

Proportion of Human Resources and Material and Equipment Financing in Housing Projects

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Published: July, 2023



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Abstract: Improper distribution of human resources and equipment proportions in a construction project will result in an increase in the cost budget, therefore it is necessary to deepen through research regarding the proportion of construction project resources. This research aims to calculate human and material resources and equipment in housing construction projects using the comparative method. Use of the comparison method to compare the differences in 2 or more groups in different samples. The proportion results for human resources in Grand Permata Kaliurang housing is 19.64 percent and in Diamond City housing 19.88 percent, while the proportion of material resources in Grand Permata Kaliurang housing is 79.21 percent and in Diamond City housing is 78.84 percent and for equipment resources at Grand Permata Kaliurang housing 1.15 percent and for Diamond City housing 1.28 percent.

Keywords: Human Resources, Material, Equipment

INTRODUCTION

A project is an activity that can be planned and uses resources such as money and labor, which can have benefits or future results (Suwinardi, 2015). Projects are routines constrained by time, budget, resources, and performance requirements designed for customer needs. Like most organizational efforts, the primary goal of a project is to satisfy customer needs. Building Management is the application of administrative functions in the form of planning, systematically implemented and monitored with project management by using existing resources effectively and efficiently to achieve optimal project goals. With the implementation of this program, project costs are expected to decrease by controlling unnecessary funds in the event of technical disruptions in the planning and construction implementation stages, without weakening the quality, reliability and functionality of the project. The network analyst's planning method is described in a relationship diagram for a project work order. Work that must be preceded by other work related to time. This network is useful for planning and management (Furkan, 2003 in Gudiño León. et al., 2021). When implementing a project, there are always obstacles or barriers that exist in the project that are not always fully known. Before it has a big impact, the schedule needs to be adjusted to new conditions and changing circumstances so that it does not affect project implementation (Furkan, 2003 in Gudiño León. et al., 2021).

Many problems in construction projects are caused by the lack of uncertainty in determining the proportion of project resources which results in project cost overruns. This is because there is no appropriate proportion reference as an illustration of the proportion of resources such as wages, labor, materials and appropriate tools for carrying out construction in the field (Sdm et al., nd). To meet the need for the number of workers by balancing the number of workers and the volume of work, contractors generally combine direct labor with piece labor (ASTAWA et al., 2020). Whether the process is implemented or not Implementation of construction in the field really depends on determination, enthusiasm and expertise from the builders (Gunasti 2015, 2017a). Because the expertise of builders must be very large, builders must have superior skills (Gunasti, 2019). Construction equipment (construction plant) is one resource the most important thing that can support the achievement of a desired goal, at Construction projects require equipment between 7 – 15 percent of the project cost (Fahan, 2005). Use tool heavy is something must, although will needed financing Which Enough big in its implementation. According to (Rostiyanti; 1999 in Fahan, 2005).

The percentage of human resource costs according to research (Rini Pebri Utari, Ernawan Setyono , 2018) is 28 percent in simple buildings and 21 percent in non-simple buildings, this factor is because non-simple buildings use more complex technology so they use less human power. The proportion of human resources on average has a greater value in simple building projects compared to non-simple buildings. The linear equation for the proportion of human resources in simple building projects in the East Java Region is $Y = 0.0001x + 0.257$. Meanwhile, the linear equation for non-simple buildings is $Y = 0.005x + 0.248$.

Meanwhile, the proportion of costs according to research (Rini Pebri Utari, Ernawan Setyono , 2018) is that the proportion of use of material resources in simple building projects in the East Java region has the largest value of 58 percent and in non-simple buildings in the East Java region which was used as a sample. It was found that the average proportion of materials was 63 percent. From this it can be stated that in both simple buildings and non-simple buildings, the proportion of material used is the largest compared to other resources.

