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Project Cost Analysis Using the Earned Value Method on the Bagor Bridge Replacement Project in Situbondo Regency

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Abstract. *Delays in project implementation are caused by a lack of good control so that it affects the cost and completion time. The purpose of the study is to determine or predict how much a project will cost at the time of implementation and to determine the effectiveness of project control using the Earned Value Method. Aspects of project implementation time in weeks 2,4,5,9,11,13,16,17, 18,20,21,24 are slower than the planned schedule, this is indicated from the Schedule Variant (SV) indicator. While the performance of the project implementation time in week 3,6,7,8,10,12,14,15,19,22 is faster than the plan schedule, this is indicated by the Schedule Variant (SV) is positive. While the cost performance aspects of project implementation from week 6,9,11,13,17,19,22,23 incurred costs greater than the plan cost, this is indicated from the Cost Variant (CV) indicator is negative. Whereas in weeks 7,8,10,12,14,15,16,18,20,21, 24 incurred costs less than the plan cost, this is indicated by a positive Cost Variance (CV) indicator. The calculation results obtained from the effectiveness value of 1.603 for controlling the cost and time of the project using the Earned Value Method. In other words, the results of the effectiveness value greater than 1 (one) can be said to control the construction project of the Situbondo Regency bagor bridge very effectively using the Earned Value method.*

Keywords: *Cost, Evaluation, Performance, Result Value, Time*

1. INTRODUCTION

National development includes infrastructure development. Currently, infrastructure development is the main focus of the Indonesian government. Basically, development is a process of continuous progress and improvement that is carried out to achieve certain goals, namely improving the welfare of society. As a basic infrastructure, the transportation infrastructure and facilities system are very important for regional economic movement (Pangemanan et al., 2022). The supporting and driving system of transportation infrastructure greatly affects the efficiency and effectiveness of regional economic activities, and the level of accessibility of an area is influenced by this system (Rahadian et al., 2024).

Economic growth will be influenced by adequate infrastructure to support economic activity (Marpaung et al., 2021). The provision of village infrastructure is done to facilitate access and support production, economic, and social activities, which are an important part of village development. Bridges are components of road or transportation infrastructure that allow people and goods to connect with each other and not be isolated. Transportation can provide

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good services for human activities and is sufficiently available and affordable by the purchasing power of rural communities.

The development of adequate facilities and infrastructure is very important to connect different territorial areas with each other, allowing the movement of people and people more widely without walking (Siswanto & Hidayati, 2020). With adequate facilities and infrastructure, the activities carried out will be smoother. However, the main economic equity program, infrastructure development and construction, often faces a number of problems (Sinaga, 2022). Natural factors, availability of funds, and efficiency of work can hinder infrastructure work. In rural communities, economic growth and community development are highly dependent on infrastructure.

The process of continuous change in economic conditions towards a better state over a period of time is called economic growth (Maciulyte-Sniukiene & Butkus, 2022; Srinivasu et al., 2013). Economic growth is defined as the development of economic activity that results in an increase in the amount of goods and services produced by society, which ultimately results in an increase in the prosperity of society. Therefore, economic growth can be considered an indication of prosperity.

Situbondo Regency has an area of 1,638.50 km², or 163,850 ha, and is located on the north coast of the Horseshoe region of East Java, approximately 150 km from west to east. Situbondo is the capital of Situbondo Regency. Of the total sub-districts, 13 are located in coastal areas. Sumbermalang sub-district has an altitude of 100-1,223 meters above sea level, and Banyuputih sub-district has the largest area, 481.67 km². In 2019, climatic conditions recorded the highest rainfall of 3,549 milli/meter in December, with 16 most frequent rainy days. Situbondo Regency is located at 7°35'-7°44' South latitude and 113°30'-114°42' East longitude.

Situbondo Regency originally had Situbondo as its capital and was known as Panarukan Regency. During the Dutch administration of Governor General Daendels, who built a forced labor road along the north coast of Java Island, the road was called "Jalan Anyer - Panarukan" or better known as "Jalan Daendels". However, during the administration of Regent Achmad Tahir (± 1972), the name was changed to Situbondo Regency.

Situbondo district is between 0 and 1,250 meters above sea level. Areas in the south west, such as Jatibanteng and Sumbermalang, have an average altitude. On the other hand, Bungatan sub-district is in the northern part, with its highest area at 1250 meters above sea level. Soil types in this area include alluvial, Regosol, Gleysol, Renzine, Grumosol, Mediterranean, Latosol, and Andosol. The soil texture is generally medium 96.26 percent, fine 2.75 percent,

and coarse 0.99 percent. Soil drainage is not flooded 99.42 percent, sometimes flooded 0.05 percent, and always flooded 0.53 percent. According to the way the land is used, an area of 73,407.5 ha (4^2(0.53%) always flooded.

Situbondo Regency can be divided into three regions based on their potential and geographical conditions. The northern region, located by the coast and sea, has great potential for fisheries development, including fish farming and fishing; the central region, which has a flat topography, has potential for agriculture; and the southern region, which has a sloping topography, has potential for plantations and forestry.

One of the bridges in Situbondo is the Bagor Bridge that connects two regions. These bridges are usually built to facilitate public transportation and improve accessibility. Geographical conditions and local requirements can determine the design and construction of these bridges. The functions of the Bagor Bridge include the following:

1. Connecting Regions: These bridges connect two different regions, allowing easy access to villages or towns.
2. Improves Mobility: With a bridge, the flow of vehicular and pedestrian traffic becomes smoother, making travel faster.
3. Supports the Economy: Better access can boost local businesses, such as trade and tourism.
4. Transportation Safety: A good bridge makes transportation easier.

The Bagor Bridge in Kalibagor Village, Situbondo Subdistrict, Situbondo Regency, is forty years older than planned. As a result, the East Java Provincial Bina Marga Public Works Office (DPU) plans to build or replace the bridge this year to ensure the safety, comfort and security of local residents. To replace the old Bagor Bridge, which was built of brick frames and is less than seven meters wide, a new bridge is needed that has a width that meets provincial road and bridge standards. In addition, to compensate for the load or weight of vehicles passing through, as vehicles passing through the provincial road are currently heavier.

During the replacement of the Bagor Bridge, there will be an emergency bridge called the Bailey bridge. This bridge is 45 meters long, with a vehicle track width of 4.20 meters, and an approach road length of about 35.00 meters plus 25.00 meters. The bridge has a vehicle capacity of up to 20 tons (vehicle weight and load). Based on this background, the purpose of the study is to determine the cost efficiency of the Bagor Bridge Replacement Project using the Earned Value Concept Method.

2. METHODS

Research Subject

The subject of this research is the Study of Project Time and Cost Performance Using the Value Concept on the Bagor Bridge Replacement project in Situbondo Regency.

Location and Time of Research

The research location is at the Bagor Bridge Replacement Project in Situbondo Regency in week 31.

