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Optimal Profitability Analysis for Contractors Regarding Variations in Payment Systems and Scheduling

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ABSTRACT

Construction projects often face higher risks than other types of projects, primarily due to potential delays from inaccurate scheduling and cash flow issues. Therefore, effective scheduling and payment systems are crucial for contractors to reduce risks and achieve optimal profitability. This study aims to identify optimal cash flow and profitability for contractors through the analysis of various payment systems and the utilization of float time. The methods used include cash flow analysis and feasibility analysis using NPV, BCR, and ROI methods. This research explores eight different payment and scheduling approaches to evaluate their impact on project profitability. The results show that cash flow across all alternatives remains positive without experiencing a shortage of funds and indicate that the contractor's optimal profitability is achieved with application of alternative 5, featuring 0% float time and no advance payments. This alternative results in the highest profit, with an NPV of Rp 15,338,960,581, a BCR of 1.059, and an ROI of 5.90%. From these results, it can be concluded that not utilizing float time leads to the most optimal profitability for the contractor. Additionally, it can be said that the scheduling plan implemented by the contractor for the Twin Tower project is well-structured. However, for the payment system, it is recommended to adopt a no-advance payment approach. It is hoped that this study will help contractors optimize their profits in the competitive construction industry.

Keywords: Profitability, Payment Systems, Scheduling, Cash Flow Analysis, Feasibility Analysis

ABSTRACT

Proyek konstruksi sering kali dihadapkan pada risiko yang lebih tinggi daripada jenis proyek lainnya, terutama disebabkan oleh potensi keterlambatan akibat penjadwalan yang tidak akurat dan masalah dalam arus kas. Oleh karena itu, analisis penjadwalan dan sistem pembayaran yang efektif sangat penting bagi kontraktor untuk mengurangi risiko serta mendapatkan profitabilitas optimal. Penelitian ini dilakukan dengan tujuan untuk mengidentifikasi aliran kas (cash flow) serta profitabilitas optimal bagi kontraktor melalui analisis berbagai sistem pembayaran dan pemanfaatan waktu tunda (*float time*). Metode yang digunakan mencakup analisis aliran kas dan analisis kelayakan dengan menggunakan metode NPV, BCR, dan ROI. Penelitian ini mengeksplorasi delapan variasi pendekatan pembayaran dan penjadwalan yang berbeda untuk mengevaluasi dampaknya terhadap profitabilitas proyek. Hasil penelitian menunjukkan bahwa aliran arus kas (*cash flow*) pada seluruh alternatif tetap positif dan tidak mengalami kekurangan dana serta menunjukkan bahwa profitabilitas optimal kontraktor dapat dicapai pada alternatif 5, dengan variasi waktu float time 0% dan tanpa pembayaran muka. Alternatif tersebut menghasilkan profit tertinggi, dengan NPV sebesar Rp 15.338.960.581, BCR sebesar 1,059, dan ROI sebesar 5,90%. Dari hasil tersebut dapat disimpulkan bahwa apabila tidak dilakukan pemanfaatan waktu tunda (float time), maka akan didapatkan profitabilitas paling optimal bagi kontraktor. Selain itu, dapat dikatakan bahwa rencana penjadwalan yang diterapkan oleh kontraktor pada proyek Twin Tower sudah tersusun dengan baik. Namun, untuk sistem pembayarannya disarankan untuk menerapkan pembayaran tanpa uang muka. Dengan ini diharapkan agar penelitian ini membantu kontraktor dalam mengoptimalkan keuntungannya dalam industri konstruksi yang kompetitif.

Kata Kunci**:** Profitabilitas, Sistem Pembayaran, Penjadwalan, Analisis Arus Kas, Analisis Kelayakan

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1. INTRODUCTION

A construction project is a series of activities aimed at achieving development according to the established schedule, budget, and quality standards (Sugiyanto, 2020). Compared to other types of projects, construction projects are known to have a higher level of uncertainty and risk due to several factors (Xie & Yang, 2021). Factors such as design complexity and frequent changes, uncertainty in labor and fund availability, and suboptimal contractual relationships between project owners, consultants, and contractors contribute to increased uncertainty. Therefore, it is crucial for contractors to identify, predict, and manage potential risks in a project to ensure its smooth execution (Huqban et al., 2020).

In projects, there are numerous risks that might occur. Delays in activity execution are a common risk. According to Tolangi et al. (2012), this risk can result in schedule changes and significantly impact the overall project cost. Such delays directly oppose the contractor's goal of achieving optimal profitability. One effective way to address delays or changes in project execution is by utilizing float time. Float time allows for the postponement of activities without affecting the overall project completion time (Putri et al., 2023).

Besides delays, cost risks can also arise from cash flow disruptions due to the contractor's lack of skills in managing cash flow (Suniarta et al., 2023). This can lead to delays due to the unavailability of funds to continue activities, forcing the project to halt (Natalia et al., 2017). Contractor profitability stems from the difference between the cost estimate and the project cost budget. However, many construction service companies face liquidity issues due to a lack of understanding in financial management (Gundes et al., 2019). Therefore, contractors need to recognize that with limited financial resources, effective resource management is essential to achieve maximum profit or profitability.

In summary, managing risks such as delays and cash flow disruptions, and understanding the financial aspects of a project, are key to ensuring the successful completion and profitability of construction projects. Proper utilization of float time, and good financial management practices are crucial for achieving the goals.

2. LITERATURE REVIEW

A. Project Scheduling

Project scheduling is crucial for ensuring a project progresses as planned. It organizes activities from initiation to completion, considering progress, duration, and overall advancement. Accurate scheduling mitigates potential delays and ensures smooth execution. Time performance standards are set by detailing project stages, durations, and predecessors.

This research uses microsoft project for scheduling, employing network planning methods like the critical path method (CPM) and the precedence diagram method (PDM). These methods identify the critical path and task dependencies, and help determine float time, which is a key focus of this study.

1. CPM (Critical Path Method)

The critical path method or critical path analysis, is a project network analysis technique that calculates the total duration of project. The critical path comprises a series of activities that determine the shortest possible project

completion time (Siregar & Ardiansyah, 2022). This path represents the longest sequence of activities in the project network and is highly sensitive to delays. If a critical activity is delayed by even one day, the entire project will be delayed, regardless of whether other activities are on schedule (Safitri et al., 2019).

2. PDM (Precedence Diagram Method)

The precedence diagram method (PDM) is a project scheduling technique that helps to easily understand the relationships between project activities. The PDM network principle involves dependencies among activities based on four fundamental relationships:

a. Finish to Start (FS)
Where an activity cannot start until the preceding activity finishes

b. Start to Start (SS)
Where an activity cannot start until the preceding activity starts

c. Finish to Finish (FF)
Where an activity cannot finish until the preceding activity finishes

d. Start to Finish (SF)
Where an activity cannot finish until the preceding activity starts.

B. Execution Budget Plan

The construction cost budget is an estimate of the costs required to execute a project on-site. By accurately calculating work volume, material requirements, detailed prices, and labor costs for each unit of work. Additionally, the costs of necessary equipment, including procurement and operational expenses, must be considered. The formula for calculating the execution budget plan is as follows:

$$\begin{aligned}\textbf{Execution Budget Plan} &= \text{Project Cost} - \text{Profit Margin} \\ &= \text{Project Cost} - (10\% \times \text{Project Cost}) \\ &= 0{,}90 \times \text{Project Cost}\end{aligned} \quad (1)$$

In this formula, profit is 10% of the project cost. Subtracting this from the project cost yields the execution budget plan, which is 90% of the project cost.

C. Task Weight

Task weight or work weight represents the proportion of work completed relative to the total project workload. Assigning a weight to each task highlights its contribution to overall progress. Understanding task weight helps identify each task's impact on the total project completion.

$$\textbf{Task Weight} = \frac{\text{Estimated Effort for Task}}{\sum_{t=0}^{t=n} \text{Estimated Effort for All Task}} \times 100 \quad (2)$$

D. Cash Flow

Cash flow is a critical aspect of running a business. It refers to the movement of cash in and out of a company over a specific period. A solid understanding of cash flow is essential as it reflects the financial health of a

company. A positive cash flow indicates that the company is generating more money than it is spending. Conversely, a negative cash flow suggests that the company is spending more money than it is earning, which can lead to financial troubles. Effective cash flow management involves careful monitoring of inflows and outflows, as well as strategic planning to ensure smooth operations and sustainable business growth. Thus, understanding and effectively managing cash flow are key to ensuring financial success.

