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Factors Causing Overbudget for Roof Cover Work in the Construction of High-rise Buildings

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ABSTRACT

The development of building construction in Indonesia is experiencing rapid development. In 2018, the total construction projects are predicted to increase by 3% compared to 2017. The concept of building high-rise buildings now uses the concept of green building. Where in the use of materials must be according to the approval of a green building consultant. This study uses roof covering material with solar panels, using these materials project planning becomes overbudget. Overbudget that occurs when planning with the green building concept is 15% of the initial contract. Therefore, the researcher will discuss the factors that influence the cost efficiency of the roof cover work of high-rise buildings. Processing data using SPSS tools (Statistical Package for Social Sciences). From this data processor with SPSS, there were 10 factors that caused the overbudget of roof cover work on the construction of high-rise buildings using wrong estimation techniques, complicated development requirements, inadequate project funding, not taking into account unexpected costs, inaccurate estimation of costs, data and incomplete project information, material selection according to work drawings, owner changes to design changes when construction is underway, lack of coordination between construction manager - planner and estimated cost of building high-rise buildings. For this reason, look for factors that cause roof cover work in the construction of high-rise buildings.

Key Words: *Key Success Factors, Overbudget, Solar Panels, High-rise Buildings.*

1. INTRODUCTION

Multi-storey buildings are buildings that have more than one floor vertically. This study will discuss roof cover work in high-rise academic buildings. The roof is a part of a building that functions as a cover for all the rooms below. The roof is also a crown that has a function to add beauty and to protect buildings from heat and rain. In the current development, roof cover material is increasingly developing roof cover using solar panels. Solar panels are technologies that function to convert or convert solar radiation into electrical energy directly. There are 2 types of solar panels, namely solar panels using batteries and not using batteries.

2. ESTIMATED COSTS

Cost estimation is the process of estimating the relationship between costs and the effect of these costs. Estimated cost is divided estimation of direct costs and estimates of indirect costs. Estimated direct costs are calculated based on the multiplication of bid unit prices with the volume of work referring to the drawings and technical specifications, while the estimated indirect costs are not easy because there is no accurate reference of information as well as the drawings and technical specifications [1], According to [2], cost estimation is an iterative process of developing estimates of the monetary resources needed to complete project activities. According to [3] estimated costs are areas of engineering activities where experience and technical considerations are used in applying science especially the problem of estimating costs and controlling costs [4]

3. EFFICIENT COSTS

Cost efficiency is a strategic choice used by many companies, especially companies engaged in construction. Efficient costs on construction projects are usually carried out in material selection where using material with the same function is used material at a cheaper price and still in the required standard specifications. Efficient project costs are usually controlled by the project manager, cost control and Quantity Surveyor. For this reason, material selection definitely requires approval from that party.

4. PROJECT OVERBUDGET

Freezing costs is the construction cost of a project which, during the implementation phase, exceeds (budget) the project budget set at the beginning (estimated cost), thus causing significant losses to the contractor [5]. Project overbudget occurs in a construction project can be caused by internal parties or external parties from the construction project itself. The cost swelling itself is divided into three parts, namely: 1. Freezing costs in the initial stages of construction, 2. Freezing costs during the construction project process, and Freezing post-construction costs. Therefore, in this study we will discuss the factors that influence the overbudget of construction projects.

5. RESEARCH METHOD

According to research methods [6] is basically a scientific way to get valid data with objectives that are discovery, proof and development of a knowledge so that the results can be used to understand, solve and anticipate problems. The flow in this study is:

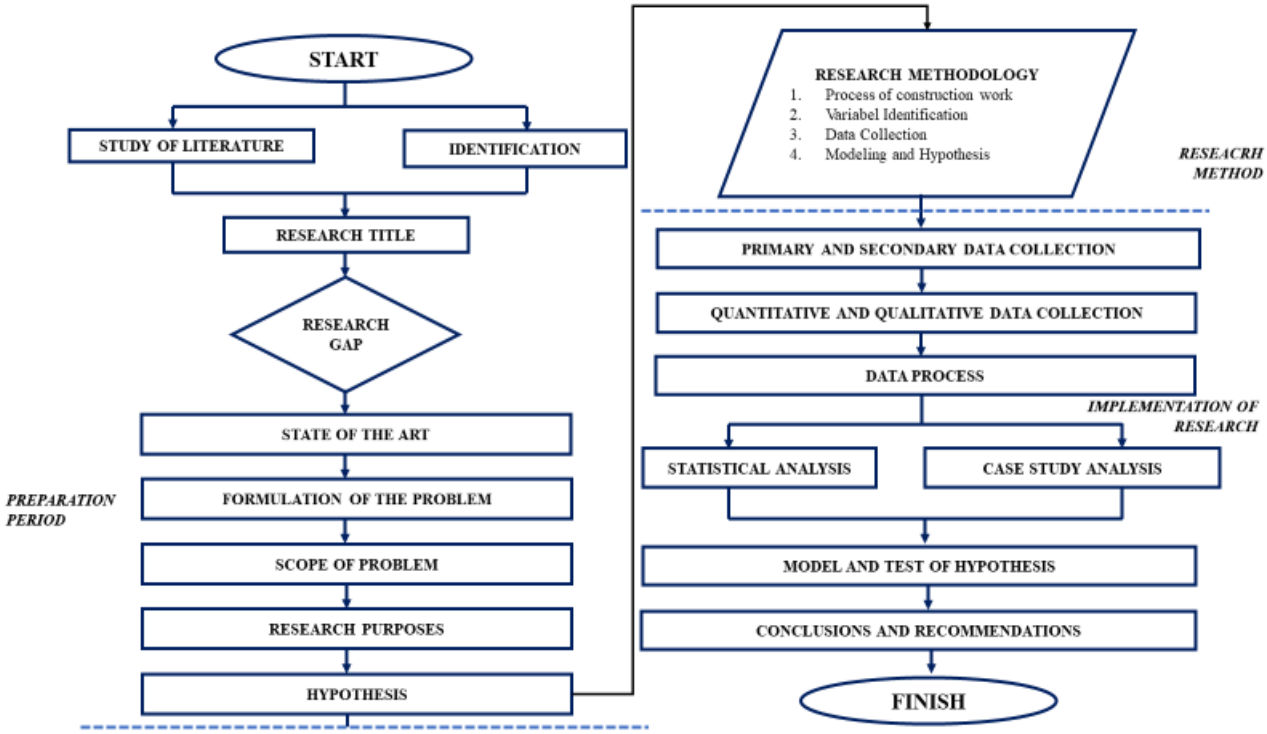

Figure 1. Research Flow

From the research method above, it can be concluded that the flow of this study uses successful key factors obtained from reference to journals, books or e-books. The results of the key success factors can be done by analyzing the data which then can draw conclusions from the efficiency and effectiveness in terms of costs that can improve the project's overbudget.

6. IDENTIFICATION OF VARIABLES

This study has 3 independent variables and 1 dependent variable for processing and analyzing the results of factors in roofing work of high-rise buildings, variables can be in the form of theory or object of research [7]. These variables are:

- Dependent Variabel : 1. Overbudget (X1)
  2. Design of high-rise building (X2)
  3. Roof cover work (X3)
- Independent Variabel : - Cost performance (Y1)

Variable identification is obtained from the key success factors obtained from journals, books, e-books and other references

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respondents obtained from this study were 52 respondents. Determination of the number of respondents using the Slovin method. Where to use the target population, the target population is the number of respondents according to the project organizational structure. The following are influential factors:

Table 1. Factors that Influence Overbudget Roof Cover Work

NO	MAIN FACTOR		SUBFACTOR	KEY SUCCESS FACTOR
1	X1	X1-1	OVERBUDGET	Use the wrong estimation technique
2		X1-2		Complex development requirements
3		X1-3		Inaccurate estimated costs
4		X1-4		Project data and information are incomplete
5		X1-5		Lack of coordination between contractor construction manager planners
6		X1-6		Design drawings and working drawings
7		X1-7		Labor productivity
8		X1-8		Poor cost control in the field
9		X1-9		High equipment prices / rental
10		X1-10		Error managing equipment storage
11		X1-11		Lack of construction materials
12		X1-12		Unhealthy competition
13		X1-13		Too many projects are handled at the same time
14		X1-14		Consultants are less able to supervise the project
15		X1-15		Poor quality control
16		X1-16		There is an increase in material prices
17	X2	X2-1	HIGH-LEVEL BUILDING DESIGN	Classification of High-rise Buildings
18		X2-2		Design and Planning of High-rise Buildings
19		X2-3		Control of High-rise Buildings
20		X2-4		Operations and Activities of High-rise Buildings
21		X2-5		Team Performance of High-rise Buildings
22		X2-6		Project Optimization
23		X2-7		Estimated Cost of Building High-rise Buildings
24		X2-8		Installation Process and Work Technique
25	X3	X3-1	ROOF CLOSING WORK	Design drawings
26		X3-2		Material Selection In Accordance With Working Pictures
27		X3-3		Conformity and Clarity of Specifications
28		X3-4		Availability of Material Stock
29		X3-5		Roofing Materials and their Applications in Building Construction
30		X3-6		Expertise and Experience in Work
31		X3-7		Accuracy (Determination) and Measurement
32		X3-8		Aesthetic and Appearance Considerations
33		X3-9		Material Costs and Equipment used
34	Y1	Y1-1	COST	Inadequate project funding
35		Y1-2		Does not take into account unexpected costs
36		Y1-3		The owner made a design change when the construction was running
37		Y1-4		Planning is not competent
38		Y1-5		Miscommunication in design planning

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7. PROCESSING STAGE

The research method determines how a research process is carried out from data collection, processing data into information to be analyzed and finally producing findings that can be drawn conclusions. The steps in this study are as follows: 1. Deciphering the background, 2. Identifying the problem, 3 Arranging the theoretical foundation, 4. Determining the research variables, 5. Choosing research instruments, 6. Determining the subject of research, 7. Collecting data, 8. Processing data and 9. Writing research report. [8]

In its own validity test [9] a measure that can show the validity or validity of the instrument. So in testing the validity it refers to an instrument in carrying out its functions. Variables obtained from journals, e-books, and books that can be published. The process of testing the validity and reliability is carried out using the tools in the SPSS program as follows: data processing flow:

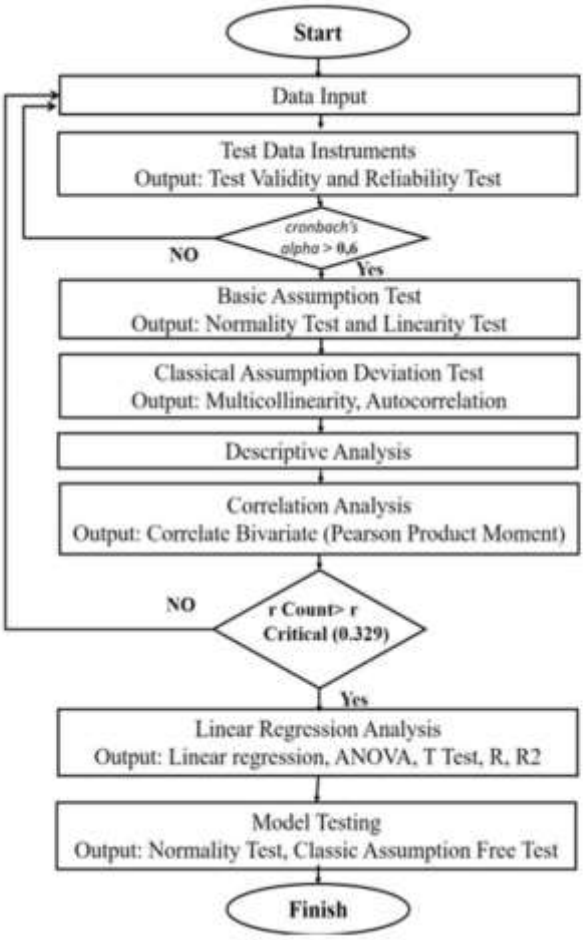

Figure 2. Flow diagram

8. DETERMINATION OF THE NUMBER OF RESPONDENTS

This study uses a target population type, where questionnaires will be distributed to people directly involved in the construction of the high-rise building. Determination of the number of respondents using Slovin formula. the number of targer population is N = 60 people. The following is the number of samples using the Slovin method:

$$n = \frac{N}{N\,x\,d^2+1} \ldots\ldots\ldots\ldots\ldots$$

$$n = \frac{60}{60\,x\,0.05^2+1} = \mathbf{52{,}17 \sim\ 52\ Respondents}$$

So, in this study there were 52 number of respondents.

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9. VALIDITY AND RELIABILITY TEST

Judging from the value of corrected item total correlation if the value is more than 0.300, it can be stated Relatively and the value of Cronbach's Alpha (Calculated Validity).

Table 2. Reliability Test and Validity Test X1

VARIABLE X1	RELIABILITY CALCULATED VALUE	RELIABILITY STANDARD VALUE	RELIABLE/NON RELIABLE	VALUE OF VALIDITY COUNT	STANDARD VALIDITY VALUE	VALID/NON VALID
X1-1	0,619	0,300	RELIABEL	0,898	0,600	VALID
VARIABLE X1	**RELIABILITY CALCULATED VALUE**	**RELIABILITY STANDARD VALUE**	**RELIABLE/NON RELIABLE**	**VALUE OF VALIDITY COUNT**	**STANDARD VALIDITY VALUE**	**VALID/NON VALID**
X1-2	**0,289**	**0,300**	**NON RELIABEL**	**0,910**	**0,600**	**VALID**
X1-3	0,554	0,300	RELIABEL	0,900	0,600	VALID
X1-4	0,496	0,300	RELIABEL	0,902	0,600	VALID
X1-5	0,454	0,300	RELIABEL	0,903	0,600	VALID
X1-6	0,434	0,300	RELIABEL	0,904	0,600	VALID
X1-7	0,388	0,300	RELIABEL	0,905	0,600	VALID
X1-8	0,425	0,300	RELIABEL	0,904	0,600	VALID
X1-9	0,727	0,300	RELIABEL	0,894	0,600	VALID
X1-10	0,671	0,300	RELIABEL	0,896	0,600	VALID
X1-11	0,701	0,300	RELIABEL	0,895	0,600	VALID
X1-12	0,639	0,300	RELIABEL	0,897	0,600	VALID
X1-13	0,842	0,300	RELIABEL	0,890	0,600	VALID
X1-14	0,715	0,300	RELIABEL	0,895	0,600	VALID
X1-15	0,644	0,300	RELIABEL	0,897	0,600	VALID
X1-16	0,700	0,300	RELIABEL	0,895	0,600	VALID

From table 2. Test reliability and validity test can be concluded for the count reliability test more than 0.300 then the results are reliable and if the test validity count is more than 600 then the result is valid

Table 3. Test Reliability and Test Validity X2

VARIABLE X2	RELIABILITY CALCULATED VALUE	RELIABILITY STANDARD VALUE	RELIABLE/NON RELIABLE	VALUE OF VALIDITY COUNT	STANDARD VALIDITY VALUE	VALID/NON VALID
X2-1	0,528	0,300	RELIABEL	0,823	0,600	VALID
X2-2	0,580	0,300	RELIABEL	0,816	0,600	VALID
X2-3	0,810	0,300	RELIABEL	0,783	0,600	VALID
X2-4	0,440	0,300	RELIABEL	0,834	0,600	VALID
X2-5	0,530	0,300	RELIABEL	0,823	0,600	VALID
X2-6	0,544	0,300	RELIABEL	0,821	0,600	VALID
X2-7	0,690	0,300	RELIABEL	0,804	0,600	VALID
X2-8	0,439	0,300	RELIABEL	0,834	0,600	VALID