Data Collection Procedure

Data collection in this study was carried out by:

1. Primary data includes literature studies collected and field observations.
2. Secondary data includes plan drawings, time schedules, weekly reports, monthly reports and Budget Plan Costs

Data Analysis Technique

Data analysis is the process of transforming data into information that is easy to understand and can be used to solve problems. In this study, the data analysis technique used was descriptive qualitative, namely by analyzing the data collected, then explaining the process and results of data analysis. And the analysis steps can be explained as follows:

1. Status date
2. Percentage (%) Complete
3. ACWP (Actual Cost Work Performance)
4. BCWS (Budget Cost Work Schedule)
5. BCWP (Budget Cos Work Performance)
6. CV (Cost Variance)
7. SV (Schedule Variance)
8. CPI (Cost Performance Index)
9. SPI (Schedule Performance Index)
10. ETC (Estimate to Complete)
11. EAC (Estimate at Completion)
12. VAC (Variance at Completion)

3. RESULTS

Earned Value Analysis on Project Implementation Control

Earned Value Concept is the multiplication of the percentage (%) of work completed with the total budget provided. The Earned Value Concept requires three cost indicators to analyze any deviations that occur. The three indicators are as follows:

1. BCWS (Budged cost of work schedule) is the budget provided for an item of work that is compiled and linked to the implementation schedule (Chen, 2008).

Example of calculating the percentage of BCWS value for week 2 in division 1 (general) with payment item number 1.17.(1k)

Percentage of Work Plan

$$\% = \frac{0{,}014}{0{,}041} \text{ x } 100\% \qquad = 34{,}14\%$$

Example of calculating the week 2 BCWS value in division 1 (general) with payment item number 1.17.(1k)

Plan work cost

Cost of work = 34,14% x Total price of work per item

= 34,14% x Rp 4.185.000,00 = Rp 1.428.965,11

Table 1. Project Cost Analysis Plan/Week (Week 1 to 10)

No. Mata Pembayaran	Uraian Pekerjaan	Satuan	Total Harga (Rp)	BOBOT	Analisa Biaya Proyek Rencana/ Minggu									
					1	2	3	4	5	6	7	8	9	10
	DIVISI 1. UMUM													
1.17	**Pengamanan Lingkungan Hidup**													
1.17.(1k)	Pengujian Parameter Kualitas Air Lainnya	Buah	4,185,000.000	0.041		1,428,965.106	-	-						
1.17.(2a)	Pengujian Vibrasi Lingkungan untuk Kenyamanan dan Kesehatan	Buah	4,725,000.000	0.046		1,531,034.042								
1.17.(3h)	Pengujian Parameter Udara Emisi dan Ambien Lainnya	Buah	8,100,000.000	0.079		2,653,792.339								
1.2	**Pengujian Tanah**													
1.20.(1)	Pengeboran, termasuk SPT dan Laporan	m1	43,260,067.200	0.424		21,630,033.600	21,630,033.600							
Skh-1.1.22	**Sistem Manajemen Keselamatan Konstruksi (SMKK)**													
7.000	**Rambu dan Perlengkapan lalu Lintas yang diperlukan atau Manajemen Lalu Lintas**													
Skh-1.1.22.(7l)	Jembatan Sementara	Kg	469,414,943.909	4.599								22,353,092.567	22,353,092.567	22,353,092.567
	DIVISI 2. DRAINASE													
2.1.(1)	Galian untuk Selokan Drainase dan Saluran Air	M3	6,116,321.383	0.060										
2.3.(36)	Pengadaan & Pemasangan U-Ditch 60.80-120 cm + Cover (BG.20 Ton)	M1	120,449,281.260	1.180										
2.3.(39)	Pengadaan dan Pemasangan BC 60.60-100 12,5 cm (G.20 Ton)	M1	18,467,541.600	0.181										
	DIVISI 3. PEKERJAAN TANAH DAN GEOSINTETIK													
3.1.(1)	Galian Biasa	M3	60,898,830.134	0.597				8,165,514.889	8,165,514.889	8,165,514.889	8,165,514.889	9,412,256.860	9,412,256.860	9,412,256.860
3.1.(4)	Galian Struktur dengan kedalaman 0 - 2 meter	M3	266,523,852.408	2.611								33,274,473.171	33,274,473.171	
3.1.(9)	Galian perkerasan Berbutir	M3	1,264,301.800	0.012								252,860.360	252,860.360	252,860.360
3.2.(2a)	Timbunan Pilihan dari Sumber Galian	M3	416,549,894.762	4.081										
3.3.(1)	Penyiapan Badan Jalan	M2	2,628,690.354	0.026										
	DIVISI 4. PEKERJAAN PREVENTIF													
	DIVISI 5. PERKERASAN BERBUTIR DAN PERKERASAN BETON SEMEN													
5.1.(1)	Lapis Pondasi Agregat Kelas A	M3	155,329,752.060	1.522										
	DIVISI 6. PERKERASAN ASPAL													
6.1.(1)	Lapis Resap Pengikat - Aspal Cair/Emulsi	Liter	10,859,147.460	0.106										
6.1.(2a)	Lapis Perekat - Aspal Cair/Emulsi	Liter	6,847,737.810	0.067										
6.3(5a)	Laston Lapis Aus (AC-WC)	Ton	171,304,231.631	1.678				-	-					
6.3(6a)	Laston Lapis Antara (AC-BC)	Ton	125,983,584.424	1.234				-	-					
	DIVISI 7. STRUKTUR													
7.1.(5a)	Beton struktur, fc'30 MPa	m3	1,155,393,453.265	11.320				-	-			13,473,099.566		
7.1.(7a)	Beton struktur, fc'20 MPa	m3	97,497,379.459	0.955				-	-					
7.1.(8)	Beton, fc'15 MPa	m3	53,940,852.476	0.528										
7.1.(10)	Beton, fc'10 Mpa	m3	21,666,138.778	0.212										
7.3.(1)	Baja Tulangan Polos-BjTP 280	Kg	38,776,769.563	0.380								3,525,160.869		
7.3.(3)	Baja Tulangan Sirip BjTS 420A	Kg	2,087,495,472.272	20.452								87,677,216.116		
7.4.(5a)	Pemasangan Jembatan Rangka Baja yang disediakan Pengguna Jasa	Kg	513,753,696.502	5.033										
7.4.(5b)	Pengangkutan Bahan Jembatan yang disediakan Pengguna Jasa	Kg	383,142,770.350	3.754									127,688,239.070	85,151,510.427
7.6.(19a)	Tiang Bor Beton, diameter 800 mm	m1	1,423,023,194.880	13.942										
7.6.(27b)	Pengujian Pembebanan Dinamis Jenis PDLT (Pile Dynamic Laod Test)	Buah	18,043,851.180	0.177										
7.6.(28)	Pengujian Keutuhan Tiang dengan Pile Integrated Test (PIT)	Buah	54,131,553.540	0.530										
7.9.(1)	Pasangan Batu	m3	935,205,425.055	9.162										
7.10.(3a)	Bronjong dengan Kawat yang dilapisi Galvanis	m3	252,852,979.050	2.477							24,802,751.474	57,012,556.894	57,012,556.894	57,012,556.894
7.13.(2)	Sandaran (Dekoratif)	m2	1,054,054,053.600	10.327										
7.14.(1)	Papan Nama Jembatan	m1	393,871.990	0.004										
7.15.(1)	Pembongkaran Pasangan Batu	m3	94,452,835.432	0.925								10,513,100.419	10,513,100.419	
	DIVISI 8. REHABILITASI JEMBATAN													
	DIVISI 9. PEKERJAAN HARIAN DAN PEKERJAAN LAIN-LAIN													
9.2.(1)	Marka Jalan Termoplastik	M2	7,085,784.342	0.069				-	-					
9.2.(5)	Patok Pengarah	Buah	10,488,472.800	0.103										
9.2.(10e)	Kereb Pracetak Jenis 5 (Penghalang Berpanit/ barrier Gutter) t=30 cm	M1	24,993,902.400	0.245										
9.2.(14)	Unit Lampu Penerangan Jalan Lengan Tunggal, Tipe LED	Buah	87,592,975.600	0.858										
	DIVISI 10. PEKERJAAN PEMELIHARAAN KINERJA													
	TOTAL				-	**27,243,825.086**	**21,630,033.600**	**8,165,514.889**	**8,165,514.889**	**8,165,514.889**	**32,968,266.363**	**237,493,816.823**	**260,506,579.341**	**174,182,277.108**