E. Feasibility Analysis

Feasibility analysis is essential for assessing the viability of a project before its initiation. It assesses technical, economic, legal, and operational factors for project viability. In construction projects, feasibility analysis ensures that proposed developments meet objectives. In this research, the methods used are BCR, NPV, and ROI, with the following formulas.

1. Net Present Value (NPV)

Net present value, is essential for assessing the profitability and feasibility of investments. It quantifies the disparity between the present value of net cash flows throughout the project's lifespan. This calculation involves comparing the current value of future cash inflows, discounted to present value using a set discount rate, with the initial outlay. According to Tiwari and Sahota (2018), the formula and evaluation criteria for NPV are as follows.

$$\mathbf{NPV} = \sum_{t=0}^{t=n} \frac{(Bt-Ct)}{(1+i)^t} \quad (3)$$

Where:

n = the lifespan of the project (monthly or yearly)
Bt = the revenue generated in the t-year
Ct = denotes the production in the t-year
i = discount rate

Evaluation Criteria:

If NPV > 0, the investment is profitable or feasible
If NPV = 0, the present value of benefits equals the present value of costs
If NPV < 0, the investment is not profitable or not feasible

2. Benefit-Cost Ratio (BCR)

The benefit-cost ratio (BCR) is a key financial metric for assessing the profitability and viability of investment projects. This ratio compares the present value of a project's benefits to the present value of its costs. BCR analysis aids in resource allocation and risk management to maximize returns and minimize losses. The BCR formula is expressed as the ratio of the present worth of benefits to the present worth of costs.

$$\mathbf{BCR} = \frac{\text{Present Worth Of Benefit}}{\text{Present Worth Of Cost}} \quad (4)$$

$$= \frac{\sum_{t=0}^{t=n} \frac{(Bt)}{(1+i)^t}}{\sum_{t=0}^{t=n} \frac{(Ct)}{(1+i)^t}}$$

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Evaluation Criteria:
If BCR > 1, the investment generates profits or is feasible.
If BCR < 1, the investment does not generate profits or is not feasible

3. Return on Investment (ROI)

Return on investment (ROI) is a pivotal metric measuring investment efficiency by comparing net project profit to investment costs. This financial ratio evaluates the profitability of ventures by assessing the returns relative to the capital invested. A higher ROI signifies greater profitability, while a lower ROI suggests less favorable returns. This analysis aids decision-makers in evaluating risks and rewards, guiding resource allocation and strategic planning for sustainable growth. According to Botchkarev and Andru (2011), the formula for ROI are as follows.

$$\textbf{ROI} = \frac{\sum \text{Financial Return} - \sum \text{Cost}}{\sum \text{Cost}} \quad (5)$$

By analyzing these three methods, contractors can make more informed decisions about investment projects and optimize development strategies to achieve long-term financial goals. If all three methods deem the project feasible, then the project can proceed or be implemented.

3. RESEARCH METHODOLOGY

The research was conducted at the Twin Tower building project of UPN "Veteran" East Java over five months, from January 2024 to May 2024. The project began with proposal preparation and concluded with the thesis defense. The primary objective was to analyze cash flow and project feasibility, ultimately identifying the most optimal alternatives for the contractor.

This study uses a quantitative research approach. The data used in this research is secondary data obtained from relevant parties involved in the project implementation, specifically the contractor. The research includes a flowchart that delineates the sequential steps to be followed. Below is the depicted diagram.

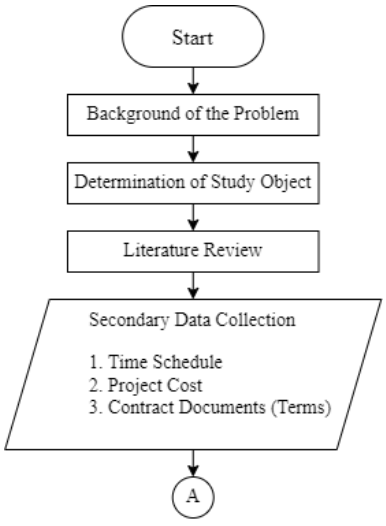

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Figure 3.1 Flowchart of research process

For further clarification regarding the above flowchart, it's essential to understand the meticulous steps involved in any research endeavor to achieve desired outcomes. Here are the outlined steps relevant to this research:

1. **Preparation**
   Reviewing existing literature to define objectives and determine methodologies.
2. **Data Collection**
   This data collection process entails gathering data by browsing official websites and making direct requests to relevant parties.
3. **Creating a Detailed Schedule Plan**
   Identifies project activities and determines their sequence and duration.
4. **Determining Float Time Variations**
   After creating the schedule plan, implementation float time variations of 0%, 35%, 65%, 100% for each activity are determined to measure the project schedule's flexibility in handling potential delays.
5. **Project Cost Evaluation**
   Analyzes material costs, labor, and other expenses involved.
6. **Calculating Monthly Execution Budget Plan**
   Tracks monthly budget allocations to ensure effective financial management by utilizing the microsoft project application.
7. **Cash Flow Calculation**
   Examines cash inflows and outflows to assess the project's financial status.
8. **Conducting Feasibility Analysis**
   The feasibility analysis involves utilizing methods such as NPV, BCR, and

ROI to evaluate project profitability.

By carefully adhering to each detailed step, thoroughly scrutinizing the research process, and systematically applying the methodologies described, significant and beneficial results are anticipated from this research endeavor.

In this study, eight variations of payment systems and scheduling will be explored. Subsequently, the optimal profitability variation will be determined.

Table 3.1 Payment systems and scheduling variations

Num	Float Time Variation	Advance Payment	No Advance Payment (Equity 60% + Debt 40%)
1	Float time 0%	Alternative 1	Alternative 5
2	Float time 35%	Alternative 2	Alternative 6
3	Float time 65%	Alternative 3	Alternative 7
4	Float time 100%	Alternative 4	Alternative 8

4. RESEARCH RESULTS

A. Project Scheduling

In this stage, scheduling is performed using the microsoft project application. The process begins by aligning the schedule with the previously formulated project plan. Once the critical path, non-critical path, and float time are determined, the subsequent step involves creating schedules based on specified float time variations, namely 0%, 35%, 65%, and 100%. This method facilitates the evaluation of how changes in float time impact the project schedule and provides insights into their influence on overall project execution. By scheduling according to different float time variations, the project team can discern the most effective strategies for efficiently managing time during project implementation.

B. Execution Budget Plan

After finalizing the scheduling according to predefined float time variations of 0%, 35%, 65%, and 100%, the next stage entails performing cash flow analysis using the microsoft project to ascertain the execution budget plan for each month. **Formula (1)** is used to calculate the execution budget plan as follows:

Execution Budget Plan = Project Cost − Profit Margin
= Rp 217.000.000.000 – (10% × Rp 217.000.000.000)
= Rp 195.300.000.000

By employing the specified calculation, a thorough comprehension understanding of the financial needs for each month is guaranteed, thereby enabling efficient budget control during project implementation phase. Utilizing this formula alongside cash flow analysis conducted via microsoft project yields a summary of the execution budget plan for each month, as depicted in **Table 4.1**

Table 4.1 Monthly execution budget plan

Month	Float Time Variations			
	0%	35%	65%	100%
1	Rp 31.857.261	Rp 31.857.261	Rp 31.857.261	Rp 31.857.261
2	Rp 2.413.788.530	Rp 2.413.788.530	Rp 2.413.788.530	Rp 2.413.788.530