From table 3. Test reliability and validity test can be concluded for the count reliability test more than 0.300 then the results are reliable and if the test validity count is more than 600 then the result is valid

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Table 4. Test Reliability and Validity Test X3

VARIABLE X3	RELIABILITY CALCULATED VALUE	RELIABILITY STANDARD VALUE	RELIABLE/NON RELIABLE	VALUE OF VALIDITY COUNT	STANDARD VALIDITY VALUE	VALID/NON VALID
X3-1	0,307	0,300	RELIABEL	0,7296	0,600	VALID
X3-2	**0,241**	**0,300**	**NON RELIBEL**	**0,7381**	**0,600**	**VALID**
X3-3	0,487	0,300	RELIABEL	0,6986	0,600	VALID
X3-4	**-0,013**	**0,300**	**NON RELIBEL**	**0,7731**	**0,600**	**VALID**
X3-5	0,452	0,300	RELIABEL	0,7051	0,600	VALID
X3-6	0,617	0,300	RELIABEL	0,6740	0,600	VALID
X3-7	**0,169**	**0,300**	**NON RELIBEL**	**0,7528**	**0,600**	**VALID**
X3-8	0,715	0,300	RELIABEL	0,6556	0,600	VALID
X3-9	0,758	0,300	RELIABEL	0,6448	0,600	VALID

From table 4. Test reliability and validity test can be concluded for the count reliability test of more than 0.300 then the results are reliable and if the test validity count is more than 600 then the result is valid

Table 5. Reliability and Validity Test Y1

VARIABLE Y1	RELIABILITY CALCULATED VALUE	RELIABILITY STANDARD VALUE	RELIABLE/NON RELIABLE	VALUE OF VALIDITY COUNT	STANDARD VALIDITY VALUE	VALID/NON VALID
Y1-1	0,414	0,300	RELIABEL	0,639	0,600	VALID
Y1-2	0,206	0,300	RELIABEL	0,711	0,600	VALID
Y1-3	0,427	0,300	RELIABEL	0,632	0,600	VALID
Y1-4	0,634	0,300	RELIABEL	0,524	0,600	VALID
Y1-5	0,497	0,300	RELIABEL	0,600	0,600	VALID

After obtaining a variable that is declared to be reliable and valid, the variable will then be analyzed by looking for the Mean value of each variable in the questionnaire.

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Table 6. Questionnaire Ranking Results