Table 2. Project Cost Analysis Plan/Week (Week 11 to 20)

No. Mata Pembayaran	Uraian Pekerjaan	Satuan	Total Harga (Rp)	BOBOT	Analisa Biaya Proyek Rencana/ Minggu									
					11	12	13	14	15	16	17	18	19	20
	DIVISI 1. UMUM													
1.17	**Pengamanan Lingkungan Hidup**													
1.17.(1k)	Pengujian Parameter Kualitas Air Lainnya	Buah	4,185,000.000	0.041										
1.17.(2a)	Pengujian Vibrasi Lingkungan untuk Kenyamanan dan Kesehatan	Buah	4,725,000.000	0.046										
1.17.(3h)	Pengujian Parameter Udara Emisi dan Ambien Lainnya	Buah	8,100,000.000	0.079										
1.2	**Pengujian Tanah**													
1.20.(1)	Pengeboran, termasuk SPT dan Laporan	m1	43,260,067.200	0.424										
Skh-1.1.22	**Sistem Manajemen Keselamatan Konstruksi (SMKK)**													
7.000	**Rambu dan Perlengkapan lalu Lintas yang diperlukan atau Manajemen Lalu Lintas**													
Skh-1.1.22.(7l)	Jembatan Sementara	Kg	469,414,943.909	4.599	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567
	DIVISI 2. DRAINASE													
2.1.(1)	Galian untuk Selokan Drainase dan Saluran Air	M3	6,116,321.383	0.060					2,038,773.794	2,038,773.794	2,038,773.794			
2.3.(3b)	Pengadaan & Pemasangan U-Ditch 60.80-120 cm + Cover (BG.20 Ton)	M1	120,449,281.260	1.180							40,149,760.420	40,149,760.420	40,149,760.420	
2.3.(3l)	Pengadaan dan Pemasangan BC 60.60-100 12,5 cm (G.20 Ton)	M1	18,467,541.600	0.181							6,155,847.200	6,155,847.200	6,155,847.200	
	DIVISI 3. PEKERJAAN TANAH DAN GEOSINTETIK													
3.1.(1)	Galian Biasa	M3	60,898,830.134	0.597										
3.1.(4)	Galian Struktur dengan kedalaman 0 - 2 meter	M3	266,523,852.408	2.611					46,237,228.057	46,237,228.057	66,651,015.278	40,849,434.675		
3.1.(9)	Galian perkerasan Berbutir	M3	1,264,301.800	0.012	252,860.360	252,860.360								
3.2.(2a)	Timbunan Pilihan dari Sumber Galian	M3	416,549,894.762	4.081		52,055,157.415	52,055,157.415	52,055,157.415	52,055,157.415	67,365,497.831	67,365,497.831	73,598,269.442		
3.3.(1)	Penyiapan Badan Jalan	M2	2,628,690.354	0.026							1,314,345.177	1,314,345.177		
	DIVISI 4. PEKERJAAN PREVENTIF													
	DIVISI 5. PERKERASAN BERBUTIR DAN PERKERASAN BETON SEMEN													
5.1.(1)	Lapis Pondasi Agregat Kelas A	M3	155,329,752.060	1.522									38,832,438.015	38,832,438.015
	DIVISI 6. PERKERASAN ASPAL													
6.1 (1)	Lapis Resap Pengikat - Aspal Cair/Emulsi	Liter	10,859,147.460	0.106										
6.1 (2a)	Lapis Perekat - Aspal Cair/Emulsi	Liter	6,847,737.810	0.067										
6.3(5a)	Laston Lapis Aus (AC-WC)	Ton	171,304,231.631	1.678										
6.3(6a)	Laston Lapis Antara (AC-BC)	Ton	125,983,584.424	1.234										
	DIVISI 7. STRUKTUR													
7.1 (5a)	Beton struktur, fc'30 MPa	m3	1,155,393,453.265	11.320						18,576,546.372	51,748,950.606	51,748,950.606	64,507,567.620	115,542,035.673
7.1 (7a)	Beton struktur, fc'20 MPa	m3	97,497,379.459	0.955										
7.1.(8)	Beton, fc'15 MPa	m3	53,940,852.476	0.528										
7.1.(10)	Beton, fc'10 Mpa	m3	21,666,138.778	0.212			10,833,069.389					10,833,069.389		
7.3.(1)	Baja Tulangan Polos-BjTP 280	Kg	38,776,769.563	0.380				3,525,160.869	3,525,160.869	3,525,160.869	3,525,160.869	3,525,160.869	3,525,160.869	3,525,160.869
7.3.(3)	Baja Tulangan Sirip BjTS 420A	Kg	2,087,495,472.272	20.452				118,297,896.948	118,297,896.948	138,711,684.176	148,918,577.781	148,918,577.781	194,033,047.540	215,263,386.250
7.4.(5a)	Pemasangan Jembatan Rangka Baja yang disediakan Pengguna Jasa	Kg	513,753,696.502	5.033										
7.4.(5b)	Pengangkutan Bahan Jembatan yang disediakan Pengguna Jasa	Kg	383,142,770.350	3.754	85,151,510.427	85,151,510.427								
7.6.(19a)	Tiang Bor Beton, diameter 800 mm	m1	1,423,023,194.880	13.942			76,551,702.080	76,551,702.080	127,586,170.134	153,103,404.161	153,103,404.161	209,031,703.066	209,031,703.066	209,031,703.066
7.6.(27b)	Pengujian Pembebanan Dinamis Jenis PDLT (Pile Dynamic Laod Test)	Buah	18,043,851.180	0.177			9,021,925.590							9,021,925.590
7.6.(28)	Pengujian Keutuhan Tiang dengan Pile Integrated Test (PIT)	Buah	54,131,553.540	0.530			27,065,776.770							27,065,776.770
7.9.(1)	Pasangan Batu	m3	935,205,425.055	9.162						52,667,571.031	52,667,571.031	52,667,571.031	93,495,145.474	93,495,145.474
7.10.(3a)	Bronjong dengan Kawat yang dilapisi Galvanis	m3	252,852,979.050	2.477	57,012,556.894									
7.13.(2)	Sandaran (Dekoratif)	m2	1,054,054,053.600	10.327										
7.14.(1)	Papan Nama Jembatan	m1	393,871.990	0.004										
7.15.(1)	Pembongkaran Pasangan Batu	m3	94,452,835.432	0.925		36,713,317.297	36,713,317.297							
	DIVISI 8. REHABILITASI JEMBATAN													
	DIVISI 9. PEKERJAAN HARIAN DAN PEKERJAAN LAIN-LAIN													
9.2.(1)	Marka Jalan Termoplastik	M2	7,085,784.342	0.069										
9.2.(5)	Patok Pengarah	Buah	10,488,472.800	0.103										
9.2.(10e)	Kerb Pracetak Jenis 5 (Penghalang Berpariti/ barrier Gutter) t=30 cm	M1	24,993,902.400	0.245										
9.2.(14)	Unit Lampu Penerangan Jalan Lengan Tunggal, Tipe LED	Buah	87,592,975.600	0.858										
	DIVISI 10. PEKERJAAN PEMELIHARAAN KINERJA													
	TOTAL				**164,770,020.248**	**196,525,938.066**	**234,594,041.108**	**272,783,009.880**	**372,093,479.784**	**504,578,958.852**	**615,991,996.716**	**661,145,782.223**	**672,083,762.771**	**734,130,664.275**

