./6	.1/6	.2/6	5/6
	Bobot	20,00	5,83	8,33	34,17

Table 8 Evaluasi Metode Zero-Zero one Finishing Wall and Floor

No	Alternative	Creiteria			Total
	Bobot	I 40	II 35	III 25	
1	D0	0	.2/6	.1/6	3/6
	Bobot	0	11,67	4,17	15,83
2	D1	.3/6	.1/6	.1/6	5/6
	Bobot	20,00	5,83	4,17	30,00
3	D2	.2/6	.2/6	.2/6	6/6
	Bobot	13,33	11,67	8,33	33,33
4	D3	0	.1/6	.2/6	3/6
	Bobot	0	5,83	8,33	14,17

d. Development and Recommendation Stage.

- Development Stage

This development stage aims to find the life cycle cost of the selected alternative results. The steps of the development stages are to compare the life cycle cost analysis of the initial cost, operating cost, maintenance and operation. In the analysis of life cycle costs, the calculations and stage, where the analysis of recording and comparison of specific differences is carried out each alternative obtained. Recommendations are seen from are as follows

Construction Cost	Rp8,856,947,010
Construction Cost	Rp8,856,947,010
Life Cycle Cost	Rp9,710,140,971
Life Cycle Cost	Rp9,565,502,771

Figure 4 Diagram Recapitulasi of Façade

Construction Cost	Rp4,904,583,650
Construction Cost	Rp4,127,877,450
Life Cycle Cost	Rp5,296,950,342
Life Cycle Cost	Rp4,458,107,646

Figure 5 Diagram Recapitulasi of Door and Window Work

Construction Cost	Rp4,554,630,502
Construction Cost	Rp4,470,684,016
Life Cycle Cost	Rp4,919,000,943
Life Cycle Cost	Rp4,458,107,646

Figure 6 Diagram Recapitulasi of Masonry and Plastering Work

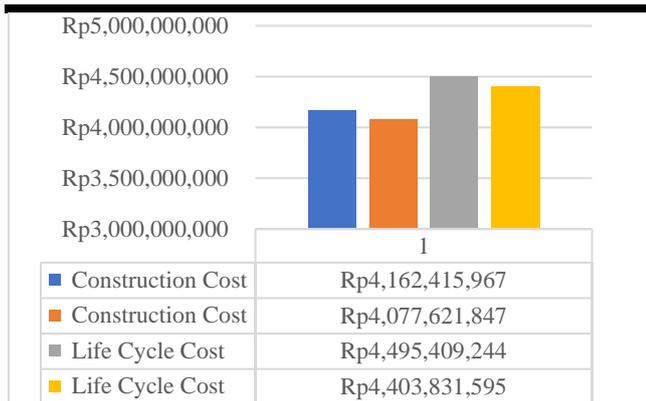|	
■ Construction Cost	Rp4,162,415,967
■ Construction Cost	Rp4,077,621,847
■ Life Cycle Cost	Rp4,495,409,244
■ Life Cycle Cost	Rp4,403,831,595

Figure 7 Diagram Recapitulation of Finishing Wall and Floor

4. CONCLUTION

The results of the analysis of the application of value engineering in the construction project of campus III of UIN Malang Engineering Lecture Building 02 can be concluded as follows:

1. The work carried out by value engineering is based on pareto diagram analysis, The selected work items are façade work, door and window work, stucco brick and mortar work, and wall and floor finishing work. finishing walls and floors.

2. The application of the value engineering method to several selected work items obtained a total savings of 3.676% of the total budget. The savings are equivalent to a value of Rp 945,446,805.74 generated through the selection of alternative materials that are more efficient but still meet the quality and function standards that have been set. This shows that value engineering not only provides cost efficiency, but also supports more rational decision-making in the planning and execution process of construction projects.

3. Based on the life cycle cost analysis, it was found that the implementation of the strategy resulted in cost savings of 2,839%, or equivalent to Rp 1,165.720.749,94. This shows that effectively managing life cycle costs can provide significant economic benefits. These savings not only improve operational efficiency, but also make a positive contribution to the reduction of cost burden in the long run. Therefore, calculating and managing life cycle costs is an important factor that must be considered in investment decision-making and sustainable resource management.

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