In research (Muzayanah, 2008) . The average proportion of equipment resources is 12 percent for simple buildings, including the smallest percentage compared to the proportion of other resources. For simple building projects it is smaller than for non-simple buildings. The results of this research also found that the average proportion of equipment resources was 15 percent for non-simple buildings. The portion of equipment costs for non-simple buildings is 3 percent greater when compared to simple buildings.

Therefore, research regarding the proportion of costs for human resources and materials and equipment is very necessary for further research to be used as a benchmark or reference to replace standard gaps. From the results of this research, the Estimator or *Quantity Engineer* (QE) or *Quantity Surveyor* (QS) owner and stakeholders can save time and reduce psychological pressure. This research aims to calculate the portion of financing for human resources and materials and equipment in housing construction.

METHOD

This research analyzes the Implementation Budget Plan (RAP) from project data and then the data is analyzed in the proportion of human and material resource costs and equipment. This case study was carried out on the Diamond City housing development work and the Grand Permata Kaliurang housing development.

After obtaining the Implementation Budget Plan (RAP), resource calculations are carried out and human resources, materials and equipment are grouped. Apart from the implementation budget plan, there is also a list of Quantities and Prices (*Bill of Quantity*) for Work Unit Price Analysis (AHSP). AHSP (Work Unit Price Analysis) consists of unit prices for materials, labor wages and equipment (Alami et al., 2021 in Gunasti et al., 2021) .

Meanwhile, the Work Unit Price Analysis used in this research is 2022. To determine the differences between the proportion of human resources, material resources and equipment using AHSP 2022.

In this research, a comparison was also made between the results of this research and the results of previous research. The purpose of this journal is to find out how much it costs to build a housing project in terms of human resources, materials and equipment used.

RESULTS AND DISCUSSION

The research results were obtained by sorting the proportion of resource costs for each work item. Below are several work items included in the construction of housing projects and are presented in several data tables.

Calculation of Resource Proportions in Diamond City Housing Development with AHSP 2022

Table 1. Calculation of Budget Plans Using AHSP 2022 for Diamond City Housing

No	Work item	Cost
1	Land Use and Costs	IDR 20,988,308,650
2	Infrastructure Costs	IDR 4,598,843,000
3	Facility Costs	IDR 41,500,000
4	Building Costs	IDR 2,041,867,000
TOTAL COST		IDR 27,670,518,650

(Source: RAB data from research, 2022)

For the results of calculating the proportion of resources in land use and cost work, the largest cost is material resources amounting to IDR 17,840,062.35 3 or the equivalent of 85% . Meanwhile, the smallest resource proportion costs are found in equipment resources amounting to IDR 209,883,087 or the equivalent of 1% . Calculation of the proportion of resources in infrastructure cost work with the highest costs, namely material resources, amounting to IDR 2,621,340,510 or the equivalent of 57% . Meanwhile, the cost of the smallest proportion of resources is found in equipment resources amounting to IDR 137,965,290 or the equivalent of 3%. For facility cost work, the proportion of resources with the greatest costs is in type 100, namely material resources amounting to IDR 5,347,410 or the equivalent of 73.30% and the smallest cost is in type 21, namely human resources amounting to IDR 1,669,280 or the equivalent of 26.23% . Work costs for buildings, the proportion of resources with the greatest costs is in type 100, namely material resources amounting to IDR 380,321,198 or the equivalent of 63.21% and the smallest cost is in type 21, namely equipment resources amounting to IDR 237,044 or the equivalent of 0.28% Total Diamond housing construction work City is IDR 27,670,518,650 .