Table 3. Project Cost Analysis Plan/Week (Week 21 to 30)

No. Mata Pembayaran	Uraian Pekerjaan	Satuan	Total Harga (Rp)	BOBOT	Analisa Biaya Proyek Rencana/ Minggu									
					21	22	23	24	25	26	27	28	29	30
	DIVISI 1. UMUM													
1.17	**Pengamanan Lingkungan Hidup**													
1.17.(1k)	Pengujian Parameter Kualitas Air Lainnya	Buah	4,185,000.000	0.041									1,378,017.447	1,378,017.447
1.17.(2a)	Pengujian Vibrasi Lingkungan untuk Kenyamanan dan Kesehatan	Buah	4,725,000.000	0.046									1,596,982.979	1,596,982.979
1.17.(3h)	Pengujian Parameter Udara Emisi dan Ambien Lainnya	Buah	8,100,000.000	0.079									2,723,103.831	2,723,103.831
1.2	**Pengujian Tanah**													
1.20.(1)	Pengeboran, termasuk SPT dan Laporan	m1	43,260,067.200	0.424										
Skh-1.1.22	**Sistem Manajemen Keselamatan Konstruksi (SMKK)**													
7.000	**Rambu dan Perlengkapan lalu Lintas yang diperlukan atau Manajemen Lalu Lintas**													
Skh-1.1.22.(7l)	Jembatan Sementara	Kg	469,414,943.909	4.599	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567	22,353,092.567		
	DIVISI 2. DRAINASE													
2.1.(1)	Galian untuk Selokan Drainase dan Saluran Air	M3	6,116,321.383	0.060										
2.3.(3b)	Pengadaan & Pemasangan U-Ditch 60.80-120 cm + Cover (BG.20 Ton)	M1	120,449,281.260	1.180										
2.3.(3l)	Pengadaan dan Pemasangan BC 60.60-100 12,5 cm (G.20 Ton)	M1	18,467,541.600	0.181										
	DIVISI 3. PEKERJAAN TANAH DAN GEOSINTETIK													
3.1.(1)	Galian Biasa	M3	60,898,830.134	0.597										
3.1.(4)	Galian Struktur dengan kedalaman 0 - 2 meter	M3	266,523,852.408	2.611										
3.1.(9)	Galian perkerasan Berbutir	M3	1,264,301.800	0.012										
3.2.(2a)	Timbunan Pilihan dari Sumber Galian	M3	416,549,894.762	4.081										
3.3.(1)	Penyiapan Badan Jalan	M2	2,628,690.354	0.026										
	DIVISI 4. PEKERJAAN PREVENTIF													
	DIVISI 5. PERKERASAN BERBUTIR DAN PERKERASAN BETON SEMEN													
5.1.(1)	Lapis Pondasi Agregat Kelas A	M3	155,329,752.060	1.522	38,832,438.015	38,832,438.015								
	DIVISI 6. PERKERASAN ASPAL													
6.1 (1)	Lapis Resap Pengikat - Aspal Cair/Emulsi	Liter	10,859,147.460	0.106										10,859,147.460
6.1 (2a)	Lapis Perekat - Aspal Cair/Emulsi	Liter	6,847,737.810	0.067										6,847,737.810
6.3(5a)	Laston Lapis Aus (AC-WC)	Ton	171,304,231.631	1.678										171,304,231.631
6.3(6a)	Laston Lapis Antara (AC-BC)	Ton	125,983,584.424	1.234										125,983,584.424
	DIVISI 7. STRUKTUR													
7.1 (5a)	Beton struktur, fc'30 MPa	m3	1,155,393,453.265	11.320	115,542,035.673	166,576,503.727	278,838,881.710						278,838,881.710	
7.1 (7a)	Beton struktur, fc'20 MPa	m3	97,497,379.459	0.955			24,374,344.865	24,374,344.865	24,374,344.865				24,374,344.865	
7.1.(8)	Beton, fc'15 MPa	m3	53,940,852.476	0.528		26,970,426.238	26,970,426.238							
7.1.(10)	Beton, fc'10 Mpa	m3	21,666,138.778	0.212										
7.3.(1)	Baja Tulangan Polos-BjTP 280	Kg	38,776,769.563	0.380	3,525,160.869						3,525,160.869	3,525,160.869		
7.3.(3)	Baja Tulangan Sirip BjTS 420A	Kg	2,087,495,472.272	20.452	215,263,386.250	230,573,726.666					235,770,037.911	235,770,037.911		
7.4.(5a)	Pemasangan Jembatan Rangka Baja yang disediakan Pengguna Jasa	Kg	513,753,696.502	5.033			128,438,424.126	128,438,424.126	128,438,424.126	128,438,424.126				
7.4.(5b)	Pengangkutan Bahan Jembatan yang disediakan Pengguna Jasa	Kg	383,142,770.350	3.754										
7.6.(19a)	Tiang Bor Beton, diameter 800 mm	m1	1,423,023,194.880	13.942	209,031,703.066									
7.6.(27b)	Pengujian Pembebanan Dinamis Jenis PDLT (Pile Dynamic Laod Test)	Buah	18,043,851.180	0.177										
7.6.(28)	Pengujian Keutuhan Tiang dengan Pile Integrated Test (PIT)	Buah	54,131,553.540	0.530										
7.9.(1)	Pasangan Batu	m3	935,205,425.055	9.162	93,495,145.474	93,495,145.474	134,407,376.688	134,407,376.688	134,407,376.688					
7.10.(3a)	Bronjong dengan Kawat yang dilapisi Galvanis	m3	252,852,979.050	2.477										
7.13.(2)	Sandaran (Dekoratif)	m2	1,054,054,053.600	10.327			150,551,680.758	150,551,680.758	150,551,680.758	232,206,829.644	150,551,680.758	119,930,999.926	99,709,500.997	
7.14.(1)	Papan Nama Jembatan	m1	393,871.990	0.004										393,871.990
7.15.(1)	Pembongkaran Pasangan Batu	m3	94,452,835.432	0.925										
	DIVISI 8. REHABILITASI JEMBATAN													
	DIVISI 9. PEKERJAAN HARIAN DAN PEKERJAAN LAIN-LAIN													
9.2.(1)	Marka Jalan Termoplastik	M2	7,085,784.342	0.069										7,085,784.342
9.2.(5)	Patok Pengarah	Buah	10,488,472.800	0.103						2,622,118.200	2,622,118.200	2,622,118.200	2,622,118.200	
9.2.(10e)	Kerb Pracetak Jenis 5 (Penghalang Berpariti/ barrier Gutter) t=30 cm	M1	24,993,902.400	0.245						6,248,475.600	6,248,475.600	6,248,475.600	6,248,475.600	
9.2.(14)	Unit Lampu Penerangan Jalan Lengan Tunggal, Tipe LED	Buah	87,592,975.600	0.858								29,197,658.533	29,197,658.533	29,197,658.533
	DIVISI 10. PEKERJAAN PEMELIHARAAN KINERJA													
	TOTAL				**698,042,961.915**	**578,801,332.688**	**765,934,226.952**	**460,124,919.004**	**460,124,919.004**	**391,868,940.137**	**421,070,565.905**	**419,647,543.607**	**446,689,084.162**	**357,370,120.446**

2. BCWP (Budgeted Cost of Work Performance), an indicator that shows the value of the results from the point of view of the value of the work that has been completed against the budget provided (Susilowati & Kurniaji, 2020).