Month	Float Time Variations			
	0%	35%	65%	100%
3	Rp 3.636.121.722	Rp 3.636.121.722	Rp 3.636.121.722	Rp 3.636.121.722
4	Rp 15.717.024.997	Rp 9.833.522.833	Rp 6.610.668.771	Rp 5.698.064.764
5	Rp 29.245.412.261	Rp 27.607.191.067	Rp 26.495.985.148	Rp 21.888.729.378
6	Rp 22.645.166.323	Rp 27.680.092.014	Rp 26.749.676.787	Rp 26.800.319.887
7	Rp 12.970.840.971	Rp 13.559.376.733	Rp 17.294.864.948	Rp 20.293.570.488
8	Rp 11.631.773.947	Rp 12.814.792.150	Rp 13.730.026.338	Rp 14.151.489.831
9	Rp 8.913.068.232	Rp 8.787.204.678	Rp 8.971.811.264	Rp 10.448.663.947
10	Rp 10.206.768.758	Rp 10.197.983.579	Rp 10.117.194.339	Rp 10.011.232.388
11	Rp 9.733.532.959	Rp 9.712.136.265	Rp 9.699.298.248	Rp 9.680.423.856
12	Rp 6.973.290.684	Rp 7.844.579.812	Rp 8.367.353.290	Rp 8.890.126.767
13	Rp 4.331.541.191	Rp 4.331.541.191	Rp 4.331.541.191	Rp 4.505.799.017
14	Rp 4.144.861.435	Rp 3.641.642.989	Rp 3.641.642.989	Rp 3.641.642.989
15	Rp 4.535.953.946	Rp 4.485.632.102	Rp 4.032.735.500	Rp 3.529.517.054
16	Rp 4.389.632.851	Rp 4.389.632.851	Rp 4.389.632.851	Rp 4.389.632.851
17	Rp 4.964.762.944	Rp 4.750.358.445	Rp 4.574.936.582	Rp 4.535.953.946
18	Rp 5.140.184.806	Rp 5.140.184.806	Rp 5.140.184.806	Rp 4.984.254.262
19	Rp 4.909.788.000	Rp 4.909.788.000	Rp 4.909.788.000	Rp 4.909.788.000
20	Rp 4.961.992.761	Rp 4.961.992.761	Rp 4.961.992.761	Rp 4.961.992.761
21	Rp 4.760.316.100	Rp 4.766.363.552	Rp 4.771.311.467	Rp 4.773.510.541
22	Rp 4.139.842.807	Rp 4.462.730.066	Rp 4.726.910.550	Rp 4.876.976.096
23	Rp 3.726.267.589	Rp 3.745.804.765	Rp 3.745.804.765	Rp 3.892.571.701
24	Rp 3.246.742.827	Rp 3.263.023.807	Rp 3.292.329.571	Rp 3.324.891.531
25	Rp 2.970.445.694	Rp 3.373.637.617	Rp 3.520.252.862	Rp 3.520.252.862
26	Rp 2.108.321.278	Rp 2.108.321.278	Rp 2.291.590.334	Rp 2.658.128.446
27	Rp 1.963.814.953	Rp 1.963.814.953	Rp 1.963.814.953	Rp 1.963.814.953
28	Rp 886.884.172	Rp 886.884.172	Rp 886.884.172	Rp 886.884.172
Total	**Rp 195.300.000.000**	**Rp 195.300.000.000**	**Rp 195.300.000.000**	**Rp 195.300.000.000**

C. Task Weight

After establishing the execution budget plan for each month, the next step is to calculate the task weights. This involves estimating costs for each individual task and determining the total cost for all tasks combined. **Formula (2)** is utilized to calculate the execution budget plan.

Utilizing this formula, task weight is calculated for each month. By analyzing the task weight and cumulative progress monthly, contractors can identify any deviations from the planned schedule and take necessary corrective actions to ensure project milestones are efficiently met. The overview of work weight and cumulative progress per month will be outlined in **Table 4.2**

Table 4.2 Recapitulation of task weight and cumulative progress for each month

Month	Float Time 0%		Float Time 35%		Float Time 65%		Float Time 100%	
	Task Weight	Progres	Task Weight	Progres	Task Weight	Progres	Task Weight	Progres
1	0,016	0,016	0,016	0,016	0,016	0,016	0,016	0,016
2	1,236	1,252	1,236	1,252	1,236	1,252	1,236	1,252
3	1,862	3,114	1,862	3,114	1,862	3,114	1,862	3,114
4	8,048	11,162	5,035	8,149	3,385	6,499	2,918	6,032
5	14,975	26,136	14,136	22,285	13,567	20,066	11,208	17,239
6	11,595	37,731	14,173	36,458	13,697	33,762	13,723	30,962
7	6,641	44,373	6,943	43,401	8,856	42,618	10,391	41,353
8	5,956	50,329	6,562	49,962	7,030	49,648	7,246	48,599
9	4,564	54,893	4,499	54,462	4,594	54,242	5,350	53,949
10	5,226	60,119	5,222	59,684	5,180	59,422	5,126	59,075
11	4,984	65,103	4,973	64,656	4,966	64,389	4,957	64,032

Month	Float Time 0%		Float Time 35%		Float Time 65%		Float Time 100%	
	Task Weight	Progres	Task Weight	Progres	Task Weight	Progres	Task Weight	Progres
12	3,571	68,673	4,017	68,673	4,284	68,673	4,552	68,584
13	2,218	70,891	2,218	70,891	2,218	70,891	2,307	70,891
14	2,122	73,013	1,865	72,756	1,865	72,756	1,865	72,756
15	2,323	75,336	2,297	75,052	2,065	74,821	1,807	74,563
16	2,248	77,584	2,248	77,300	2,248	77,068	2,248	76,811
17	2,542	80,126	2,432	79,732	2,343	79,411	2,323	79,133
18	2,632	82,758	2,632	82,364	2,632	82,043	2,552	81,685
19	2,514	85,272	2,514	84,878	2,514	84,557	2,514	84,199
20	2,541	87,812	2,541	87,419	2,541	87,097	2,541	86,740
21	2,437	90,250	2,441	89,860	2,443	89,540	2,444	89,184
22	2,120	92,369	2,285	92,145	2,420	91,961	2,497	91,681
23	1,908	94,277	1,918	94,063	1,918	93,879	1,993	93,674
24	1,662	95,940	1,671	95,733	1,686	95,564	1,702	95,377
25	1,521	97,461	1,727	97,461	1,802	97,367	1,802	97,179
26	1,080	98,540	1,080	98,540	1,173	98,540	1,361	98,540
27	1,006	99,546	1,006	99,546	1,006	99,546	1,006	99,546
28	0,454	100	0,454	100	0,454	100	0,454	100

D. Cash Flow Analysis

Cash flow analysis is crucial for the financial management of any project, ensuring its viability. In this research, cash flow analysis investigates payment systems and float time variations, including scenarios with and without advance payments at implementation of 0% float time. This analysis evaluates financial dynamics, offering insights for decision-making throughout the project lifecycle. By examining cash flows, contractors can anticipate financial challenges and make informed decisions to sustain project financial health. examination aids in identifying optimal financial strategies for project success, enhancing better management and sustainability.

1. With Advance Payments

With advance payments, a project receives funds upfront, which significantly improves cash flow. This reduces financial strain on contractors by providing immediate capital for expenses such as materials and labor and ensuring funds are available when needed. It also enhances the contractor's ability to negotiate with suppliers and subcontractors, thereby maintaining the project's financial health and operational efficiency. To enhance clarity on cash inflows and outflows, the following cash flow diagram will be presented.

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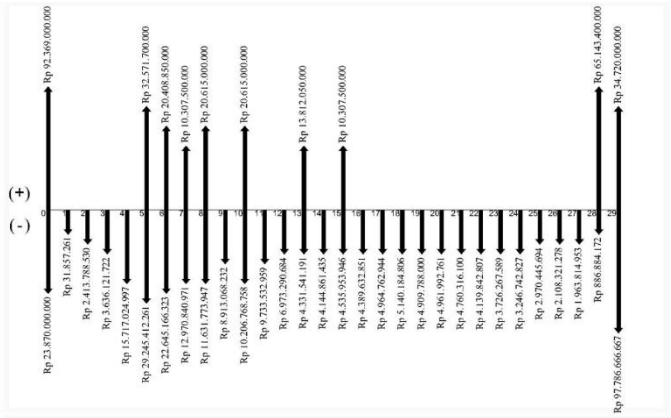

Figure 4.1 Cash flow diagram for alternative 1 (Advance Payment and 0% Float Time)

The diagram illustrates cash inflows and outflows throughout the project, offering a clear overview of its financial status at different stages. To simplify the presentation of monthly cash flow analysis results, they will be shown in **Table 4.3**