Table 2. Results of Calculation of Resource Proportions in Diamond City Housing Development

No.	Work item	Human Resources (Rp.)	Materials (Rp.)	Equipment (Rp.)	Total (Rp.)
1	Land Use and Costs	2,938,363,211 14%	17,840,062,353 85%	209,883,087 1%	20,988,308,650 100%
2	Infrastructure Costs	1,839,537,200 40%	2,621,340,510 57%	137,965,290 3%	4,598,843,000 100%
3	Biaya Sarana				
	Type 21	1.669.280 26.23%	4.695.720 73.77%	- 0.00%	6.365.000 100%
	Type 30	1.669.280 25.52%	4.870.720 74.48%	- 0.00%	6.540.000 100%
	Type 45	1.833.673 26.81%	5.006.328 73.19%	- 0.00%	6.840.000 100%
	Type 60	1,967,590 26.90%	5,347,410 73.10%	- 0.00%	7,315,000 100%
	Type 81	1,967,590 26.90%	5,347,410 73.10%	- 0.00%	7,315,000 100%
	Type 100	1,967,590 26.90%	5,347,410 73.10%	- 0.00%	7,315,000 100%
4	Building Costs				
	Type 21	34.545.818 40.59%	50.322.875 59.13%	237.044 0.28%	85.105.737 100%
	Type 30	45.999.507 37.83%	75.006.335 61.69%	576.912 0.47%	121.582.754 100%
	Type 45	84.626.613 42.61%	113.385.513 57.08%	616.314 0.31%	198.628.439 100%
	Type 60	123.425.332 34.91%	229.518.608 64.92%	613.816 0.17%	353.557.756 100%
	Type 81	163.678.187 34.29%	313.103.404 65.59%	616.314 0.13%	477.397.905 100%

No.	Work item	Human Resources (Rp.)	Materials (Rp.)	Equipment (Rp.)	Total (Rp.)
	Type 100	220.632.797	380.321.198	711.131	601.665.126
		36.67%	63.21%	0.12%	100%

(Source: RAB data from research, 2022)

For the results of calculating the proportion of overall resources in the Diamond City housing development, the human resources obtained are IDR . 5,450,808,665 or the equivalent of 19.88% and for materials Rp. 21,623,060,795 or the equivalent of 78.84% , as well as from equipment, namely Rp. 351,219,907 or the equivalent of 1.28%.

Table 3. Results of Calculation of Total Resource Proportion in Diamond City Housing Development

Resource Type	Need (Rp)	Percentage (%)
Human Resources	IDR 5,450,808,665	19.88%
Material	IDR 21,623,060,795	78.84%
Equipment	IDR 351,219,907	1.28%
Total x 11%	IDR 27,674,931,930	

(Source: RAB data from research, 2022)

a. Calculation of Resource Proportions in the Grand Permata Kaliurang Housing Development Using AHSP 2022

Table 4. Calculation of Cost Budget Plan Using AHSP 2022 for Grand Permata Kaliurang Housing

No	Work item	Cost
1	Land Use and Costs	IDR 6,046,678,550
2	Infrastructure Costs	IDR 1,284,033,000
3	Facility Costs	IDR 13,300,000
4	Building Costs	IDR 354,635,000
TOTAL COST		IDR 7,698,646,550

(Source: RAB data from research, 2022)

For the results of calculating the proportion of resources in land use and cost work, the largest cost is material resources amounting to IDR 5,139,676,768 or the equivalent of 85% . Meanwhile, the cost of the smallest proportion of resources is found in equipment resources amounting to IDR 48,373,428 or the equivalent of 1% . Calculation of the proportion of resources in infrastructure cost work with the highest costs, namely material resources, amounting to IDR 731,898,810 or the equivalent of 57% . Meanwhile, the cost of the smallest proportion of resources is found in equipment resources amounting to IDR 38,520,990 or the equivalent of 3%. For facility cost work, the proportion of resources with the highest costs is type 45, namely material resources amounting to IDR 5,006,328 or the equivalent of 73.19% and for the smallest costs it is found in type 30, namely human resources amounting to IDR 1,669,280 or the equivalent of 25.52%. Work costs for buildings, the proportion of resources with the greatest costs is in type 45, namely material resources amounting to IDR 113,385,513 or the equivalent of 57.08% and the smallest cost is in type 30, namely equipment resources amounting to IDR 576,912 or the equivalent of 0.47% Total construction work for Grand housing Permata Kaliurang is IDR 7,698,646,550 .

