DEVOTION
Journal of Research and Community Service
Volume 6, Number 8, August 2025
e-ISSN: 2797-6068 and p-ISSN: 2777-0915

Cost Budget Analysis Based on Value Engineering in a 10 – Story Hotel

Nathania Dwi Damayanti, Muhammad Usmaidi Soleh, Adam Nurjaman, Aryanti Indah
Universitas Swadaya Gunung Jati, Indonesia
Email: nathaniadwd@gmail.com, muhamad6adi@gmail.com, adamnsc120@gmail.com, aryatiindah2023@gmail.com

KEYWORDS
Value Engineering, cost efficiency, function analysis, hotel construction, alternative materials

ABSTRACT
The use of Value Engineering increases the value and performance of projects, providing many benefits for projects and organizations, including economical, technical, and managerial advantages. This research aims to analyze the application of the Value Engineering method in a 10-storey hotel construction project to identify potential cost savings and develop alternative material specifications that maintain the required quality, function, and aesthetics of the building. The process begins with the collection of project technical data, such as Detailed Engineering Design and Cost Budget Plan. Analysis was carried out on several work items, including formwork, ceiling, and façade, using the Breakdown Cost Model, FAST Diagram, and function analysis. Alternative designs are developed through creative stages, analyzed with a Life Cycle Cost approach, and evaluated in terms of advantages and disadvantages. The results show a potential cost saving of IDR 533,884,167.36. The details are as follows: formwork work resulted in savings of IDR 38,713,128.61 (2.14%), ceiling work saved IDR 11,518,697.38 (11.3%), and façade work saved IDR 483,652,341.37 (9.14%). The study offers both practical and theoretical value: it provides a framework for significant cost savings on projects and validates Value Engineering's efficacy in mid-rise hotel construction, serving as a model for industry and future research. This research proves that the systematic application of Value Engineering can improve cost efficiency while maintaining the overall quality and performance of construction.

INTRODUCTION

Value Engineering or commonly heard in construction management is the analysis of Value Engineering which aims to save the cost budget that will be incurred, so there needs to be an alternative that can be used as one of the applications of value engineering (Khanifah et al., 2023). The use of Value Engineering (VE) has many benefits for projects and organizations, including economic, technical, and managerial aspects. Thus, VE improves the value and cost performance of the project (Atabay & Galipogullari, 2022). This is an important part of construction management (Saputra et al., 2024).

Value engineering can be applied from the beginning of the project to the end, covering all stages of the development process. Even at the replacement stage, the project is carried out without performing value engineering. Therefore, it is important for value planning consultants to ensure that Value Engineering can result in cost savings on each project. Value engineering methods should be applied at the planning stage of a development project to achieve the best results (Kusuma Anisa & Kurniawati Maharani, 2023).

To eliminate unnecessary costs while still prioritizing quality and meeting the needs and functions required for building construction, Value Engineering is essential (Bhandari et al., 2018). Therefore, it is very important to apply Value Engineering to a building project, which is expected to give rise to alternative work items as recommendations for the implementing parties (Yogi, 2012).

In Indonesia, the construction sector—particularly high-rise building and hotel projects—often faces significant challenges related to cost overruns. Data from the National Construction Services Development Board (LPJKN) indicates that around 60% of building construction projects experience cost overruns of more than 10% from the initial budget, often due to inefficient material selection, design changes, and lack of value-based planning. The hotel sector, which is highly competitive and sensitive to investment returns, is particularly vulnerable to such inefficiencies (Gamage & Karunasena, 2015; Hassan et al., 2023). Despite the proven potential of Value Engineering (VE) in improving cost efficiency, its application in Indonesia's construction industry remains limited, especially in the early planning stages of private projects such as hotels (Ilayaraja & Eqyaabal, 2015; Mahadik, 2016).

The urgency of this research is also reflected in the context of national economic development and sustainable construction policies. Efficient construction practices not only support cost-effectiveness but also contribute to resource optimization and environmental sustainability—key priorities in Indonesia's infrastructure development goals. Moreover, in the highly competitive hospitality industry, cost efficiency can enhance a hotel's financial viability and market competitiveness, making VE an essential strategic tool (Tom & Gowrisankar, 2015)..

This study offers a novel contribution by focusing on the integrated application of VE through a detailed function analysis, Life Cycle Cost (LCC) evaluation, and comparative material assessment specifically for a 10-story hotel—a typology that has received limited attention in previous VE studies in Indonesia (Samuel & Snapp, 2020; Sandupama et al., 2018). Unlike earlier research, which often focused on public infrastructure or simple structures, this study provides a comprehensive framework for VE implementation in multi-story hospitality buildings, highlighting significant savings in structural and architectural elements without compromising quality or function. The systematic approach and tangible results presented here aim to serve as a practical reference for contractors, developers, and policymakers in promoting value-based construction practices (Naik, 2019).

In this study, the case study method is applied to the 10-Storey Hotel Building Construction Project. By considering the work items, namely structural work, architectural work, and related aspects described above, the researcher aims to identify alternative materials that can be used without reducing the quality of the material or construction. Furthermore, the study determines the amount of cost savings achieved after Value Engineering on the contract value of this development project (Osman et al., 2015).

This research offers significant practical benefits. For project owners and developers, it provides a validated framework for achieving substantial cost efficiency, which can enhance investment returns and financial feasibility. For contractors and project managers, it serves as a guideline for implementing Value Engineering in similar projects, promoting more disciplined budget management and resource optimization. Academically, this study contributes to the body of knowledge on value-based construction management by illustrating a systematic and replicable methodology for high-rise hotel projects—a building typology that remains underexplored in existing literature. Ultimately, the findings are expected to support the broader adoption of Value Engineering practices in the Indonesian construction industry, fostering more sustainable and economically viable project outcomes.

RESEARCH METHOD

The data collection methods used in this study are primary data and secondary data. The primary data is obtained directly from the original source, namely, Detail Engineer Design and Unit Wage Prices. Meanwhile, secondary data as supporting data that is used as reference input

in conducting Value Engineering research is such as scientific journals, final project reports and books on Value Engineering.

This study employs a descriptive case study with a mixed-methods approach to investigate the application of Value Engineering. Data were collected through several techniques common in both qualitative and quantitative research. These include (1) interviews, where the research team interacts directly with respondents to obtain data on their views, experiences, and perceptions, and (2) direct observation of the research subject to gather data on behaviors, interactions, or phenomena (Jailani M. Sayhran et al., 2023). This methodology allows for a comprehensive analysis that integrates numerical cost data with deeper qualitative insights into the project's implementation.