Example of calculating the percentage of BCWS value for week 2 in division 1 (general) with payment item number 1.17.(1k)

Percentage of Work Realization

$$\% = \frac{0{,}000}{0{,}041} \text{ x } 100\% = 0{,}00\%$$

Example of calculating the week 2 BCWS value in division 1 (general) with payment item number 1.17.(1k)

Realized job cost

Cost of work = 0,00% x Total price of work per item

= 0,00% x 4.185.000,00

= Rp 0,00

Table 4. Realized Project Cost Analysis / Week (Week 1 to 12)

No. Mata Pembayaran	Uraian Pekerjaan	Satuan	Total Harga (Rp)	BOBOT	Analisa Biaya Proyek Realisasi/ Minggu											
					1	2	3	4	5	6	7	8	9	10	11	12
	DIVISI 1. UMUM															
1.17	**Pengamanan Lingkungan Hidup**															
1.17.(1k)	Pengujian Parameter Kualitas Air Lainnya	Buah	4,185.000.000	0.041					1,395.000.000							
1.17.(2a)	Pengujian Vibrasi Lingkungan untuk Kenyamanan dan Kesehatan	Buah	4,725.000.000	0.046					1,575.000.000							
1.17.(3h)	Pengujian Parameter Udara Emisi dan Ambien Lainnya	Buah	8,100.000.000	0.079					2,700.000.000							
1.2	**Pengujian Tanah**															
1.20.(1)	Pengeboran, termasuk SPT dan Laporan	m1	43,260,067.200	0.424		15,412,409.352	27,847,657.848									
Skh-1.1.22	**Sistem Manajemen Keselamatan Konstruksi (SMKK)**															
7.000	**Rambu dan Perlengkapan lalu Lintas yang diperlukan atau Manajemen Lalu Lintas**															
Skh-1.1.22.(7)	Jembatan Sementara	Kg	469,414,943.909	4.599										469,414,943.909		
	DIVISI 2. DRAINASE															
2.1.(1)	Galian untuk Selokan Drainase dan Saluran Air	M3	6,116,321.383	0.060												
2.3.(36)	Pengadaan & Pemasangan U-Ditch 60.80-120 cm + Cover (BG.20 Ton)	M1	120,449,281.260	1.180												
2.3.(39)	Pengadaan dan Pemasangan BC 60.60-100 12.5 cm (G.20 Ton)	M1	18,467,541.600	0.181												
	DIVISI 3. PEKERJAAN TANAH DAN GEOSINTETIK															
3.1.(1)	Galian Biasa	M3	60,898,830.134	0.597						9,594,479.994	26,027,578.707	10,206,893.611				
3.1.(4)	Galian Struktur dengan kedalaman 0 - 2 meter	M3	266,523,852.408	2.611												
3.1.(9)	Galian perkerasan Berbutir	M3	1,264,301.800	0.012												
3.2.(2a)	Timbunan Pilihan dari Sumber Galian	M3	416,549,894.762	4.081									61,955,844.217			
3.3.(1)	Penyiapan Badan Jalan	M2	2,628,690.354	0.026												
	DIVISI 4. PEKERJAAN PREVENTIF															
	DIVISI 5. PERKERASAN BERBUTIR DAN PERKERASAN BETON SEMEN															
5.1.(1)	Lapis Pondasi Agregat Kelas A	M3	155,329,752.060	1.522												
	DIVISI 6. PERKERASAN ASPAL															
6.1.(1)	Lapis Resap Pengikat - Aspal Cair/Emulsi	Liter	10,859,147.460	0.106												
6.1.(2a)	Lapis Perekat - Aspal Cair/Emulsi	Liter	6,847,737.810	0.067												
6.3(5a)	Laston Lapis Aus (AC-WC)	Ton	171,304,231.631	1.678												
6.3(6a)	Laston Lapis Antara (AC-BC)	Ton	125,983,584.424	1.234												
	DIVISI 7. STRUKTUR															
7.1 (5a)	Beton struktur, fc'30 MPa	m3	1,155,393,453.265	11.320									43,889,642.526			
7.1 (7a)	Beton struktur, fc'20 MPa	m3	97,497,379.459	0.955										6,022,067.230	1,633,102.978	
7.1.(8)	Beton, fc'15 MPa	m3	53,940,852.476	0.528												
7.1.(10)	Beton, fc'10 Mpa	m3	21,666,138.778	0.212												
7.3.(1)	Baja Tulangan Polos-BjTP 280	Kg	38,776,769.563	0.380											5,817,929.358	
7.3.(3)	Baja Tulangan Sirip BjTS 420A	Kg	2,087,495,472.272	20.452								30,416,542.960	30,416,542.960	6,226,205.103		
7.4.(5a)	Pemasangan Jembatan Rangka Baja yang disediakan Pengguna Jasa	Kg	513,753,696.502	5.033												
7.4.(5b)	Pengangkutan Bahan Jembatan yang disediakan Pengguna Jasa	Kg	383,142,770.350	3.754												383,142,770.350
7.6.(19a)	Tiang Bor Beton, diameter 800 mm	m1	1,423,023,194.880	13.942												
7.6.(27b)	Pengujian Pembebanan Dinamis Jenis PDLT (Pile Dynamic Laod Test)	Buah	18,043,851.180	0.177												
7.6.(28)	Pengujian Kelutihan Tiang dengan Pile Integrated Test (PIT)	Buah	54,131,553.540	0.530												
7.9.(1)	Pasangan Batu	m3	935,205,425.055	9.162										143,713,062.039	34,601,369.340	
7.10.(3a)	Bronjong dengan Kawat yang dilapisi Galvanis	m3	252,852,979.050	2.477							24,496,544.666	228,356,434.384				
7.13.(2)	Sandaran (Dekoratif)	m2	1,054,054,053.600	10.327												
7.14.(1)	Papan Nama Jembatan	m1	393,871.990	0.004												
7.15.(1)	Pembongkaran Pasangan Batu	m3	94,452,835.432	0.925												
	DIVISI 8. REHABILITASI JEMBATAN															
	DIVISI 9. PEKERJAAN HARIAN DAN PEKERJAAN LAIN-LAIN															
9.2.(1)	Marka Jalan Termoplastik	M2	7,085,784.342	0.069												
9.2.(5)	Patok Pengarah	Buah	10,488,472.800	0.103												
9.2.(10a)	Kereb Precetak Jenis 5 (Penghalang Berpariti barrier Gutter) h=30 cm	M1	24,993,902.400	0.245												
9.2.(14)	Unit Lampu Penerangan Jalan Lengan Tunggal, Tipe LED	Buah	87,592,975.600	0.858												
	DIVISI 10. PEKERJAAN PEMELIHARAAN KINERJA															
	TOTAL				-	**15,412,409.352**	**27,847,657.848**	-	**5,670,000.000**	**9,594,479.994**	**50,524,123.373**	**268,979,870.955**	**136,262,029.703**	**625,376,278.280**	**42,052,401.676**	**383,142,770.350**