RANK	MAIN FACTO	SUB FACTOR	ITEM KSF	RECAPITULATION OF QUESTIONARY					AMOUNT OF RESPONDENTS	W	S	R	INDEX RII
				1	2	3	4	5					
1	I	X1-1	Use the wrong estimation technique	0	0	19	19	14	52	203	5	52	0,781
2	I	X1-2	Complex development requirements	0	0	20	19	13	52	201	5	52	0,773
3	IV	Y1-1	Inadequate project funding	0	0	21	18	13	52	200	5	52	0,769
4	IV	Y1-2	Does not take into account unexpected costs	0	0	21	19	12	52	199	5	52	0,765
5	I	X1-3	Inaccurate estimated costs	0	0	22	18	12	52	198	5	52	0,762
6	I	X1-4	Project data and information are incomplete	0	0	23	17	12	52	197	5	52	0,758
7	III	X3-2	Material Selection In Accordance With Working Pictures	0	0	24	16	12	52	196	5	52	0,754
8	IV	Y1-3	The owner made a design change when the construction was running	0	1	23	16	12	52	195	5	52	0,750
9	I	X1-5	Lack of coordination between contractor construction manager planners	0	1	24	15	12	52	194	5	52	0,746
10	II	X2-7	Estimated Cost of Construction of High-rise Buildings	0	1	25	14	12	52	193	5	52	0,742
11	I	X1-6	Design drawings and working drawings	0	2	24	14	12	52	192	5	52	0,738
12	III	X3-4	Availability of Material Stock	0	2	25	13	12	52	191	5	52	0,735
13	II	X2-1	Classification of High-rise Buildings	0	2	25	14	11	52	190	5	52	0,731
14	I	X1-7	Labor productivity	0	2	26	13	11	52	189	5	52	0,727
15	II	X2-2	Design and Planning of High-rise Buildings	0	2	27	12	11	52	188	5	52	0,723
16	III	X3-1	Design drawings	0	2	28	11	11	52	187	5	52	0,719
17	I	X1-8	Poor cost control in the field	0	3	27	11	11	52	186	5	52	0,715
18	I	X1-11	Lack of construction materials	0	3	28	10	11	52	185	5	52	0,712
19	III	X3-5	Roofing Materials and their Applications in Building Construction	0	4	27	10	11	52	184	5	52	0,708
20	III	X3-7	Accuracy (Determination) and Measurement	0	4	28	10	10	52	182	5	52	0,700

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RANK	MAIN FACTO	SUB FACTOR	ITEM KSF	RECAPITULATION OF QUESTIONARY					AMOUNT OF RESPONDENTS	W	S	R	INDEX RII
				1	2	3	4	5					
21	III	X3-3	Conformity and Clarity of Specifications	0	4	29	9	10	52	181	5	52	0,696
22	II	X2-4	Operations and Activities of High-rise Buildings	0	4	29	10	9	52	180	5	52	0,692
23	II	X2-6	Project Optimization	0	5	29	8	10	52	179	5	52	0,688
24	I	X1-12	Unhealthy competition	0	5	29	9	9	52	178	5	52	0,685
25	III	X3-9	Material Costs and Equipment used	0	5	30	8	9	52	177	5	52	0,681
26	III	X3-8	Aesthetic and Appearance Considerations	0	5	30	9	8	52	176	5	52	0,677
27	I	X1-13	Too many projects are handled at the same time	0	6	29	9	8	52	175	5	52	0,673
28	I	X1-14	Consultants are less able to supervise the project	0	6	30	8	8	52	174	5	52	0,669
29	II	X2-3	Control of High-rise Buildings	0	6	31	7	8	52	173	5	52	0,665
30	II	X2-5	Team Performance of High-rise Buildings	0	7	30	7	8	52	172	5	52	0,662
31	I	X1-15	Poor quality control	0	7	30	8	7	52	171	5	52	0,658
32	IV	Y1-4	Planning is not competent	0	7	31	7	7	52	170	5	52	0,654
33	IV	Y1-5	Miscommunication in design planning	0	8	30	7	7	52	169	5	52	0,650
34	III	X3-6	Expertise and Experience in Work	0	8	31	6	7	52	168	5	52	0,646
35	II	X2-8	Installation Process and Work Technique	0	8	31	7	6	52	167	5	52	0,642
36	I	X1-16	There is an increase in material prices	0	9	30	7	6	52	166	5	52	0,638
37	I	X1-9	High equipment prices / rental	1	9	29	6	7	52	165	5	52	0,635
38	I	X1-10	Error managing equipment storage	1	9	29	7	6	52	164	5	52	0,631

10. CONCLUSION

From the processing of SPSS data, it can be concluded that 10 work items are the factors that cause the overbudget of roof cover work in high-rise buildings:[10]

1. Using the wrong estimation technique
2. Complex development requirements
3. Inadequate project funding
4. Does not take into account unexpected costs
5. Inaccurate estimated costs
6. Project data and information are incomplete
7. Material selection according to the work picture
8. *The owner made a design change when the construction was running*
9. Lack of coordination between the construction-manager planner
10. Estimated cost of building a high-rise building

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