1. Stages of the Value Engineering Process

   Based on the data that has been collected, *a* Value Engineering analysis was carried out which aims to produce cost savings in the 10-storey hotel construction project in Bandung. Value Engineering is carried out in four stages, namely:

   a) Information Phase

      This stage is intended to find and identify obvious problems, get an idea of the project that Value Engineering will undertake, and identify the parts of the project that will be strategically assessed to be studied (Ferdinand & Adianto, 2022).

      1) Breakdown Cost Model

         To show the distribution of the total cost of a project, the Breakdown Cost Model can use a chart arranged from top to bottom to show the figure. (Mendonka , 2015)

      2) Diagram FAST

         In this study, the FAST system development method is a combination of several popular system development methods, The steps in determining this diagram start from the main function and how to achieve it (how), and will be explained about why it is done. (Aldo and Al. , 2021)

      3) Function Analysis

         After determining the work items that can be used for VE, function analysis is critical in value engineering because it is a component that distinguishes cost-saving methods from other methods. (Kusuma Anisa & Kurniawati Maharani, 2023)

$$Ratio = \frac{Cost}{Worth} = < 1 \text{ ..... Unnecessary small costs}$$

$$Ratio = \frac{Cost}{Worth} = > 1 \text{ ..... The amount of unnecessary costs}$$

   b) Creative Phase

      In this phase, concepts are created and alternatives are thought of. Costs are not necessarily caused by the inability to develop new ideas. In this creative phase, ideas can be developed more widely by working with people from different fields of work. (Nandito et al., 2021).

   c) Analysis Phase

      At this stage, the *Value Engineering* Team analyzes the alternatives used in work items in terms of cost and non-cost (Mendonka, 2015) The following are the steps used in the analysis stage:

      1) Life Cycle Cost (LCC)

         Value Engineering uses Life Cycle Cost optimization methods to find solutions that make the most money over their lifetime or the lowest lifecycle costs. (Husin & Kurniawan, 2023)

      2) Profit and Loss Analysis

At the creative stage, alternatives are noted with their advantages and disadvantages, and then given a rating. Some of the criteria used to filter ideas are durability, cost, strength, aesthetics, and so on. (Yogi, 2012)

3) Jucial Steps (Considerations)
At this point, various considerations are taken, because during the creative phase there are many choices that have not been evaluated about the function, quality, and quality of the product or project because it is still in the thought process.

$$Cost\ Saving\ = \frac{Cost\ After\ Savings}{Initial\ Cost} \text{ x } 100\%$$

d) Recommendation Phase
The purpose of this stage is so that the research results of the *Value Engineering* team proposed in the previous stage can convince decision-makers (Kusuma Anisa & Kurniawati Maharani, 2023)

RESULTS AND DISCUSSION

1. Information Phase
At this stage, the data obtained is further analyzed to determine which work items VE will perform. This study reviews the work of structure and architecture after going through the analyst process according to the research flow used:

a) Job Item Information

1) Work Formwork
Formwork work is chosen because structural work is very important because it has uses and functions that affect the implementation of building structure construction, without reducing the quality and quality of the building structure.

Table 1. Formwork Data Information

INFORMATION STAGE		
Project	**:**	**10 Floors Hotels in Bandung**
Job Items	**:**	**Bekisting**
Function	**:**	**Concrete Molding**
SOURCES INFORMATION		PROJECT TECHNICAL DATA
PT. X On the 10-Story Hotel Construction Project in Bandung		Detail Engineer Design (DED) Cost Budget Plan

Source: Data processed

2) Ceiling Work
Ceiling work is an important part of architectural work that has great potential for VE to be done. What can be reviewed from the use of materials therefore ceiling work can be done by VE.

Table 2. Ceiling Job Data Information

INFORMATION STAGE		
Project	**:**	**10 Floors Hotels in Bandung**
Job Items	**:**	**Ceiling**
Function	**:**	**Concrete Molding**
SOURCES INFORMATION		PROJECT TECHNICAL DATA
PT. X On the 10-Story Hotel Construction Project in Bandung		Detail Engineer Design (DED) Cost Budget Plan

Source: Data processed

3) Façade Work
In architectural work, façade components serve as weather shields and building aesthetic identities, thus becoming a high-cost component, which enables Value Engineering.

Table 3. Facade Work Data Information

INFORMATION STAGE		
Project	**:**	**10 Floors Hotels in Bandung**
Job Items	**:**	**Facade**
Function	**:**	**Concrete Molding**
SOURCES INFORMATION		PROJECT TECHNICAL DATA
PT. X On the 10-Story Hotel Construction Project in Bandung		Detail Engineer Design (DED) Cost Budget Plan

Source: Data processed

b) Breakdown Cost Model

With *the* Breakdown Cost Model, the VE analysis team can identify cost efficiency opportunities on work items without compromising on function, quality and performance.

Here is the Breakdown Cost Model on the selected work item:

1) Work Forming

Table 4. *Breakdown Cost Model* Formwork Work

No.	**Job Components**	**Cost (Rp)**	**Cost Percentage (%)**
A	**B**	**C**	**D**
1	COLUMN FORMWORK WORK	IDR 429.314.904	**23,75%**
2	BEAM FORMWORK WORK	IDR 505,577,767	**27,97%**
3	PLATE FORMWORK WORK	IDR 872.514.112	**48,27%**
TOTAL		IDR 1,807,406,783	**100,00%**
VAT 11%		IDR 198,814,746	
Rounding		IDR 2,010,000,000	

Source: Breakdown Cost Model and Life Cycle Cost (LCC) analysis results

The percentage of formwork work is obtained 100% adjusted to the weight and cost used in the project cost budget plan. Where the percentage distribution of each item in this formwork work has been divided according to the weight needs based on the Design Engineer Detail.