Table 4.3 Cash flow analysis results of alternative 1

CASH FLOW ANALYSIS											
Month		0	1	2	3	4	5	6	7	8	9
Task Weight		0,000	0,016	1,236	1,862	8,048	14,975	11,595	6,641	5,956	4,564
Cumulative Progress		0,000	0,016	1,252	3,114	11,162	26,136	37,731	44,373	50,329	54,893
CASH IN											
Invoice	(Termyn)	Rp13.020.000.000					Rp34.286.000.000	Rp21.483.000.000	Rp10.850.000.000	Rp21.700.000.000	
Retention	(5% × Termyn)	(Rp651.000.000)					(Rp1.714.300.000)	(Rp1.074.150.000)	(Rp542.500.000)	(Rp1.085.000.000)	
Net Termyn Payment		Rp12.369.000.000					Rp32.571.700.000	Rp20.408.850.000	Rp10.307.500.000	Rp20.615.000.000	
Return Of Guarantees											
Advance Payment Guarantee											
Performance Guarantee											
Maintenance Guarantee											
Capital Loan		Rp80.000.000.000									
Cash In Total		Rp92.369.000.000	Rp0	Rp0	Rp0	Rp0	Rp32.571.700.000	Rp20.408.850.000	Rp10.307.500.000	Rp20.615.000.000	Rp0
CASH OUT											
Net Cost Budget			(Rp31.857.261)	(Rp2.413.788.530)	(Rp3.636.121.722)	(Rp15.717.024.997)	(Rp29.245.412.261)	(Rp22.645.166.323)	(Rp12.970.840.971)	(Rp11.631.773.947)	(Rp8.913.068.232)
Guarantees Payment											
Advance Payment Guarantee		(Rp13.020.000.000)									
Performance Guarantee		(Rp10.850.000.000)									
Loan Repayment											
Cash Out Total		(Rp23.870.000.000)	(Rp31.857.261)	(Rp2.413.788.530)	(Rp3.636.121.722)	(Rp15.717.024.997)	(Rp29.245.412.261)	(Rp22.645.166.323)	(Rp12.970.840.971)	(Rp11.631.773.947)	(Rp8.913.068.232)
CASH FLOW											
Ending Cash Balance		Rp68.499.000.000	Rp68.467.142.739	Rp66.053.354.208	Rp62.417.232.486	Rp46.700.207.489	Rp50.026.495.228	Rp47.790.178.906	Rp45.126.837.935	Rp54.110.063.988	Rp45.196.995.756

CASH FLOW ANALYSIS											
Month		10	11	12	13	14	15	16	17	18	19
Task Weight		5,226	4,984	3,571	2,218	2,122	2,323	2,248	2,542	2,632	2,514
Cumulative Progress		60,119	65,103	68,673	70,891	73,013	75,336	77,584	80,126	82,758	85,272
CASH IN											
Invoice	(Termyn)	Rp21.700.000.000			Rp14.539.000.000		Rp10.850.000.000				
Retention	(5% × Termyn)	(Rp1.085.000.000)			(Rp726.950.000)		(Rp542.500.000)				
Net Termyn Payment		Rp20.615.000.000			Rp13.812.050.000		Rp10.307.500.000				
Return Of Guarantees											
Advance Payment Guarantee											
Performance Guarantee											
Maintenance Guarantee											
Capital Loan											
Cash In Total		Rp20.615.000.000	Rp0	Rp0	Rp13.812.050.000	Rp0	Rp10.307.500.000	Rp0	Rp0	Rp0	Rp0
CASH OUT											
Net Cost Budget		(Rp10.206.768.758)	(Rp9.733.532.959)	(Rp6.973.290.684)	(Rp4.331.541.191)	(Rp4.144.861.435)	(Rp4.535.953.946)	(Rp4.389.632.851)	(Rp4.964.762.944)	(Rp5.140.184.806)	(Rp4.909.788.000)
Guarantees Payment											
Advance Payment Guarantee											
Performance Guarantee											
Loan Repayment											
Cash Out Total		(Rp10.206.768.758)	(Rp9.733.532.959)	(Rp6.973.290.684)	(Rp4.331.541.191)	(Rp4.144.861.435)	(Rp4.535.953.946)	(Rp4.389.632.851)	(Rp4.964.762.944)	(Rp5.140.184.806)	(Rp4.909.788.000)
CASH FLOW											
Ending Cash Balance		Rp55.605.226.997	Rp45.871.694.038	Rp38.898.403.355	Rp48.378.912.164	Rp44.234.050.728	Rp50.005.596.782	Rp45.615.963.931	Rp40.651.200.987	Rp35.511.016.181	Rp30.601.228.182

CASH FLOW ANALYSIS											
Month		20	21	22	23	24	25	26	27	28	29
Task Weight		2,541	2,437	2,120	1,908	1,662	1,521	1,080	1,006	0,454	-
Cumulative Progress		87,812	90,250	92,369	94,277	95,940	97,461	98,540	99,546	100	100
CASH IN											
Invoice	(Termyn)									Rp68.572.000.000	
Retention	(5% × Termyn)									(Rp3.428.600.000)	
Net Termyn Payment										Rp65.143.400.000	
Return Of Guarantees											
Advance Payment Guarantee											Rp13.020.000.000
Performance Guarantee											Rp10.850.000.000
Maintenance Guarantee											Rp10.850.000.000
Capital Loan											
Cash In Total		Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp65.143.400.000	Rp34.720.000.000
CASH OUT											
Net Cost Budget		(Rp4.961.992.761)	(Rp4.760.316.100)	(Rp4.139.842.807)	(Rp3.726.267.589)	(Rp3.246.742.827)	(Rp2.970.445.694)	(Rp2.108.321.278)	(Rp1.963.814.953)	(Rp886.884.172)	
Guarantees Payment											
Advance Payment Guarantee											
Performance Guarantee											
Loan Repayment											(Rp97.786.666.667)
Cash Out Total		(Rp4.961.992.761)	(Rp4.760.316.100)	(Rp4.139.842.807)	(Rp3.726.267.589)	(Rp3.246.742.827)	(Rp2.970.445.694)	(Rp2.108.321.278)	(Rp1.963.814.953)	(Rp886.884.172)	(Rp97.786.666.667)
CASH FLOW											
Ending Cash Balance		Rp25.639.235.421	Rp20.878.919.321	Rp16.739.076.514	Rp13.012.808.924	Rp9.766.066.097	Rp6.795.620.403	Rp4.687.299.125	Rp2.723.484.172	Rp66.980.000.000	Rp3.913.333.333

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The table shows a consistently positive cash balance from month 0 - 29, indicating a healthy financial status throughout the project duration. This reflects effective management of cash inflows and outflows, ensuring that the funds are available to cover expenses and meet financial obligations. With this stable financial foundation, the project can proceed to the feasibility analysis phase.

2. Without Advance Payments

Without advance payments, projects depend solely on progress or post-completion payments, which can strain contractors' cash flow. Covering initial expenses from their own financing may lead to stress and delays if funds are insufficient. This situation also reduces negotiating leverage with suppliers, potentially increasing costs. Managing cash flow under these conditions becomes more challenging, requiring careful financial planning to keep the project on track and within budget. To provide a clearer understanding of cash inflows and outflows, the following cash flow diagram will be presented.

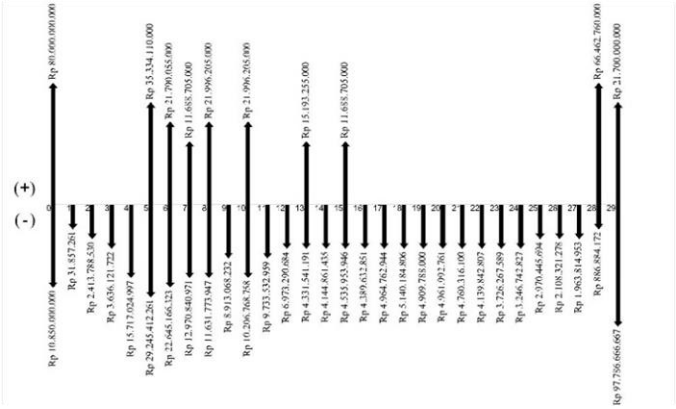

Figure 4.2 Cash flow diagram for alternative 5
(No Advance Payment and 0% Float Time)

The diagram illustrates cash inflows and outflows throughout the project, offering a clear overview of its financial status at different stages. To simplify the presentation of monthly cash flow analysis results, they will be shown in **Table 4.4**