Table 5. Results of Calculation of Resource Proportions in the Grand Permat Kaliurang Housing Development

No.	Work item	Human Resources (Rp.)	Materials (Rp.)	Equipment (Rp.)	Total (Rp.)	
1	Land Use and Costs	858.628.354	5,139,676,768	48,373,428	6,046,678,550	
		14%	85%	1%	100%	
2	Infrastructure Costs	513,613,200	731,898,810	38,520,990	1,284,033,000	
		40%	57%	3%	100%	
3	Facility Costs	Type 30	4,870,720	-	6,540,000	
			25.52%	74.48%	0.00%	100%
		Type 45	5,006,328	-	6,840,000	
			26.81%	73.19%	0.00%	100%
4	Building Costs	Type 30	75,006,335	576,912	121,582,754	
			37.83%	61.69%	0.47%	100%
		Type 45	113,385,513	616,314	198,628,439	
			42.61%	57.08%	0.31%	100%

(Source: RAB data from research, 2022)

For the results of calculating the proportion of overall resources in the Grand Permata Kaliurang housing development, human resources were obtained at Rp. 1,502,867,674 or the equivalent of 19.64% and for materials Rp. 6,059,967,425 or the equivalent of 79.21% , as well as from equipment, namely Rp. 88,087,644 or the equivalent of 1.15%.

Table 6. Results of Calculation of Total Resource Proportion in the Grand Permata Kaliurang Housing Development

Resource Type	Need (Rp)	Percentage (%)
Human Resources	IDR 1,502,867,674	19.64%
Material	IDR 6,059,967,425	79.21%
Equipment	IDR 88,087,644	1.15%
Total x 11%	IDR 7,698,626,246	

(Source: RAB data from research, 2022)

Results study on project Diamond housing development shows that cost For source Power man as big as 19.88%. Portion cost For source Power man this is more small when compared to with study (Rini Pebri Utari And Ernawan Setyono , 2018). In Rini Pebri Utari's research And Ernawan Setyono portion for Source Power Man is as big as 28.00% For building simple. On portion Material resources in this study were 78.84%. Portion for These material resources are greater when compared to research (Hani, 2019) . In Hani's research the portion is for resources material/materials is 77.26% for simple buildings. Whereas on equipment resources is 1.28%. This portion of resources is smaller than study (Apdeni et al., 2022) . On research by Risma Apdeni et al for portions source Power equipment is 9.26% in simple buildings.

Meanwhile, the results of research on the Grand Permata Kaliurang housing development project show that costs for human Resources amounting to 19.64%. Cost portion For source This human resource is smaller when compared to research (Rifat Aditya et al., 2021 in Teknologi et al., 2023) . In Rifat Aditya et al's research for Human Resources it was equal to 20.09% for simple buildings. For sourceThe strength of the material in this study was 79.21%. Portion for resources This material/material is greater when compared to research (Rini Pebri Utari and Ernawan Setyono , 2018). In the research of Rini Pebri Utari and Ernawan

Setyono and friends portion for sources Power materials/ingredients is as big as 63% For construction building simple. Meanwhile, equipment resources are 1.15%. Portion of this resource smaller than in research (Yannu Muzayanah, 2008). In Yannu Muzayanah's research for portions source Power equipment is 12% for simple buildings.

CONCLUSION

This research shows the importance of calculating resource proportions to be used as a reference in working on a project in order to prevent uncertain increases in the budget. It can be seen from the results of calculating the resource portion of the two housing development projects that the highest portion is material resources and the lowest portion is equipment resources because in terms of equipment there is less housing construction work. Therefore, it is highly recommended to use a calculation of the proportion of project resources in the future.

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