2) Ceiling Work

Table 5. *Breakdown Cost Model* Ceiling Work

No.	**Job Components**	**Cost (Rp)**	**Cost Percentage (%)**
A	**B**	**C**	**D**
1	PLAFOND GYPSUMBOARD	IDR 18,411,775	**18%**
2	PLAFOND GYPSUMBOARD WR	IDR 815,266	**1%**
3	EXPOSED CEILING	IDR 78.402.096	**77%**

4	PAINT ON THE CEILING	IDR 4,316,727	**4%**
TOTAL		IDR 101.945.864	**100%**
VAT 11%		IDR 474,840	
Rounding		IDR 102,500,000	

Source: Breakdown Cost Model and Life Cycle Cost (LCC) analysis results

The weight of the ceiling work is obtained 100% adjusted to the weight and costs used in the project cost budget plan. Where the percentage distribution of each item in this ceiling work has been divided according to the weight needs based on the Design Engineer Detail.

3) Façade Work

Table 6. *Breakdown Cost Model* Facade Work

No.	Job Components	Cost (Rp)	Cost Percentage (%)
A	**B**	**C**	**D**
1	FRONT VIEW OF FAÇADE A	IDR 860,440,858	**16%**
2	LEFT SIDE VIEW	IDR 2,083,279,629	**39%**
3	REAR VIEW	IDR 477,834,917	**9%**
4	RIGHT SIDE VIEW	IDR 1,255,257,409	**24%**
5	LANTAI MEZZANINE	IDR 60,216,212	**1%**
6	SWIMMING POOL	IDR 212.130.036	**4%**
7	KANOPI LOBBY	IDR 343,927,724	**6,5%**
TOTAL		IDR 5,293,086,785	**100%**
VAT 11%		IDR 582,239,546	
Rounding		IDR 5,880,000,000	

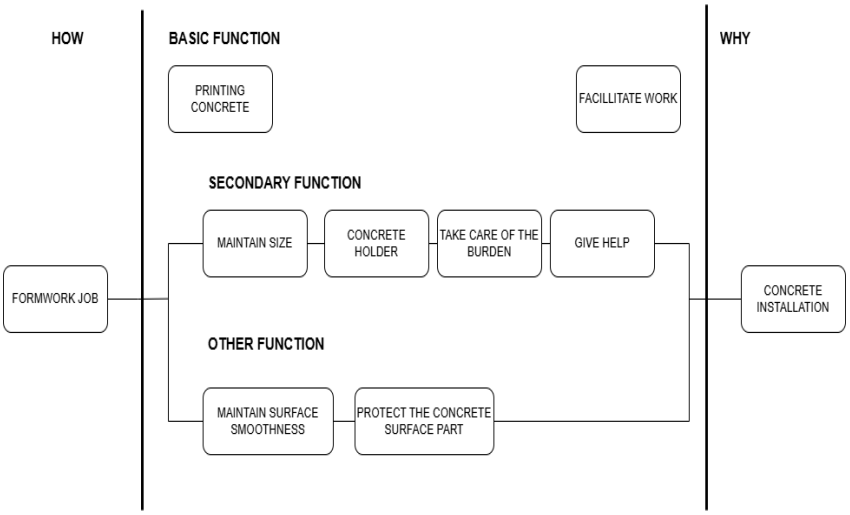
Source: Breakdown Cost Model and Life Cycle Cost (LCC) analysis results

Furthermore, the percentage of façade work is obtained 100% adjusted to the weight and costs used in the project cost budget plan. Where the percentage distribution of each item in this façade work has been divided according to the weight needs based on the Design Engineer Detail.

c) Diagram FAST

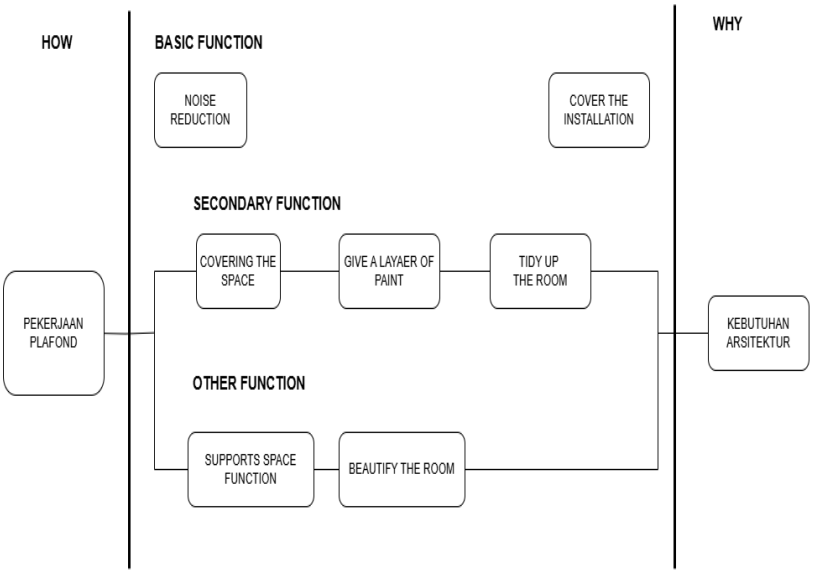
To find the best way to achieve Value Engineering without compromising the main function, the FAST diagram is used to map the logical relationships between the functions of the work item.

1) Bekisitng



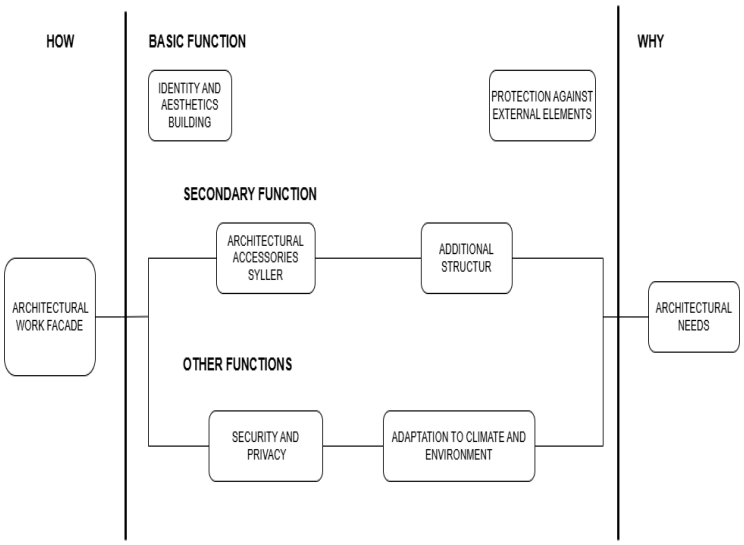
Picture 1. Formwork FAST Diagram

2) Ceiling



Picture 2. FAST Diagram of Ceiling Work

3) Facade



Picture 3. FAST Diagram of Facade Work

d) Function Analysis

Function analysis aims to find out the value of unnecessary costs. The analysis of the functions described in the table can be identified individually between the function of the element and the constituent of the work item using verbs (Verb), then after that the function of the work item is categorized with the Base function and the Secondary function.