Table 4.4 Cash flow analysis results of alternative 5

CASH FLOW ANALYSIS											
Month		0	1	2	3	4	5	6	7	8	9
Task Weight		0,000	0,016	1,236	1,862	8,048	14,975	11,595	6,641	5,956	4,564
Cumulative Progress		0,000	0,016	1,252	3,114	11,162	26,136	37,731	44,373	50,329	54,893
CASH IN											
Invoice	(Termyn)						Rp37.193.800.000	Rp22.936.900.000	Rp12.303.900.000	Rp23.153.900.000	
Retention	(5% × Termyn)						(Rp1.859.690.000)	(Rp1.146.845.000)	(Rp615.195.000)	(Rp1.157.695.000)	
Net Termyn Payment							Rp35.334.110.000	Rp21.790.055.000	Rp11.688.705.000	Rp21.996.205.000	
Return Of Guarantees											
Performance Guarantee											
Maintenance Guarantee											
Capital Loan		Rp80.000.000.000									
Cash In Total		Rp80.000.000.000	Rp0	Rp0	Rp0	Rp0	Rp35.334.110.000	Rp21.790.055.000	Rp11.688.705.000	Rp21.996.205.000	Rp0
CASH OUT											
Net Cost Budget			(Rp31.857.261)	(Rp2.413.788.530)	(Rp3.636.121.722)	(Rp15.717.024.997)	(Rp29.245.412.261)	(Rp22.645.166.323)	(Rp12.970.840.971)	(Rp11.631.773.947)	(Rp8.913.068.232)
Guarantees Payment											
Performance Guarantee		(Rp10.850.000.000)									
Loan Repayment											
Cash Out Total		(Rp10.850.000.000)	(Rp31.857.261)	(Rp2.413.788.530)	(Rp3.636.121.722)	(Rp15.717.024.997)	(Rp29.245.412.261)	(Rp22.645.166.323)	(Rp12.970.840.971)	(Rp11.631.773.947)	(Rp8.913.068.232)
CASH FLOW											
Ending Cash Balance		Rp69.150.000.000	Rp69.118.142.739	Rp66.704.354.208	Rp63.068.232.486	Rp47.351.207.489	Rp53.439.905.228	Rp52.584.793.906	Rp51.302.657.935	Rp61.667.088.988	Rp52.754.020.756

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CASH FLOW ANALYSIS										
Month		10	11	12	13	14	15	16	17	18	19
Task Weight		5,226	4,984	3,571	2,218	2,122	2,323	2,248	2,542	2,632	2,514
Cumulative Progress		60,119	65,103	68,673	70,891	73,013	75,336	77,584	80,126	82,758	85,272
CASH IN											
Invoice	(Termyn)	Rp23.153.900.000			Rp15.992.900.000		Rp12.303.900.000				
Retention	(5% × Termyn)	(Rp1.157.695.000)			(Rp799.645.000)		(Rp615.195.000)				
Net Termyn Payment		Rp21.996.205.000			Rp15.193.255.000		Rp11.688.705.000				
Return Of Guarantees											
Performance Guarantee											
Maintenance Guarantee											
Capital Loan											
Cash In Total		Rp21.996.205.000	Rp0	Rp0	Rp15.193.255.000	Rp0	Rp11.688.705.000	Rp0	Rp0	Rp0	Rp0
CASH OUT											
Net Cost Budget		(Rp10.206.768.758)	(Rp9.733.532.959)	(Rp6.973.290.684)	(Rp4.331.541.191)	(Rp4.144.861.435)	(Rp4.535.953.946)	(Rp4.389.632.851)	(Rp4.964.762.944)	(Rp5.140.184.806)	(Rp4.909.788.000)
Guarantees Payment											
Performance Guarantee											
Loan Repayment											
Cash Out Total		(Rp10.206.768.758)	(Rp9.733.532.959)	(Rp6.973.290.684)	(Rp4.331.541.191)	(Rp4.144.861.435)	(Rp4.535.953.946)	(Rp4.389.632.851)	(Rp4.964.762.944)	(Rp5.140.184.806)	(Rp4.909.788.000)
CASH FLOW											
Ending Cash Balance		Rp64.543.456.997	Rp54.809.924.038	Rp47.836.633.355	Rp58.698.347.164	Rp54.553.485.728	Rp61.706.236.782	Rp57.316.603.931	Rp52.351.840.987	Rp47.211.656.181	Rp42.301.868.182

CASH FLOW ANALYSIS											
Month		20	21	22	23	24	25	26	27	28	29
Task Weight		2,541	2,437	2,120	1,908	1,662	1,521	1,080	1,006	0,454	-
Cumulative Progress		87,812	90,250	92,369	94,277	95,940	97,461	98,540	99,546	100	100
CASH IN											
Invoice	(Termyn)									Rp69.960.800.000	
Retention	(5% × Termyn)									(Rp3.498.040.000)	
Net Termyn Payment										Rp66.462.760.000	
Return Of Guarantees											
Performance Guarantee											Rp10.850.000.000
Maintenance Guarantee											Rp10.850.000.000
Capital Loan											
Cash In Total		Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp66.462.760.000	Rp21.700.000.000
CASH OUT											
Net Cost Budget		(Rp4.961.992.761)	(Rp4.760.316.100)	(Rp4.139.842.807)	(Rp3.726.267.589)	(Rp3.246.742.827)	(Rp2.970.445.694)	(Rp2.108.321.278)	(Rp1.963.814.953)	(Rp886.884.172)	
Guarantees Payment											
Performance Guarantee											
Loan Repayment											(Rp97.786.666.667)
Cash Out Total		(Rp4.961.992.761)	(Rp4.760.316.100)	(Rp4.139.842.807)	(Rp3.726.267.589)	(Rp3.246.742.827)	(Rp2.970.445.694)	(Rp2.108.321.278)	(Rp1.963.814.953)	(Rp886.884.172)	(Rp97.786.666.667)
CASH FLOW											
Ending Cash Balance		Rp37.339.875.421	Rp32.579.559.321	Rp28.439.716.514	Rp24.713.448.924	Rp21.466.706.097	Rp18.496.260.403	Rp16.387.939.125	Rp14.424.124.172	Rp80.000.000.000	Rp3.913.333.333

The table shows a consistently positive cash balance from month 0 - 29, indicating a healthy financial status throughout the project duration. This ensures there are sufficient funds available to cover expenses and meet financial obligations. With this, the project can proceed to the feasibility analysis phase.

E. Feasibility Analysis

After analyzing cash flow and assessing project feasibility, the next step is to explore alternative options for maximizing profitability. This involves selecting alternatives based on evaluation results using methods like Net Present Value (NPV), Benefit-Cost Ratio (BCR), and Return on Investment (ROI). These methods offer valuable insights into the financial viability. For instance, NPV compares cash inflows and outflows over the project's lifespan, while BCR compares the present value of benefits to costs. Additionally, ROI measures investment efficiency by comparing net profit to investment costs. An example feasibility analysis for alternatives with and without an advance payment system at a 0% float time variation will be provided to illustrate this process.

1. With Advance Payments

In the analysis with advance payments, NPV, BCR, and ROI values are calculated to assess the project's financial viability. These metrics offer essential insights into the profitability, cost-benefit ratio, and investment efficiency.

A. Net Present Value (NPV)

$$\mathbf{NPV} = \sum_{t=0}^{t=n} \frac{(Bt-Ct)}{(1+i)^t} \quad (6)$$

= Rp 13.290.456.816 > 1 (**Feasible**)

Evaluation Criteria

If NPV > 0, the investment is profitable or feasible.
If NPV = 0, the present value of benefits equals the present value of costs
If NPV < 0, the investment is not profitable or not feasible.

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B. Benefit Cost Rasio (BCR)

$$\mathbf{BCR} = \frac{\sum_{t=0}^{t=n} \frac{(Bt)}{(1+i)^t}}{\sum_{t=0}^{t=n} \frac{(Ct)}{(1+i)^t}} \quad (7)$$

$$= \frac{\text{Present Worth Of Benefit}}{\text{Present Worth Of Cost}}$$

$$= \frac{\text{Rp } 286.079.764.678}{\text{Rp } 272.789.307.863}$$

$$= 1{,}049 > 1 \ (\textbf{Feasible})$$

Evaluation Criteria

If BCR > 1, the investment generates profits or is feasible.