Table 5. Realized Project Cost Analysis / Week (Week 13 to 24)

No. Mata Pembayaran	Uraian Pekerjaan	Satuan	Total Harga (Rp)	BOBOT	Analisa Biaya Proyek Realisasi/ Minggu											
					13	14	15	16	17	18	19	20	21	22	23	24
	DIVISI 1. UMUM															
1.17	**Pengamanan Lingkungan Hidup**															
1.17.(1k)	Pengujian Parameter Kualitas Air Lainnya	Buah	4,185.000.000	0.041										1,395.000.000		
1.17.(2a)	Pengujian Vibrasi Lingkungan untuk Kenyamanan dan Kesehatan	Buah	4,725.000.000	0.046										1,575.000.000		
1.17.(3h)	Pengujian Parameter Udara Emisi dan Ambien Lainnya	Buah	8,100.000.000	0.079										2,700.000.000		
1.2	**Pengujian Tanah**															
1.20.(1)	Pengeboran, termasuk SPT dan Laporan	m1	43,260,067.200	0.424												
Skh-1.1.22	**Sistem Manajemen Keselamatan Konstruksi (SMKK)**															
7.000	**Rambu dan Perlengkapan lalu Lintas yang diperlukan atau Manajemen Lalu Lintas**															
Skh-1.1.22.(7)	Jembatan Sementara	Kg	469,414,943.909	4.599												
	DIVISI 2. DRAINASE															
2.1.(1)	Galian untuk Selokan Drainase dan Saluran Air	M3	6,116,321.383	0.060												
2.3.(36)	Pengadaan & Pemasangan U-Ditch 60.80-120 cm + Cover (BG.20 Ton)	M1	120,449,281.260	1.180												
2.3.(39)	Pengadaan dan Pemasangan BC 60.60-100 12.5 cm (G.20 Ton)	M1	18,467,541.600	0.181												
	DIVISI 3. PEKERJAAN TANAH DAN GEOSINTETIK															
3.1.(1)	Galian Biasa	M3	60,898,830.134	0.597												
3.1.(4)	Galian Struktur dengan kedalaman 0 - 2 meter	M3	266,523,852.408	2.611					26,537,923.388	73,999,978.678		100,537,902.066			65,448,048.277	
3.1.(9)	Galian perkerasan Berbutir	M3	1,264,301.800	0.012										1,264,301.800		
3.2.(2a)	Timbunan Pilihan dari Sumber Galian	M3	416,549,894.762	4.081								1,326,896.169			191,685,462.009	
3.3.(1)	Penyiapan Badan Jalan	M2	2,628,690.354	0.026												
	DIVISI 4. PEKERJAAN PREVENTIF															
	DIVISI 5. PERKERASAN BERBUTIR DAN PERKERASAN BETON SEMEN															
5.1.(1)	Lapis Pondasi Agregat Kelas A	M3	155,329,752.060	1.522												
	DIVISI 6. PERKERASAN ASPAL															
6.1.(1)	Lapis Resap Pengikat - Aspal Cair/Emulsi	Liter	10,859,147.460	0.106												
6.1.(2a)	Lapis Perekat - Aspal Cair/Emulsi	Liter	6,847,737.810	0.067												
6.3(5a)	Laston Lapis Aus (AC-WC)	Ton	171,304,231.631	1.678												
6.3(6a)	Laston Lapis Antara (AC-BC)	Ton	125,983,584.424	1.234												
	DIVISI 7. STRUKTUR															
7.1 (5a)	Beton struktur, fc'30 MPa	m3	1,155,393,453.265	11.320	13,881,375.311						204,954,423.703	88,493,767.605	280,077,160.678	160,758,574.369		
7.1 (7a)	Beton struktur, fc'20 MPa	m3	97,497,379.459	0.955	2,347,585.530	4,388,964.253	3,368,274.892	1,531,034.042								
7.1.(8)	Beton, fc'15 MPa	m3	53,940,852.476	0.528										53,940,852.476		
7.1.(10)	Beton, fc'10 Mpa	m3	21,666,138.778	0.212							9,594,479.994	9,594,479.994				
7.3.(1)	Baja Tulangan Polos-BjTP 280	Kg	38,776,769.563	0.380	5,817,929.358	5,817,929.358	4,082,757.444	1,837,240.850								
7.3.(3)	Baja Tulangan Sirip BjTS 420A	Kg	2,087,495,472.272	20.452	4,593,102.125	6,430,342.975	4,082,757.444	1,939,309.786			696,416,351.060		346,115,762.340	362,855,067.861		362,752,998.925
7.4.(5a)	Pemasangan Jembatan Rangka Baja yang disediakan Pengguna Jasa	Kg	513,753,696.502	5.033											513,753,696.502	
7.4.(5b)	Pengangkutan Bahan Jembatan yang disediakan Pengguna Jasa	Kg	383,142,770.350	3.754												
7.6.(19a)	Tiang Bor Beton, diameter 800 mm	m1	1,423,023,194.880	13.942	118,604,103.757	533,616,397.969	592,918,449.847	177,884,243.307								
7.6.(27b)	Pengujian Pembebanan Dinamis Jenis PDLT (Pile Dynamic Laod Test)	Buah	18,043,851.180	0.177						18,043,851.180						
7.6.(28)	Pengujian Kelutihan Tiang dengan Pile Integrated Test (PIT)	Buah	54,131,553.540	0.530						54,131,553.540						
7.9.(1)	Pasangan Batu	m3	935,205,425.055	9.162	71,346,186.339	148,306,164.164	257,724,063.671	46,441,365.929								47,564,124.228
7.10.(3a)	Bronjong dengan Kawat yang dilapisi Galvanis	m3	252,852,979.050	2.477												
7.13.(2)	Sandaran (Dekoratif)	m2	1,054,054,053.600	10.327												
7.14.(1)	Papan Nama Jembatan	m1	393,871.990	0.004												
7.15.(1)	Pembongkaran Pasangan Batu	m3	94,452,835.432	0.925										11,737,927.652		
	DIVISI 8. REHABILITASI JEMBATAN															
	DIVISI 9. PEKERJAAN HARIAN DAN PEKERJAAN LAIN-LAIN															
9.2.(1)	Marka Jalan Termoplastik	M2	7,085,784.342	0.069												-
9.2.(5)	Patok Pengarah	Buah	10,488,472.800	0.103												
9.2.(10a)	Kereb Precetak Jenis 5 (Penghalang Berpariti barrier Gutter) h=30 cm	M1	24,993,902.400	0.245												
9.2.(14)	Unit Lampu Penerangan Jalan Lengan Tunggal, Tipe LED	Buah	87,592,975.600	0.858												
	DIVISI 10. PEKERJAAN PEMELIHARAAN KINERJA															
	TOTAL				**216,590,282.420**	**698,559,798.718**	**862,176,303.298**	**229,633,193.914**	**26,537,923.388**	**146,175,383.398**	**910,965,254.758**	**199,953,045.834**	**626,192,923.018**	**596,226,724.159**	**770,887,206.788**	**410,317,123.151**

3. ACWP (Actual Cost of Work Performed), namely, the actual cost of work that has been carried out, the data is obtained from weekly project accounting reports with assumptions based on existing data (Utkarsh et al., 2022). ACWP is the actual amount of expenditure or funds used to carry out work at a certain time. ACWP for the second week is IDR 15,412,409.352.