Ratio=Cost/Worth = < 1 ..... Unnecessary small costs

Ratio=Cost/Worth = > 1 ..... The amount of unnecessary costs

1) Work Forming

Table 7. Analysis of the Function of Formwork Work

NO.	JOB ITEMS	FUNCTION	FUNCTION ANALYSIS	FUNCTION ANALYSIS		COST	WORTH
				Verb	Child		
1	COLUMN FORMWORK	Primary Functions	Formwork forms concrete by providing a temporary mold that follows the shape, size, and position of the planned concrete structure elements	Form	Basic	IDR 236,123,197,00	IDR 236,123,197,00
		Secondary Functions	Formwork bears the load of wet concrete by passing through a support structure designed to withstand vertical and horizontal pressures	Hold	Basic	IDR 171,725,962,00	IDR 171,725,962,00
		Other Functions	Formwork maintains the smoothness of the concrete surface and can make the job easier	Guard	Secondary	IDR 21,465,745,00	-
2	BEKISTING BALOK	Primary Functions	Formwork forms concrete by providing a temporary mold that follows the shape, size, and position of the planned concrete structure elements	Form	Basic	IDR 303.346.660,00	IDR 303.346.660,00
		Secondary Functions	Formwork bears the load of wet concrete by passing through a support structure designed to withstand	Hold	Basic	IDR 176,952,218,00	IDR 176,952,218,00

			vertical and horizontal pressures				
		Other Functions	Formwork maintains the smoothness of the concrete surface and can make the job easier	Guard	Secondary	IDR 25,278,888,00	-
3	FORMWORK FLAT	Primary Functions	Formwork forms concrete by providing a temporary mold that follows the shape, size, and position of the planned concrete structure elements	Form	Basic	IDR 523,508,467,00	IDR 523,508,467,00
		Secondary Functions	Formwork bears the load of wet concrete by passing through a support structure designed to withstand vertical and horizontal pressures	Hold	Basic	IDR 305,379,939,00	IDR 305,379,939,00
		Other Functions	Formwork maintains the smoothness of the concrete surface and can make the job easier	Guard	Secondary	IDR 43,625,706,00	-
		SUM				**IDR 1,807,406,782**	**IDR 1,717,036,443**
		RASIO = COST/WORTH					**1,053**

Source: Function analysis results using *the Function Analysis System Technique (FAST) method*

After this formwork is carried out, the function analysis of the ratio obtained is 1.053, then a Value Engineering analysis can be carried out , because the ratio is greater than the cost that is not needed. So that it can be continued at the next stage.

2) Ceiling Work

Table 8. Analysis of the Ceiling Job Function

NO.	JOB ITEMS	FUNCTION	FUNCTION ANALYSIS	FUNCTION ANALYSIS		COST	WORTH
				Verb	Child		
1	PLAFOND GYPSUMBOARD	Primary Functions	Covers the installation in the building and reduces noise	Cover	Basic	IDR 11,967,654,00	IDR 11,967,654,00
		Secondary Functions	Useful for coating the room with paint material so that the room becomes neat	Coating	Basic	IDR 5,523,533,00	IDR 5,523,533,00
		Other Functions	Supports the function of the space and adds the aesthetics of the beauty of the room	Support	Secondary	IDR 920.589,00	-
2	PLAFOND GYPSUMBOARD WR	Primary Functions	Covers the installation in the building and reduces noise	Cover	Basic	IDR 529.923,00	IDR 529.923,00
		Secondary Functions	Useful for coating the room with paint material so that the room becomes neat	Coating	Basic	IDR 244,580,00	IDR 244,580,00

		Other Functions	Supports the function of the space and adds the aesthetics of the beauty of the room	Support	Secondary	IDR 40,763.00	-
3	EXPOSED CEILING	Primary Functions	Covers the installation in the building and reduces noise	Cover	Basic	IDR 50,961,362,00	IDR 50,961,362,00
		Secondary Functions	Useful for coating the room with paint material so that the room becomes neat	Coating	Basic	IDR 23,520,628,00	IDR 23,520,628,00
		Other Functions	Supports the function of the space and adds the aesthetics of the beauty of the room	Support	Secondary	IDR 3,920,104,00	-
4	PAINT ON THE CEILING	Primary Functions	Protects the ceiling surface and gives the final look to architectural needs	Protect	Basic	IDR 2,805,872,00	IDR 2,805,872,00
		Secondary Functions	Adds the impression of space and enhances the lighting of the room	Add	Secondary	IDR 1,295,018,00	-
		Other Functions	Provides an artistic or decorative effect for the art function of the interior	Give	Secondary	IDR 215,836,00	-
		SUM				**IDR 101,945,862**	**IDR 95,553,552,**
		RASIO = COST/WORTH					**1,067**

Source: Function analysis results using the Function Analysis System Technique (FAST) method

The calculation of the ratio on this ceiling work analysis of the ratio function obtained is 1.067, then a Value Engineering analysis can be carried out , because the ratio is greater than the cost that is not needed. So that it can be continued at the next stage.

3) Facade Work

Table 9. Facade Job Function Analysis

NO.	JOB ITEMS	FUNCTION	FUNCTION ANALYSIS	FUNCTION ANALYSIS		COST	WORTH
				Verb	Child		
1	FRONT VIEW OF FAÇADE A	Primary Functions	Become the identity and aesthetic aspect of the building and provide protection against external elements	Protection	Basic	IDR 559.286.558,00	IDR 559.286.558,00
		Secondary Functions	It is a distributor of accessories in architecture and	Dealer	Basic	IDR 258,132,257,00	IDR 258,132,257,00