If BCR < 1, the investment does not generate profits or is not feasible

C. Return On Investment (ROI)

$$\mathbf{ROI} = \frac{\sum \text{Financial Return} - \sum \text{Cost}}{\sum \text{Cost}} \quad (8)$$

$$= \frac{\text{Rp } 286.079.764.678 - \text{Rp } 272.789.307.863}{\text{Rp } 272.789.307.863} \times 100$$

$$= 4{,}87\% \ (\textbf{Feasible})$$

For a clearer presentation of the project evaluation results for each month and to facilitate feasibility analysis, they will be illustrated in the table below:

Table 4.5 Project evaluation of alternative 1

PROJECT EVALUATION										
Month	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Work Weight	0,000	0,016	1,236	1,862	8,048	14,975	11,595	6,641	5,956	4,564
Cumulative Progress	0,000	0,016	1,252	3,114	11,162	26,136	37,731	44,373	50,329	54,893
Cash In	Rp92.369.000.000	Rp0	Rp0	Rp0	Rp0	Rp32.571.700.000	Rp20.408.850.000	Rp10.307.500.000	Rp20.615.000.000	Rp0
Cash Out	(Rp23.870.000.000)	(Rp31.857.261)	(Rp2.413.788.530)	(Rp3.636.121.722)	(Rp15.717.024.997)	(Rp29.245.412.261)	(Rp22.645.166.323)	(Rp12.970.840.971)	(Rp11.631.773.947)	(Rp8.913.068.232)
Net Operating Income (NOI)	Rp68.499.000.000	(Rp31.857.261)	(Rp2.413.788.530)	(Rp3.636.121.722)	(Rp15.717.024.997)	Rp3.326.287.739	(Rp2.236.316.323)	(Rp2.663.340.971)	Rp8.983.226.053	(Rp8.913.068.232)
Discounted Factor (DF)	1,000	0,990	0,980	0,970	0,961	0,951	0,942	0,932	0,923	0,914
Present Worth Of Benefit (PWOB)	Rp92.369.000.000	Rp0	Rp0	Rp0	Rp0	Rp30.983.123.397	Rp19.220.304.266	Rp9.610.633.644	Rp19.030.008.055	Rp0
Present Worth Of Cost (PWOC)	(Rp23.870.000.000)	(Rp31.540.269)	(Rp2.365.991.214)	(Rp3.528.655.622)	(Rp15.100.737.576)	(Rp27.819.064.306)	(Rp21.326.384.724)	(Rp12.093.912.260)	(Rp10.737.460.679)	(Rp8.145.913.954)
Discounted Cash Flow (DCF)	Rp68.499.000.000	(Rp31.540.269)	(Rp2.365.991.214)	(Rp3.528.655.622)	(Rp15.100.737.576)	Rp3.164.059.091	(Rp2.106.080.458)	(Rp2.483.278.616)	Rp8.292.547.376	(Rp8.145.913.954)
Sum Of PWOB	Rp286.079.764.678									
Sum Of PWOC	(Rp272.789.307.863)									
Sum Of DCF	Rp13.290.456.816									
Net Present Value (NPV)	**Rp13.290.456.816**									
Benefit Cost Rasio (BCR)	**1,049**									
Return On Investment (ROI)	**4,87%**									

PROJECT EVALUATION										
Month	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Work Weight	5,226	4,984	3,571	2,218	2,122	2,323	2,248	2,542	2,632	2,514
Cumulative Progress	60,119	65,103	68,673	70,891	73,013	75,336	77,584	80,126	82,758	85,272
Cash In	Rp20.615.000.000	Rp0	Rp0	Rp13.812.050.000	Rp0	Rp10.307.500.000	Rp0	Rp0	Rp0	Rp0
Cash Out	(Rp10.206.768.758)	(Rp9.733.532.959)	(Rp6.973.290.684)	(Rp4.331.541.191)	(Rp4.144.861.435)	(Rp4.535.953.946)	(Rp4.389.632.851)	(Rp4.964.762.944)	(Rp5.140.184.806)	(Rp4.909.788.000)
Net Operating Income (NOI)	Rp10.408.231.242	(Rp9.733.532.959)	(Rp6.973.290.684)	Rp9.480.508.809	(Rp4.144.861.435)	Rp5.771.546.054	(Rp4.389.632.851)	(Rp4.964.762.944)	(Rp5.140.184.806)	(Rp4.909.788.000)
Discounted Factor (DF)	0,905	0,896	0,887	0,878	0,869	0,861	0,852	0,844	0,835	0,827
Present Worth Of Benefit (PWOB)	Rp18.653.179.967	Rp0	Rp0	Rp12.128.261.307	Rp0	Rp8.871.716.500	Rp0	Rp0	Rp0	Rp0
Present Worth Of Cost (PWOC)	(Rp9.235.444.799)	(Rp8.719.608.762)	(Rp6.184.736.748)	(Rp3.803.495.023)	(Rp3.603.357.684)	(Rp3.904.118.115)	(Rp3.740.584.443)	(Rp4.188.579.249)	(Rp4.293.425.266)	(Rp4.060.176.081)
Discounted Cash Flow (DCF)	Rp9.417.735.168	(Rp8.719.608.762)	(Rp6.184.736.748)	Rp8.324.766.285	(Rp3.603.357.684)	Rp4.967.598.385	(Rp3.740.584.443)	(Rp4.188.579.249)	(Rp4.293.425.266)	(Rp4.060.176.081)
Sum Of PWOB										
Sum Of PWOC										
Sum Of DCF										
Net Present Value (NPV)										
Benefit Cost Rasio (BCR)										
Return On Investment (ROI)										

PROJECT EVALUATION										
Month	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**
Work Weight	2,541	2,437	2,120	1,908	1,662	1,521	1,080	1,006	0,454	-
Cumulative Progress	87,812	90,250	92,369	94,277	95,940	97,461	98,540	99,546	100	100
Cash In	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp65.143.400.000	Rp34.720.000.000
Cash Out	(Rp4.961.992.761)	(Rp4.760.316.100)	(Rp4.139.842.807)	(Rp3.726.267.589)	(Rp3.246.742.827)	(Rp2.970.445.694)	(Rp2.108.321.278)	(Rp1.963.814.953)	(Rp886.884.172)	(Rp97.786.666.667)
Net Operating Income (NOI)	(Rp4.961.992.761)	(Rp4.760.316.100)	(Rp4.139.842.807)	(Rp3.726.267.589)	(Rp3.246.742.827)	(Rp2.970.445.694)	(Rp2.108.321.278)	(Rp1.963.814.953)	Rp64.256.515.828	(Rp63.066.666.667)
Discounted Factor (DF)	0,819	0,811	0,803	0,795	0,787	0,779	0,771	0,763	0,756	0,748
Present Worth Of Benefit (PWOB)	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp49.234.001.794	Rp25.979.535.748
Present Worth Of Cost (PWOC)	(Rp4.062.517.163)	(Rp3.858.618.381)	(Rp3.322.284.665)	(Rp2.960.628.966)	(Rp2.553.964.102)	(Rp2.313.371.975)	(Rp1.625.614.630)	(Rp1.499.126.647)	(Rp670.288.270)	(Rp73.169.706.290)
Discounted Cash Flow (DCF)	(Rp4.062.517.163)	(Rp3.858.618.381)	(Rp3.322.284.665)	(Rp2.960.628.966)	(Rp2.553.964.102)	(Rp2.313.371.975)	(Rp1.625.614.630)	(Rp1.499.126.647)	Rp48.563.713.523	(Rp47.190.170.541)
Sum Of PWOB										
Sum Of PWOC										
Sum Of DCF										
Net Present Value (NPV)										
Benefit Cost Rasio (BCR)										
Return On Investment (ROI)										

The feasibility analysis for alternative 1 with advance payment and a 0% float time shows that the project is viable based on criteria NPV, BCR, and ROI.

2. Without Advance Payments

In the analysis without advance payments, NPV, BCR, and ROI values are

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calculated to assess the project's financial viability. These metrics offer essential insights into the profitability, cost-benefit ratio, and investment efficiency.

A. Net Present Value (NPV)

$$\mathbf{NPV} = \sum_{t=0}^{t=n} \frac{(Bt-Ct)}{(1+i)^t} \quad (9)$$

= Rp 15.338.960.581 > 1 (**Feasible**)

Evaluation Criteria

If NPV > 0, the investment is profitable or feasible.
If NPV = 0, the present value of benefits equals the present value of costs
If NPV < 0, the investment is not profitable or not feasible.