4. Calculating SV (Schedule Variance) and CV (Cost Variance)

SV = BCWP – BCWS

= 15.412.409,352 - 27.243.825,086

= - Rp 11.831.415,73

CV = BCWP – ACWP

= 15.412.409,352 - 15.412.409,352

= Rp 0

In the same way for the calculation of other jobs, for week three and so on can be seen in the following table.

Table 6. Cost Variant and Schedule Variant Analysis

Minggu ke-	Analisa Konsep Hasil						Varian	
	BCWS	Kumulatif	BCWP	Kumulatif	ACWP	Kumulatif	SV	CV
1	-	-	-	-		-		
2	27,243,825.09	27,243,825.09	15,412,409.35	15,412,409.35	15,412,409.35	15,412,409.35	- 11,831,415.73	-
3	21,630,033.60	48,873,858.69	27,847,657.85	43,260,067.20	27,847,657.85	43,260,067.20	6,217,624.25	-
4	8,165,514.89	57,039,373.57	-	43,260,067.20	-	43,260,067.20	- 8,165,514.89	-
5	8,165,514.89	65,204,888.46	5,670,000.00	48,930,067.20	5,670,000.00	48,930,067.20	- 2,495,514.89	-
6	8,165,514.89	73,370,403.35	9,594,479.99	58,524,547.19	10,835,000.00	59,765,067.20	1,428,965.11	- 1,240,520.01
7	32,968,266.36	106,338,669.71	50,524,123.37	109,048,670.57	49,235,921.00	109,000,988.20	17,555,857.01	1,288,202.37
8	237,493,816.82	343,832,486.54	268,979,870.95	378,028,541.52	256,739,022.00	365,740,010.20	31,486,054.13	12,240,848.95
9	260,506,579.34	604,339,065.88	136,262,029.70	514,290,571.23	140,432,098.00	506,172,108.20	- 124,244,549.64	- 4,170,068.30
10	174,182,277.11	778,521,342.99	625,376,278.28	1,139,666,849.51	620,432,901.00	1,126,605,009.20	451,194,001.17	4,943,377.28
11	164,770,020.25	943,291,363.23	42,052,401.68	1,181,719,251.18	42,345,091.00	1,168,950,100.20	- 122,717,618.57	- 292,689.32
12	196,525,938.07	1,139,817,301.30	383,142,770.35	1,564,862,021.53	380,231,776.00	1,549,181,876.20	186,616,832.28	2,910,994.35
13	234,594,041.11	1,374,411,342.41	216,590,282.42	1,781,452,303.95	230,785,934.00	1,779,967,810.20	- 18,003,758.69	- 14,195,651.58
14	272,783,009.88	1,647,194,352.29	698,559,798.72	2,480,012,102.67	692,558,656.00	2,472,526,466.20	425,776,788.84	6,001,142.72
15	372,093,479.78	2,019,287,832.07	862,176,303.30	3,342,188,405.97	853,189,303.00	3,325,715,769.20	490,082,823.51	8,987,000.30
16	504,578,958.85	2,523,866,790.92	229,633,193.91	3,571,821,599.88	210,874,332.00	3,536,590,101.20	- 274,945,764.94	18,758,861.91
17	615,991,996.72	3,139,858,787.64	26,537,923.39	3,598,359,523.27	35,098,721.00	3,571,688,822.20	- 589,454,073.33	- 8,560,797.61
18	661,145,782.22	3,801,004,569.86	146,175,383.40	3,744,534,906.67	140,162,383.00	3,711,851,205.20	- 514,970,398.83	6,013,000.40
19	672,083,762.77	4,473,088,332.63	910,965,254.76	4,655,500,161.43	912,978,254.00	4,624,829,459.20	238,881,491.99	- 2,012,999.24
20	734,130,664.28	5,207,218,996.91	199,953,045.83	4,855,453,207.26	180,940,045.83	4,805,769,505.03	- 534,177,618.44	19,013,000.00
21	698,042,961.92	5,905,261,958.82	626,192,923.02	5,481,646,130.28	596,205,923.00	5,401,975,428.03	- 71,850,038.90	29,987,000.02
22	578,801,332.69	6,484,063,291.51	596,226,724.16	6,077,872,854.44	620,786,931.00	6,022,762,359.03	17,425,391.47	- 24,560,206.84
23	765,934,226.95	7,249,997,518.46	770,887,206.79	6,848,760,061.22	791,996,827.00	6,814,759,186.03	4,952,979.84	- 21,109,620.21
24	460,124,919.00	7,710,122,437.47	410,317,123.15	7,259,077,184.38	400,304,137.00	7,215,063,323.03	- 49,807,795.85	10,012,986.15

5. Calculating CPI (Cost Performance Index) and SPI (Schedule Performance Index)

CPI = BCWP/ACWP

= 15.412.409,352 / 27.243.825,086

= 0,566

SPI = BCWP/ BCWS

= 15.412.409,352 / 15.412.409,352

= 1

In the same way, the calculation of work in week three and so on can be seen in the following table.

Table 7. Analysis of Cost Performance Index (CPI) and Schedule Performance Index (SPI)