			becomes an additional structure				
		Other Functions	Serves to adapt to the climate and environment as well as security and privacy for users	Adaptation	Basic	IDR 43,022,043,00	IDR 43,022,043,00
2	LEFT SIDE VIEW	Primary Functions	Become the identity and aesthetic aspect of the building and provide protection against external elements	Protection	Basic	IDR 1,354,131,759,00	IDR 1,354,131,759,00
		Secondary Functions	It is a distributor of accessories in architecture and becomes an additional structure	Dealer	Basic	IDR 624,983,889,00	IDR 624,983,889,00
		Other Functions	Serves to adapt to the climate and environment as well as security and privacy for users	Adaptation	Basic	IDR 104,163,981,00	IDR 104,163,981,00
3	REAR VIEW	Primary Functions	Become the identity and aesthetic aspect of the building and provide protection against external elements	Protection	Basic	IDR 310,592,696,00	IDR 310,592,696,00
		Secondary Functions	It is a distributor of accessories in architecture and becomes an additional structure	Dealer	Basic	IDR 143,350,475,00	IDR 143,350,475,00
		Other Functions	Serves to adapt to the climate and environment as well as security and privacy for users	Adaptation	Basic	IDR 23,891,746,00	IDR 23,891,746,00
4	RIGHT SIDE VIEW	Primary Functions	Become the identity and aesthetic aspect of the building and provide protection against external elements	Protection	Basic	IDR 815.917.316.00	IDR 815.917.316.00
		Secondary Functions	It is a distributor of accessories in architecture and becomes an additional structure	Dealer	Basic	IDR 376,577,223,00	IDR 376,577,223,00
		Other Functions	Serves to adapt to the climate and environment as well as security and privacy for users	Adaptation	Basic	IDR 62.762.870.00	IDR 62.762.870.00
5	LANTAI MEZZANINE	Primary Functions	Become the identity and aesthetic aspect of the building and provide protection against external elements	Protection	Basic	IDR 39.140.538.00	IDR 39.140.538.00

		Secondary Functions	It is a distributor of accessories in architecture and becomes an additional structure	Dealer	Basic	IDR 18.064.864.00	IDR 18.064.864.00
		Other Functions	Serves to adapt to the climate and environment as well as security and privacy for users	Adaptation	Basic	IDR 3,010,811,00	IDR 3,010,811,00
6	SWIMMING POOL	Primary Functions	The use of the façade in the pool area serves as a physical barrier from the weather and protects the interior of the pool area	Limiting	Basic	IDR 137,884,523	IDR 137.884.523.00
		Secondary Functions	Be the controller of lighting and ventilation and provide privacy and security to users	Give	Basic	IDR 63.639.011	IDR 63.639.011
		Other Functions	Supporting the function of a thermal insulation system that can control the water temperature in the pool	Control	Secondary	IDR 10.606.502	-
7	KANOPI LOBBY	Primary Functions	Keeping the lobby area shaded and visually marked access to assist visitors and give a first impression of the building	Guard	Basic	IDR 223.553.021	IDR 223.553.021
		Secondary Functions	It is used to be *a Drop-off* so that it helps regulate the flow of vehicle traffic and creates a transition zone from the outside to the inside	Organize	Secondary	IDR 103.178.317	-
		Other Functions	As a branding medium, it is usually a place to display the company's logo, building name or other visual identity elements	Display	Secondary	IDR 17,196,386	-
		SUM				**IDR 5,293,086,786**	**IDR 5,162,105,581**
		RASIO = COST/WORTH					**1,025**

Source: Function analysis results using the Function Analysis System Technique (FAST) method

In façade work after the function analysis is carried out, the ratio obtained is 1.025, then a Value Engineering analysis can be carried out , because the ratio is greater than the cost that is not needed. Next, it is the creative stage by considering the previous stages.

2. Creative Stage

After the function is analyzed, the results of alternative ideas appear at this creative stage. Encouraging an innovative mindset in this way emphasizes the mindset and temporary abandonment of technical, budgetary and initial design constraints.

a) Work Formwork

Table 10. Formwork Alternatives

The Creative Stage of Alternative Gathering		
Project	**:**	**Construction of a 10-Storey Hotel**
Job Items	**:**	**Formwork Columns, Beams and Plates**
Function	**:**	**Concrete molding**
Initial Design : Polywood 12 mm and 18 mm		
NO		**Alternatif**
1		Bekisiting Plywood Phenolic
2		Bekisting Plywood Film Faced

Source: Data processed

b) Ceiling Work

Table 11. Ceiling Job Alternatives

The Creative Stage of Alternative Gathering		
Project	**:**	**Construction of a 10-Storey Hotel**
ItemsJobs	**:**	**Ceiling**
Function	**:**	**Closing the Installation**
Initial Design : Gypsum Ceiling		
No		**Alternatif**
1		Plafond PVC (Polyvinyl Chloride)
2		Plafond GRC (Glassfiber Relinforced Cement)

Source: Data processed

c) Façade Work

Table 12. Facade Work Alternatives

The Creative Stage of Alternative Gathering		
Project	**:**	**Construction of a 10-Storey Hotel**
Job Items	**:**	**Facade**
Function	**:**	**Identity and aesthetics of buildings**
Initial Design : Aluminum Composite Panel		
No		**Alternatif**
1		Facade HPL (High Preassure Laminate)
2		Facade Panel Metal

Source: Data processed

3. Stages of Analysis

At the stage of data analysis, the obtained data is then calculated by the method used. In addition, the purpose of the analysis stage is to reduce the selection of various concepts that have been made before, so that only the best options can proceed to the evaluation and recommendation stage

a) Life Cycle Cost

The following is a table of Life Cycle Costs on alternative ideas for work items that have been analyzed:

Table 13. LCC Formwork Work

FORMWORK WORK

Fee Type	Initial Design	Alternative 1	Alternative 2
Construction Costs	IDR 1,207,331,017,32	IDR 1,168,617,332.73	IDR 1,222,755,074,74
Operating Costs	IDR 600,075,759,61	IDR 600,076,315,59	IDR 600,076,315,59
Maintenance Costs	-	-	-
Replacement Fee	-	-	-
Residual Value	IDR 9,992,080,67	-	-
	IDR 1,807,406,776,93	IDR 1,768,693,648.32	IDR 1,822,831,390,33

Source: Breakdown Cost Model and Life Cycle Cost (LCC) analysis results

In the alternative formwork work chosen is alternative 1 or Plywood Phenolic formwork at a cost of IDR 1,768,693,648.32

Table 14. LCC Ceiling Work

CEILING WORK

Fee Type	Initial Design	Alternative 1	Alternative 2
Construction Costs	IDR 62,446,866,71	IDR 69,944,099,06	IDR 50,928,169,33
Operating Costs	IDR 39,496,728,74	IDR 39,496,728,82	IDR 39,496,728,74
Maintenance Costs	-	-	-
Replacement Fee	-	-	-
Residual Value			
	IDR 101,943,595,45	IDR 109,440,827,88	IDR 90,424,898,07