B. Benefit Cost Rasio (BCR)

$$\mathbf{BCR} = \frac{\sum_{t=0}^{t=n} \frac{(Bt)}{(1+i)^t}}{\sum_{t=0}^{t=n} \frac{(Ct)}{(1+i)^t}} \quad (10)$$

$$= \frac{\text{Present Worth Of Benefit}}{\text{Present Worth Of Cost}}$$

$$= \frac{\text{Rp } 274.236.663.814}{\text{Rp } 259.318.613.414}$$

= 1,059 > 1 (**Feasible**)

Evaluation Criteria

If BCR > 1, the investment generates profits or is feasible.
If BCR < 1, the investment does not generate profits or is not feasible

C. Return On Investment (ROI)

$$\mathbf{ROI} = \frac{\sum \text{Financial Return} - \sum \text{Cost}}{\sum \text{Cost}} \quad (11)$$

$$= \frac{\text{Rp } 274.236.663.814 - \text{Rp } 259.318.613.414}{\text{Rp } 259.318.613.414} \times 100$$

= 5,90% (**Feasible**)

For a clearer presentation of the project evaluation results for each month and to facilitate feasibility analysis, they will be illustrated in the table below:

Table 4.6 Project evaluation alternative 5

PROJECT EVALUATION										
Month	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Work Weight	0,000	0,016	1,236	1,862	8,048	14,975	11,595	6,641	5,956	4,564
Cumulative Progress	0,000	0,016	1,252	3,114	11,162	26,136	37,731	44,373	50,329	54,893
Cash In	Rp80.000.000.000	Rp0	Rp0	Rp0	Rp0	Rp35.334.110.000	Rp21.790.055.000	Rp11.688.705.000	Rp21.996.205.000	Rp0
Cash Out	(Rp10.850.000.000)	(Rp31.857.261)	(Rp2.413.788.530)	(Rp3.636.121.722)	(Rp15.717.024.997)	(Rp29.245.412.261)	(Rp22.645.166.323)	(Rp12.970.840.971)	(Rp11.631.773.947)	(Rp8.913.068.232)
Net Operating Income (NOI)	Rp69.150.000.000	(Rp31.857.261)	(Rp2.413.788.530)	(Rp3.636.121.722)	(Rp15.717.024.997)	Rp6.088.697.739	(Rp855.111.323)	(Rp1.282.135.971)	Rp10.364.431.053	(Rp8.913.068.232)
Discounted Factor (DF)	1,000	0,990	0,980	0,970	0,961	0,951	0,942	0,932	0,923	0,914
Present Worth Of Benefit (PWOB)	Rp80.000.000.000	Rp0	Rp0	Rp0	Rp0	Rp33.610.806.014	Rp20.521.072.332	Rp10.898.458.552	Rp20.305.018.594	Rp0
Present Worth Of Cost (PWOC)	(Rp10.850.000.000)	(Rp31.540.269)	(Rp2.365.991.214)	(Rp3.528.655.622)	(Rp15.100.737.576)	(Rp27.819.064.306)	(Rp21.326.384.724)	(Rp12.093.912.260)	(Rp10.737.460.679)	(Rp8.145.913.954)
Discounted Cash Flow (DCF)	Rp69.150.000.000	(Rp31.540.269)	(Rp2.365.991.214)	(Rp3.528.655.622)	(Rp15.100.737.576)	Rp5.791.741.708	(Rp805.312.392)	(Rp1.195.453.708)	Rp9.567.557.915	(Rp8.145.913.954)
Sum Of PWOB	Rp275.108.268.444									
Sum Of PWOC	(Rp259.769.307.863)									
Sum Of DCF	Rp15.338.960.581									
Net Present Value (NPV)	**Rp15.338.960.581**									
Benefit Cost Rasio (BCR)	**1,059**									
Return On Investment (ROI)	**5,90%**									

PROJECT EVALUATION										
Month	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Work Weight	5,226	4,984	3,571	2,218	2,122	2,323	2,248	2,542	2,632	2,514
Cumulative Progress	60,119	65,103	68,673	70,891	73,013	75,336	77,584	80,126	82,758	85,272
Cash In	Rp21.996.205.000	Rp0	Rp0	Rp15.193.255.000	Rp0	Rp11.688.705.000	Rp0	Rp0	Rp0	Rp0
Cash Out	(Rp10.206.768.758)	(Rp9.733.532.959)	(Rp6.973.290.684)	(Rp4.331.541.191)	(Rp4.144.861.435)	(Rp4.535.953.946)	(Rp4.389.632.851)	(Rp4.964.762.944)	(Rp5.140.184.806)	(Rp4.909.788.000)
Net Operating Income (NOI)	Rp11.789.436.242	(Rp9.733.532.959)	(Rp6.973.290.684)	Rp10.861.713.809	(Rp4.144.861.435)	Rp7.152.751.054	(Rp4.389.632.851)	(Rp4.964.762.944)	(Rp5.140.184.806)	(Rp4.909.788.000)
Discounted Factor (DF)	0,905	0,896	0,887	0,878	0,869	0,861	0,852	0,844	0,835	0,827
Present Worth Of Benefit (PWOB)	Rp19.902.943.025	Rp0	Rp0	Rp13.341.087.438	Rp0	Rp10.060.526.511	Rp0	Rp0	Rp0	Rp0
Present Worth Of Cost (PWOC)	(Rp9.235.444.799)	(Rp8.719.608.762)	(Rp6.184.736.748)	(Rp3.803.495.023)	(Rp3.603.357.684)	(Rp3.904.118.115)	(Rp3.740.584.443)	(Rp4.188.579.249)	(Rp4.293.425.266)	(Rp4.060.176.081)
Discounted Cash Flow (DCF)	Rp10.667.498.226	(Rp8.719.608.762)	(Rp6.184.736.748)	Rp9.537.592.416	(Rp3.603.357.684)	Rp6.156.408.396	(Rp3.740.584.443)	(Rp4.188.579.249)	(Rp4.293.425.266)	(Rp4.060.176.081)
Sum Of PWOB										
Sum Of PWOC										
Sum Of DCF										
Net Present Value (NPV)										
Benefit Cost Rasio (BCR)										
Return On Investment (ROI)										

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PROJECT EVALUATION										
Month	20	21	22	23	24	25	26	27	28	29
Work Weight	2,541	2,437	2,120	1,908	1,662	1,521	1,080	1,006	0,454	-
Cumulative Progress	87,812	90,250	92,369	94,277	95,940	97,461	98,540	99,546	100	100
Cash In	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp66.462.760.000	Rp21.700.000.000
Cash Out	(Rp4.961.992.761)	(Rp4.760.316.100)	(Rp4.139.842.807)	(Rp3.726.267.589)	(Rp3.246.742.827)	(Rp2.970.445.694)	(Rp2.108.321.278)	(Rp1.963.814.953)	(Rp886.884.172)	(Rp97.786.666.667)
Net Operating Income (NOI)	(Rp4.961.992.761)	(Rp4.760.316.100)	(Rp4.139.842.807)	(Rp3.726.267.589)	(Rp3.246.742.827)	(Rp2.970.445.694)	(Rp2.108.321.278)	(Rp1.963.814.953)	Rp65.575.875.828	(Rp76.086.666.667)
Discounted Factor (DF)	0,819	0,811	0,803	0,795	0,787	0,779	0,771	0,763	0,756	0,748
Present Worth Of Benefit (PWOB)	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp0	Rp50.231.146.134	Rp16.237.209.843
Present Worth Of Cost (PWOC)	(Rp4.062.517.163)	(Rp3.858.618.381)	(Rp3.322.284.665)	(Rp2.960.628.966)	(Rp2.553.964.102)	(Rp2.313.371.975)	(Rp1.625.614.630)	(Rp1.499.126.647)	(Rp670.288.270)	(Rp73.169.706.290)
Discounted Cash Flow (DCF)	(Rp4.062.517.163)	(Rp3.858.618.381)	(Rp3.322.284.665)	(Rp2.960.628.966)	(Rp2.553.964.102)	(Rp2.313.371.975)	(Rp1.625.614.630)	(Rp1.499.126.647)	Rp49.560.857.863	(Rp56.932.496.447)
Sum Of PWOB										
Sum Of PWOC										
Sum Of DCF										
Net Present Value (NPV)										
Benefit Cost Rasio (BCR)										
Return On Investment (ROI)										

The feasibility analysis for alternative 5 without advance payment and a 0% float time shows that the project is viable based on criteria NPV, BCR, and ROI.

Following the demonstrated method, feasibility analysis will be conducted for all eight alternatives. This comprehensive evaluation will assess various payment systems and scheduling strategies. The results will be presented in **Table 4.7** for clear comparative analysis, facilitating informed decision-making.