Minggu ke-	Analisa Konsep Hasil						Varian	
	BCWS	Kumulatif	BCWP	Kumulatif	ACWP	Kumulatif	SPI	CPI
1	-	-	-	-		-		
2	27,243,825.09	27,243,825.09	15,412,409.35	15,412,409.35	15,412,409.35	15,412,409.35	0.566	1.000
3	21,630,033.60	48,873,858.69	27,847,657.85	43,260,067.20	27,847,657.85	43,260,067.20	1.287	1.000
4	8,165,514.89	57,039,373.57	-	43,260,067.20	-	43,260,067.20	0.000	
5	8,165,514.89	65,204,888.46	5,670,000.00	48,930,067.20	5,670,000.00	48,930,067.20	0.694	1.000
6	8,165,514.89	73,370,403.35	9,594,479.99	58,524,547.19	10,835,000.00	59,765,067.20	1.175	0.886
7	32,968,266.36	106,338,669.71	50,524,123.37	109,048,670.57	49,235,921.00	109,000,988.20	1.533	1.026
8	237,493,816.82	343,832,486.54	268,979,870.95	378,028,541.52	256,739,022.00	365,740,010.20	1.133	1.048
9	260,506,579.34	604,339,065.88	136,262,029.70	514,290,571.23	140,432,098.00	506,172,108.20	0.523	0.970
10	174,182,277.11	778,521,342.99	625,376,278.28	1,139,666,849.51	620,432,901.00	1,126,605,009.20	3.590	1.008
11	164,770,020.25	943,291,363.23	42,052,401.68	1,181,719,251.18	42,345,091.00	1,168,950,100.20	0.255	0.993
12	196,525,938.07	1,139,817,301.30	383,142,770.35	1,564,862,021.53	380,231,776.00	1,549,181,876.20	1.950	1.008
13	234,594,041.11	1,374,411,342.41	216,590,282.42	1,781,452,303.95	230,785,934.00	1,779,967,810.20	0.923	0.938
14	272,783,009.88	1,647,194,352.29	698,559,798.72	2,480,012,102.67	692,558,656.00	2,472,526,466.20	2.561	1.009
15	372,093,479.78	2,019,287,832.07	862,176,303.30	3,342,188,405.97	853,189,303.00	3,325,715,769.20	2.317	1.011
16	504,578,958.85	2,523,866,790.92	229,633,193.91	3,571,821,599.88	210,874,332.00	3,536,590,101.20	0.455	1.089
17	615,991,996.72	3,139,858,787.64	26,537,923.39	3,598,359,523.27	35,098,721.00	3,571,688,822.20	0.043	0.756
18	661,145,782.22	3,801,004,569.86	146,175,383.40	3,744,534,906.67	140,162,383.00	3,711,851,205.20	0.221	1.043
19	672,083,762.77	4,473,088,332.63	910,965,254.76	4,655,500,161.43	912,978,254.00	4,624,829,459.20	1.355	0.998
20	734,130,664.28	5,207,218,996.91	199,953,045.83	4,855,453,207.26	180,940,045.83	4,805,769,505.03	0.272	1.105
21	698,042,961.92	5,905,261,958.82	626,192,923.02	5,481,646,130.28	596,205,923.00	5,401,975,428.03	0.897	1.050
22	578,801,332.69	6,484,063,291.51	596,226,724.16	6,077,872,854.44	620,786,931.00	6,022,762,359.03	1.030	0.960
23	765,934,226.95	7,249,997,518.46	770,887,206.79	6,848,760,061.22	791,996,827.00	6,814,759,186.03	1.006	0.973
24	460,124,919.00	7,710,122,437.47	410,317,123.15	7,259,077,184.38	400,304,137.00	7,215,063,323.03	0.892	1.025

Cost Control Effectiveness Analysis

In analyzing the effectiveness of control, be it time or cost, you must pay attention to the project from the beginning so that there is no cost overrun and delay in project implementation. The parameters that need to be considered for cost control effectiveness are parameters that can affect quality and effectiveness related to good cost control. The better the control, the higher the quality and effectiveness of a project. To determine the scoring of the parameters of control effectiveness can be calculated:

1. Cost Parameter Analysis

From the Cost-Performance Index (CPI) table, the following results are obtained:

- Amount of data = 24 weeks
- Result > 1 = 14 weeks
- Result < 1 = 10 weeks
- Expected score = 0,90

Cost-effectiveness is obtained $= \frac{14}{10} = 1,4$

$= 1,4 \times 0,9 = 1,26$

Control Effectiveness	Parameter	Score
Cost	Difference between plan and actual cost	1,260

The score results from the above parameters to determine the value of the effectiveness of project cost and time control:

- Parameter results for costs have a score of 1.26, meaning that the costs incurred are greater than the budget.

The relationship between the two cost and time parameters above is that the work is faster at a cost greater than the budget.

a. Effectiveness < 1 : Less Effective

b. Effectiveness = 1 : Effective

c. Effectiveness > 1 : Very Effective

Therefore, the parameter results above can be calculated using the following formula:

$$\text{Effectiveness} = \frac{\text{Expected results} - \text{Worst result}}{\text{Best result} - \text{Worst Result}}$$

$$= \frac{0,9 - 0,1}{1,26 - 0,761}$$

$$= 1,603$$

From the above calculations, an effectiveness value of 1.603 is obtained for controlling project costs and time using the Earned Value method. In other words, the effectiveness value is greater than 1 (one), so controlling the Bagor Bridge Replacement project in Situbondo Regency is very effective using the Earned Value method.

4. CONCLUSION

The cost performance of project implementation from weeks 6, 9, 11, 13, 17, 19, 22, 23 incurs costs greater than the plan cost, this is indicated by the Cost Variance (CV) indicator with a negative value. Whereas in weeks 7, 8, 10, 12, 14, 15, 16, 18, 20, 21, 24 incurred costs less than the plan cost, this is indicated by a positive Cost Variance (CV) indicator. The value of effectiveness and efficiency in this project is 1.603 for controlling project costs and time using the Earned Value method. In other words, the effectiveness value is less than 1 (one), so controlling the Bagor Bridge Replacement project in Situbondo Regency is very effective using the Earned Value method.

REFERENCES

Chen, P. H. (2008). Integration of cost and schedule using extensive matrix method and spreadsheets. *Automation in Construction, 18*(1). https://doi.org/10.1016/j.autcon.2008.04.009

Maciulyte-Sniukiene, A., & Butkus, M. (2022). Does infrastructure development contribute to EU countries' economic growth? *Sustainability, 14*(9). https://doi.org/10.3390/su14095610

Marpaung, G. N., Soesilowati, E., Rahman, Y. A., Pangestu, Y. A. G., & Wicaksana, T. (2021). Socioeconomy conditions after the development of toll roads in Salatiga. *Economics Development Analysis Journal, 10*(1). https://doi.org/10.15294/edaj.v10i1.40966

Pangemanan, D., Latief, R. U., & Hamzah, S. (2022). Sustainable construction framework model on development of Likupang special economic zone. *IOP Conference Series: Earth and Environmental Science*, *1117*(1). https://doi.org/10.1088/1755-1315/1117/1/012011

Rahadian, D., Koespiadi, K., & Oetomo, W. (2024). Performance analysis of supervisory consultants on projects in the housing and settlement areas of East Java province. *International Journal on Advanced Technology, Engineering, and Information System*, *2*(3), 222–232. https://doi.org/10.55047/ijateis.v2i3.1015

Sinaga, A. A. P. (2022). Poverty perspectives and reduction strategies in Indonesia. *Three Seas Economic Journal*, *3*(3). https://doi.org/10.30525/2661-5150/2022-3-1

Siswanto, E., & Hidayati, D. (2020). Management indicators of good infrastructure facilities to improve school quality. *International Journal of Educational Management and Innovation*, *1*(1). https://doi.org/10.12928/ijemi.v1i1.1516

Srinivasu, B., Professor, A., & Srinivasa Rao, P. (2013). Infrastructure development and economic growth: Prospects and perspective. *Journal of Business Management & Social Sciences Research*, *2*(1).

Susilowati, F., & Kurniaji, W. M. (2020). Effective performance evaluation to estimate cost and time using earned value. *IOP Conference Series: Materials Science and Engineering*, *771*(1). https://doi.org/10.1088/1757-899X/771/1/012055

Utkarsh, K., Ding, F., Jin, X., Blonsky, M., Padullaparti, H., & Balamurugan, S. P. (2022). A network-aware distributed energy resource aggregation framework for flexible, cost-optimal, and resilient operation. *IEEE Transactions on Smart Grid*, *13*(2). https://doi.org/10.1109/TSG.2021.3124198