Source: Breakdown Cost Model and Life Cycle Cost (LCC) analysis results

In the alternative ceiling work, the chosen alternative is alternative 2 or GRC ceiling formwork at a cost of Rp 90,424,898.07

Table 15. LCC Facade Works

FAÇADE WORK

Fee Type	Initial Design	Alternative 1	Alternative 2
Construction Costs	IDR 3,782,692,254,72	IDR 3,243,765,360,05	IDR 3,299,039,913,35
Operating Costs	IDR 1,510,394,530,34	IDR 1,510,394,530,34	IDR 1,510,394,530,34
Maintenance Costs	-	-	-
Replacement Fee	-	-	-
Residual Value			
	IDR 5,293,086,785,06	IDR 4,754,159,890,39	IDR 4,809,434,443,69

Source: Breakdown Cost Model and Life Cycle Cost (LCC) analysis results

In the work of the alternative façade chosen is alternative 2 or Metal Panel façade with a price of Rp 4,809,4343.69

b) Profit and Loss Analysis

By determining and comparing these benefits and drawbacks, the VE team can provide recommendations that consider long-term operational and strategic feasibility as well as economic calculations. The end goal is to ensure that the chosen solution provides the best value from the perspective of the developer, hotel operator, and end guest.

Table 16. Analysis of the Cost of Work

Project	:	Construction of a 10-Storey Hotel in Bandung
Job Items	:	Formwork Work

No.	Alternative Ideas	Profit and Loss Analysis	
		Advantage	Loss
1	Bekisiting Plywood Phenolic	The resulting concrete surface is smoother, flattering, clean and less defective High resistance to water, moisture and sunlight Can be used many times to reduce the cost of formwork materials as a whole Precise and consistent dimensions make it easy to assemble and assemble Due to the precise shape, the removal and installation process is faster	Susceptible to damage if left untreated can result from a hard impact during disassembly The risk of theft in the field because it has a high value It has a weight that needs careful handling so that it requires a good manpower in this field Inflexible for custom shapes
2	Bekisting Film Faced	The quality of the concrete surface is flat, smooth so that it reduces the need for additional plastering or stucco Very economical because the use can be repeated on the job	Limited service life is generally used 6-10 times (depending on quality and maintenance) Susceptible to moisture and poor storage can result in damage

		Installation efficiency for shorter casting times and faster overall job progress	Less efficient on complex and repetitive structural work
		The use of these materials shows that the project is managed with modern and professional methods	

Source: Data processed

Table 17. Analysis of the Profit and Loss of Employment Ceiling

Project	:	Construction of a 10-Storey Hotel in Bandung
Job Items	:	Ceiling Work

No.	Alternative Ideas	Profit and Loss Analysis	
		Advantage	Loss
1	PVC ceiling	Does not absorb water so it can prevent the growth of mold and mildew that can interfere with comfort;	Less environmentally friendly because it is made of plastic
		Light weight and Easy to install, can reduce the load of the structure;	Not resistant to high heat, may warp or deform if exposed to high temperatures for a long time
		Save maintenance costs;	Limited sound immersion power
		Available in many designs and colors that can add to the aesthetic;	Susceptible to certain chemicals that can change color or weathering
2	GRC Limit	Durable and strong so it is not easy to crack and warp	Minimal post-installation flexibility, making it difficult if you need a quick renovation
		Stable and minimal maintenance does not shrink or expand significantly	May result in fine cracks if installed incorrectly
		Can be printed or shaped to suit a variety of textures, motifs and textures	The installation process is more complicated if there is a ceiling design using molds or special decorative panels
		Environmentally friendly because it is made from inorganic materials that can be recycled and do not produce harmful gases	

Source: Data processed

Table 18. Analysis of the Profit and Loss of Employment of Faacde

Project	:	Construction of a 10-Storey Hotel in Bandung
Job Items	:	Facade Work

No.	Alternative Ideas	Profit and Loss Analysis	
		Advantage	Loss
1	Facade HPL	It has a varied and elegant aesthetic and can give a modern impression	Not resistant to extreme weather, UV rays, acid rain or even drastic temperature changes
		Cheaper material and installation costs so it is more cost-effective	Adhesion and risky installation that result in easy disintegration or cracking of the panels
		Easy to install and shape according to the design including curves and corners	Risk of fading color resulting from long-term sun exposure
		Consistent display throughout the façade area for easy matching at the time of installation	
		Minimal maintenance because it only needs periodic cleaning using soap and water	
2	Facade Panel Metal	Resistant to extreme weather so it is not easily damaged even if installed on the facade most exposed to sunlight	Range of dents and scratches resulting from hard impacts or at the time of careless installation

	Modern aesthetics and high precision can give a futuristic, elegant and premium impression to the hotel building	Metal panels with shiny surfaces can reflect sunlight directly, causing glare on other buildings
	Easy maintenance as it is not easy to mold and stain	Proper drainage and ventilation systems are required
	Eco-friendly and recyclable	Has a risk of rust if not coated with anti-rust paint
	Metal panels are usually made with a modular system that can be easily installed	

Source: Data processed

c) Judicial Steps (Consideration Stage)

The following table is used at the consideration stage intended to provide a quantitative picture and a clear comparison between the cost conditions before and after the application of the results of Value Engineering (VE) analysis.