Table 4.7 Recapitulation of feasibility analysis results

Variation		NPV	BCR	ROI
Advance Payment				
Float Time 0%	Alternatif 1	Rp 13.290.456.816	1,049	4,87%
Float Time 35%	Alternatif 2	Rp 13.014.655.602	1,048	4,78%
Float Time 65%	Alternatif 3	Rp 12.932.514.665	1,047	4,75%
Float Time 100%	Alternatif 4	Rp 13.154.738.496	1,048	4,83%
Variation		**NPV**	**BCR**	**ROI**
No Advance Payment				
Float Time 0%	Alternatif 5	Rp 15.338.960.581	1,059	5,90%
Float Time 35%	Alternatif 6	Rp 15.024.963.627	1,058	5,79%
Float Time 65%	Alternatif 7	Rp 14.918.050.400	1,058	5,75%
Float Time 100%	Alternatif 8	Rp 15.140.274.232	1,058	5,84%

To facilitate the conclusion from **Table 4.7**, diagrams comparing Net Present Value (NPV), Benefit Cost Ratio (BCR), and Return on Investment (ROI) against payment systems and scheduling were created. The following diagrams show the trends of NPV, BCR, and ROI for two payment methods, namely advance payments and no advance payments, with float time variations of 0%, 35%, 65%, and 100%.

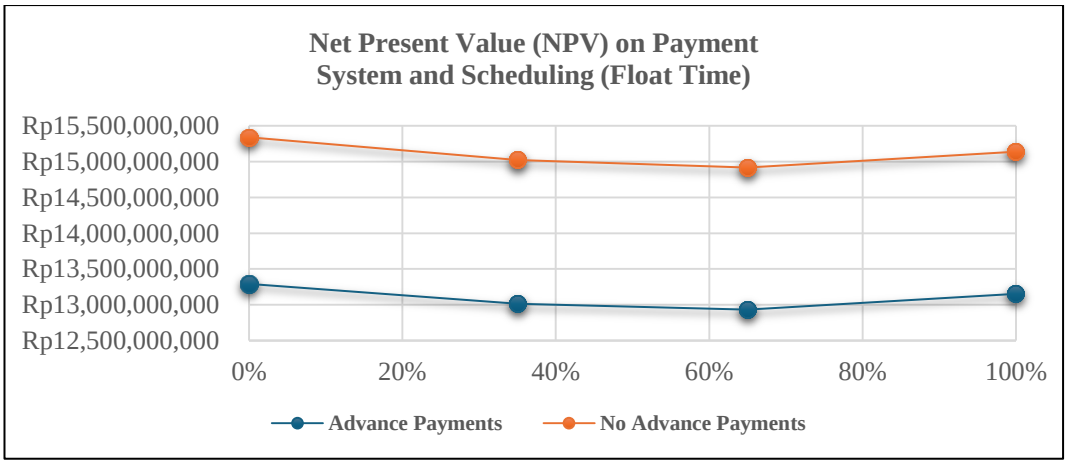

Figure 4.3 Net Present Value (NPV) on Payment System and Scheduling (Float Time)

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Figure 4.3 depicts the NPV comparison between two payment methods, advance payments and no advance payments, across varying float times of 0%, 35%, 65%, and 100%. The x-axis indicates the percentage of float time, while the y-axis represents NPV in Indonesian Rupiah (Rp). The blue line, representing advance payments, shows a lower NPV, whereas the orange line, representing no advance payments, maintains a higher NPV. Notably, no advance payments at 0% float time achieve the highest NPV, indicating the optimal profitability.

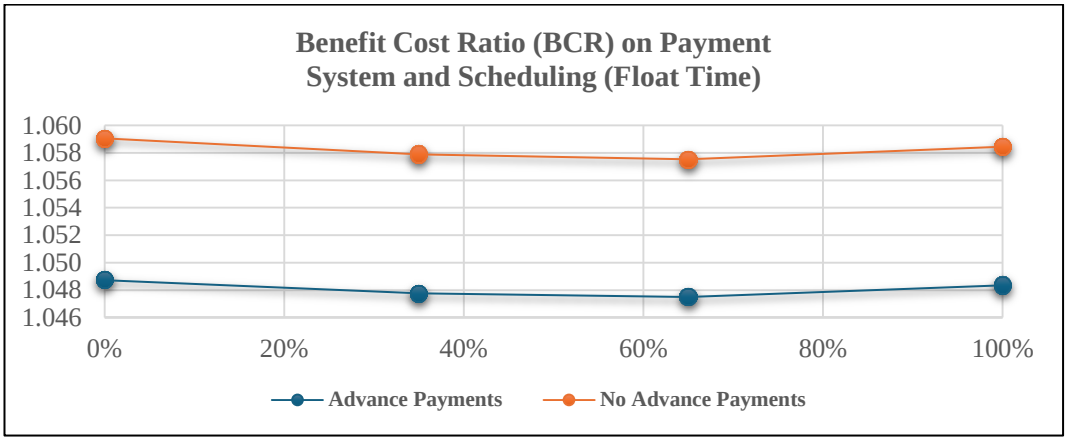

Figure 4.4 Benefit Cost Ratio (BCR) on Payment System and Scheduling (Float Time)

Figure 4.4 illustrates the BCR trends for two payment methods, advance payments and no advance payments, as the float time varies from 0%, 35%, 65%, to 100%. The x-axis shows the percentage of float time, and the y-axis displays the BCR. The blue line, representing advance payments, demonstrates a lower BCR, while the orange line, representing no advance payments, shows a higher BCR. Notably, the highest BCR is observed with no advance payments at 0% float time, indicating this is the most beneficial scenario.

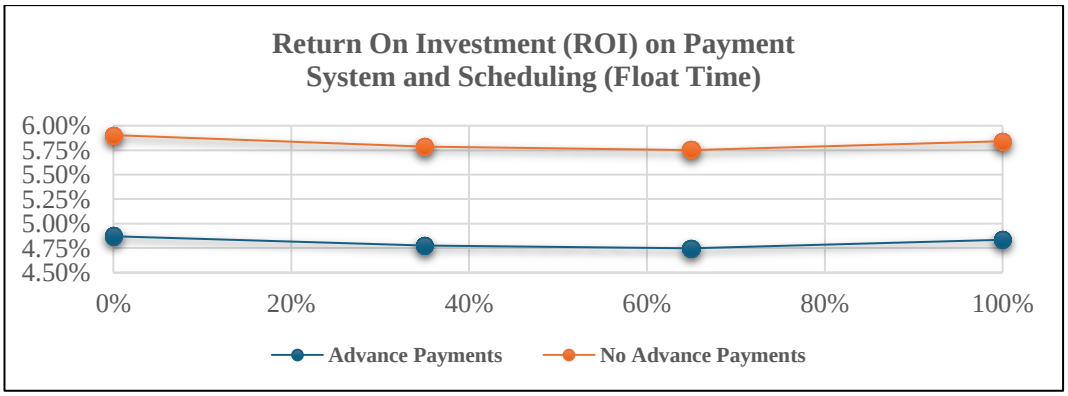

Figure 4.5 Return On Investment (ROI) on Payment System and Scheduling (Float Time)

Figure 4.5 presents the ROI comparison for advance payments and no advance payments with float times at 0%, 35%, 65%, and 100%. The x-axis denotes the percentage of float time, while the y-axis indicates the ROI. The blue line (Advance Payments) and the orange line (No Advance Payments) reveal the ROI trends under different float time scenarios. Notably, no advance payments at 0%

float time exhibit the highest ROI, highlighting the condition for maximizing returns.

5. CONCLUSION

After conducting a cash flow analysis and feasibility study utilizing float time with both advance payment and non-advance payment funding systems, the following conclusions can be drawn from the research:

1. The optimal profitability for the contractor is achieved in alternative 5, where the float time is 0% with no advance payment, resulting in an NPV of Rp 15,338,960,581, a BCR of 1.059, and an ROI of 5.90%. This alternative shows that the cash flow remains consistently positive without any funding shortages, indicating a healthy financial condition. It also shows that avoiding float time utilization results in optimal profitability for the contractor.

6. SUGESTIONS

Based on the analysis conducted, to improve the quality of future research outcomes, several recommendations can be proposed:

1. Further research is needed to analyze the feasibility and profitability of construction considering the escalation of the dollar exchange rate.
2. Further research is needed to analyze the feasibility and profitability of construction by considering the comparison of using materials with a higher percentage of local content.

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