Table 19. Initial Design Consideration Stage and VE Design

CONSIDERATION STAGE							
NO.	**JOB ITEMS**	**INITIAL DESIGN**		**VE DESIGN**		**COST**	
		VOL	**PRICE**	**VOL**	**PRICE**	**INITIAL COST**	**VE COST**
1	**Formwork Work**						
	Formwork Column	2558,06	IDR 167,828	2558,1	IDR 158,664.40	IDR 429,315,940,27	IDR 405,873,047,06
	Bekisting Balok	2684,88	IDR 188,305	2684,9	IDR 186,242.74	IDR 505,577,643,44	IDR 500.039.407,22
	Formwork Flat	4749,15	IDR 183,720	4749,2	IDR 181,670,66	IDR 872,514,806,83	IDR 862.781.194.04
Sum						**IDR 1,807,408,390,53**	**IDR 1,768,693,648.32**
2	**Ceiling Work**						
	Ceiling Work	133,35	IDR 138.071	133,35	IDR 133.026,10	IDR 18,411,849,96	IDR 17,739,030,94
	WR Ceiling Work	5,14	IDR 158,481	5,14	IDR 141,792.47	IDR 815,266,15	IDR 729.412,79
	Expo Ceiling Jobs	1103,16	IDR 71,068,48	1103,16	IDR 61,314,64	IDR 78,399,752,60	IDR 67,639,727,60
	Paint Work on the Ceiling	138,49	IDR 31,169,12	138,49	IDR 31,169,12	IDR 4,316,726,75	IDR 4,316,726,75
Sum						**IDR 101,943,595,45**	**IDR 90,424,898,08**
3	**Façade Work**						
	Front View of the Facade	1322,92	IDR 650.411	1322,92	IDR 588,563.30	IDR 860,440,858,15	IDR 778,621,295,07
	Left Side View	3695,93	IDR 563,669	3695,93	IDR 509.694,19	IDR 2,083,279,628,83	IDR 1,883,791,813,81
	Rear View	1519,96	IDR 314.372	1519,96	IDR 290,294,61	IDR 477,834,917,39	IDR 441,236,918,99
	Right Side View	3725,88	IDR 336,902	3725,88	IDR 313,987,33	IDR 1,255,257,408,45	IDR 1,169,877,637,62
	Lantai Mezzanine	196,73	IDR 306.088	196,73	IDR 306.088,08	IDR 60,216,212,20	IDR 60,216,212,20
	Swimming Pool	191,35	IDR 1,108,617	191,35	IDR 1,108,617,40	IDR 212,130,036,22	IDR 212,130,036,22
	Kanopi Lobby	442,16	IDR 777,828	442,16	IDR 596,069,74	IDR 343,927,723,82	IDR 263,560,529,79
Sum						**IDR 5,293,086,785,06**	**IDR 4,809,434,443,69**

Source: Data processed

4. Recommendation Stage

a) Alternative Recommendation Results

Value Engineering (VE) analysis recommendations aim to provide a final output consisting of a solution that has been selected and tested that has gone through a thorough process of creativity, evaluation, function analysis, and consideration, so as

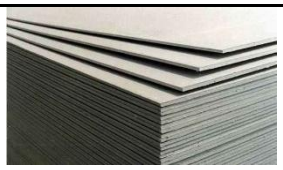
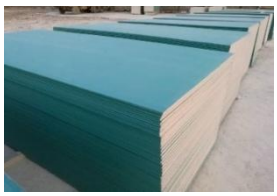
to provide maximum value for the project in terms of cost efficiency, function effectiveness, and quality of results.

Table 21. Formwork Job Recommendations

JOB PROPOSALS			
Project	:	Construction of a 10-Storey Hotel in Bandung	
Job Items	:	Formwork Work	
Function	:	Concrete Molding	
Initial Plan	:	Plywood 18 mm, 12 mm 2.400 mm x 1.200 mm (2,4 m x 1,2 m)	
Plan After Proposal	:	Plywood Phenolic 18 mm, 12 mm 2.400 mm x 1.200 mm (2,4 m x 1,2 m)	
Initial Cost			IDR 1,807,406,776,93
Cost After Proposal	:		IDR 1,768,693,648.32
Savings	:		IDR 38,713,128,61
The percentage of savings that occur is	:		2,14%

Source: Data processed

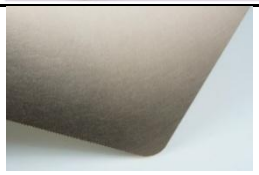
Table 22. Ceiling Job Recommendations

JOB PROPOSALS			
Project	:	Construction of a 10-Storey Hotel in Bandung	
Job Items	:	Ceiling Work	
Function	:	Closing the Installation	
Initial Plan	:	Gypsum 9 mm 2.400 mm x 1.200 mm (2,4 m x 1,2 m)	
		Gypsum 9 mm Water ressistance 2.400 mm x 1.200 mm (2,4 m x 1,2 m)	
		green paper as a moisture-resistant marker	
Plan After Proposal	:	GRC Royal Board 4mm 2.400 mm x 1.200 mm (2,4 m x 1,2 m)	
		GRC Silica Board Water Ressistace 4 mm 2.400 mm x 1.200 mm (2,4 m x 1,2 m)	
Initial Cost			IDR 101,943,595,45

Cost After Proposal	:	IDR 90,424,898,07
Savings	:	IDR 11,518,697,38
The percentage of savings that occur is	:	11,3%

Source: Data processed

Table 23. Facade Work Recommendations

JOB PROPOSALS		
Project	:	Construction of a 10-Storey Hotel in Bandung
Job Items	:	Façade work
Function	:	Identity and aesthetics of buildings
Initial Plan	:	Alumunium Composite Panel 
Plan After Proposal	:	Panel Metal 

Initial Cost		IDR 5,293,086,785,06
Cost After Proposal	:	IDR 4,809,434,443,69
Savings	:	IDR 483,652,341,37
The percentage of savings that occur is	:	9,14%

Source: Data processed

b) Presentation Stage and Follow-up Program

After going through all the stages in the Value Engineering analysis , the next stage is the presentation stage and the action program which has the goal of systematically and convincingly conveying the results and recommendations of VE to project stakeholders and setting concrete steps to implement the agreed solutions.

Table 24. Presentation Stage and Follow-up Program

NO.	JOB ITEMS	INITIAL DESIGN	NO.	JOB ITEMS	VE DESIGN	COST OPTIMIZATION
1	Bekisting Plywood	IDR 1,807,406,776,93	1	Bekisting Plywood Phonelic	IDR 1,768,693,648.32	IDR 38,713,128,61
2	Gypsum Ceiling	IDR 101,943,595,45	2	Plafond GRC (Glassfiber Relinforced Cement)	IDR 90,424,898,07	IDR 11,518,697,38
3	Facade ACP (Alumunium Composite Panel)	IDR 5,293,086,785,06	3	Facade Panel Metal	IDR 4,809,434,443,69	IDR 483,652,341,37

CONCLUSION

Based on the Value Engineering analysis applied to the 10-Story Hotel Construction Project, this study demonstrates that a systematic approach through information gathering, creativity, analysis, and recommendation stages effectively identified cost-efficient alternative materials—such as Phenolic Plywood for formwork, GRC Board for ceiling work, and Metal Panels for the facade—resulting in total savings of IDR 533,884,167.36 without compromising

quality or function. These savings amounted to 2.14% in formwork, 11.3% in ceiling, and 9.14% in facade costs, highlighting the method's potential to enhance construction budget efficiency significantly. The research provides practical material recommendations and a replicable framework that can be utilized in similar high-rise residential projects, promoting sustainable and value-oriented construction practices in Indonesia. For future research, it is suggested to explore the integration of Value Engineering with emerging digital construction technologies, such as Building Information Modeling (BIM), to further optimize material selection and cost management in complex high-rise developments.

REFERENCE

Abdul Malik Annasir, M., & Wibowo, K. (2023). Value Engineering Analysis on the Ki Ageng Sedayu Hospital Construction Project, Pekalongan Regency. Foundations, 28.

Aldo, D., Rahman Habibie, D., Telkom Technology Purwokerto, I., GICI's College of Informatics and Computer Management, B., Jl Panjaitan No, B. DI, Kidul, P., Purwokerto Sel, K., Banyumas, K., & Tengah, J. (2021). FAST method for the construction of an inventory system, 6(2).

Atabay, S., & Galipogullari, N. (2022). A Decade of Value Engineering in Construction Projects. ResearchGate. https://doi.org/10.13140/RG.2.2.15847.39520

Bhandari, P. B., et al. (2018). Value engineering application in a high rise building (a case study in Bali). ResearchGate. https://doi.org/10.1088/1755-1315/195/1/012047

Diah, A. A., Dewi, P., Jaya, N. M., Putu, N., & Trisnayanthy, E. (2024). Analysis of the Application of Value Engineering in the Villa Holly Pecatu Construction Project. Spektran Journal, 12(1).

Fanny. (2021). Benefit Cost Analysis in the Construction of Networking Flats with NPV, IRR, PP, BCR Methods Using Investment Evaluation Software.

Ferdinand, F., & Adianto, Y. L. D. (2022). Application of Value Engineering in the X Multipurpose Building Construction Project in Medan City. Journal of Sustainable Construction, 1(2), 10–18.

Gamage, K. R., & Karunasena, G. (2015). Value Engineering Practices and Its Impact to Construction Industry. The 4th World Construction Symposium 2015: Sustainable Development in the Built Environment: Green Growth and Innovative Directions, 12–14 June, Colombo, Sri Lanka.

Hassan, R. E. A., Osman, et al. (2023). Impact of Value Engineering on Construction Project Management and Achievement of Sustainable Development. International Research Journal of Innovations in Engineering and Technology (IRJIET), 7(1), 1–15.

Husin, A. E., & Kurniawan, I. (2023). Analysis of Green Cost Performance in the Main Building of the Flour Mill Plant based on Value Engineering and Life Cycle Cost Analysis. Journal of Civil Engineering Applications, 21(1), 65. https://doi.org/10.12962/j2579-891x.v21i1.14988

Ilayaraja, K., & Eqyaabal, Z. (2015). Value Engineering in Construction. ResearchGate. https://doi.org/10.13140/RG.2.1.4668.4162

Jailani, M. S., Risnita, & Ardiansyah. (2023). Data Collection Techniques and Scientific Research Instruments. http://ejournal.yayasanpendidikandzurriyatulquran.id/index.php/ihsan

Khanifah, N., Faqih, N., Abdussalam, A., Qomaruddin, M., Study, P., Civil, T., Engineering, F., Computer, I., Science, U., & Qur'an, A. (2023). Analysis of the Application of Value Engineering Structural Work in the Permai Banjarnegara Hotel Building Construction Project.

Kusuma, A., & Kurniawati, M. (2023). The Application of Value Engineering in Building Projects (Case Study: Warmadewa Civil Competition (Wcc) University Bali Building Construction Project Plan in 2020).

Mahadik, U. A. (2016). Application of Value Engineering Techniques in Construction Projects. ResearchGate, 4(7).

Mendonka, E. (2015). Application of Value Engineering in the Construction of the MIPA CENTER Building, University of Brawijaya Malang.

Naik, M. G. (2019). BIM Based Analysis of Time and Cost for Multi Storey Commercial Building. International Journal of Engineering and Technology, 11(6), 1456–1463.

Nandito, A., Huda, M., & Siswoyo, S. (2021). Application of Value Engineering in the Development Project of the Rego Manggarai West NTT. Axial: Journal of Engineering and Construction Management, 8(3), 171. https://doi.org/10.30742/axial.v8i3.1416

Osman, R. E. A. H., et al. (2015). Value Engineering and Reason of Unnecessary Cost in Construction Industry. ResearchGate. https://doi.org/10.5281/zenodo.1316890

Samuel, E., & Snapp, O. J. (2020). Cost Model for Construction of Hotel Projects. International Journal of Creative Research Thoughts (IJCRT), 8(6).

Sandupama, A. V. P. U., et al. (2018). Cost optimization for public school building projects during design stage using value engineering. ResearchGate. https://doi.org/10.1088/1757-899X/471/10/102051

Saputra, A., Wibowo, K., & Rochim, A. (2024). Value Engineering Analysis Using Matrix Cost Model and Breakdown Cost Model Methods with Final Results of Pareto Distribution in the Case Study of the Construction of Meshall NCC Amman Mineral West Nusa Tenggara. Journal of Civil Engineering, 16(3).

Steven, S., & Tamtana, J. S. (2020). The Application of Value Engineering in the Selection of Concrete Column Beksiting Types in High-Rise Building Construction. JMTS: Journal of Civil Engineering Partners, 3(2), 267. https://doi.org/10.24912/jmts.v3i2.6984

Surja, A., Budiman, J., & Nugraha, P. (2021). Application of Value Engineering in the selection of façade elements. Key Dimensions of Civil Engineering, 8(1), 01–16. https://doi.org/10.9744/duts.8.1.01-16

Tanoni, K. M., Siswoyo, S., & Soepriyono, S. (2023). Application of Value Engineering in the Maubasa Belu Bridge Construction Project, NTT. Axial: Journal of Construction Engineering and Management, 11(1), 047. https://doi.org/10.30742/axial.v11i1.2856

Tom, N., & Gowrisankar, V. (2015). Value Engineering in Residential House Construction. International Journal of Civil and Environmental Engineering & Technology (IJCIET), 6(6), 46–52.

Yogi, A. (2012). Application of Value Engineering in the Construction of the Widya Mandala Pakuwon City-Surabaya Catholic University Project.