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ANALYSIS OF THE EARNED VALUE METHOD ON THE ROAD AND BRIDGE PRESERVATION PROJECT IN SITUBONDO-KETAPANG-BANYUWANGI

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ABSTRACT

The implementation of the Situbondo – Ketapang – Banyuwangi Road and Bridge Preservation Project experienced changes in the area being worked on, requiring additional design. Issues arose when the overlay asphalt mix work was halted to await test results for Aspal Modiv PG – 70 from the Pusjatan Bandung Road Materials Laboratory, causing a delay in the 40th week by -0.813%. Delays primarily occurred in the AC - WC and AC - BC asphalt work, affecting project performance. A cost and time analysis was necessary to address this issue. The Earned Value Method (EVM) was used to determine the project's duration and cost until initial handover. The study results indicated that the project cost performance with a CPI > 1 was good, but an SPI of 0.983 < 1 indicated delays. The estimated final project cost is Rp 112,439,121,070.91, with an estimated completion time of 453 days, 3 days longer than the planned schedule.

KEYWORDS Earned Value Method, Project Performance, Project Cost

INTRODUCTION

Infrastructure development plays an important role in driving economic growth, both at the national and regional levels. Adequate infrastructure not only increases economic activity and business growth, but also reduces unemployment, alleviates poverty, and improves people's welfare. Therefore, the Government of Indonesia is committed to continuously improving infrastructure development (Kurniawati et al., 2022). Construction projects are a key element in infrastructure development. In Indonesia, many construction projects often experience delays, which is a classic problem in almost every project. The obstacles faced in project implementation often cause delays, so that the project does not run according to plan (Natalia et al., 2021).

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In line with the government's efforts to provide adequate road infrastructure, the Situbondo - Ketapang - Banyuwangi Road and Bridge Preservation project is currently being implemented. This project is part of a national road that is very important as a land transportation infrastructure. This road allows community mobility from one place to another, which is very important for economic and social activities (Kurniawati et al., 2022). According to Data on the Development of Road and Bridge Information Systems, Directorate of Road and Bridge Engineering, Directorate General of Highways (March 2023), of the total length of 1359.2 km of non-toll national roads in East Java, there are still 57.56% of roads in good condition, 39.79% in moderate condition, 2.46% slightly damaged, and 0.19% severely damaged. To prevent further damage, the government through the Director General of Highways of the Ministry of Public Works and Public Housing runs a Road and Bridge Preservation program to maintain optimal road conditions (Kurniawati et al., 2022).

The Situbondo - Ketapang - Banyuwangi Road and Bridge Preservation Work for Fiscal Year 2023-2024 aims to optimize preservation funds and maintain road service levels. The source of funds for this project comes from the 2023-2024 State Budget. The executor of the work is PT Bumi Duta Persada (KSO) PT Rajendra Pratama Jaya, based on contract number: HK.02.03-Bb8.6/1.2/736, dated June 23, 2023, with a ceiling value of Rp. 159,332,043,000 (Kurniawati et al., 2022). The project includes various works such as minor rehabilitation, major rehabilitation, periodic maintenance, and bridge replacement with an implementation period of 450 calendar days. Changes in the location of work and adjustments to the unit price of items in this project are outlined in the contract addendum to ensure the work goes according to plans and specifications (Kurniawati et al., 2022).

The demands of highway users who want comfortable and safe road conditions are a priority in this project. Therefore, reconstruction of damaged roads such as cracks and settlement due to excessive vehicle loads is necessary. In this case, the government has allocated APBN funds for this preservation project, with the appointed implementer being PT Bumi Duta Persada - PT Rajendra Pratama Jaya (KSO) (Natalia et al., 2021). To overcome delays and changes that are not in accordance with the initial contract, consistent and integrated performance control is needed. The Earned Value Management (EVM) concept is the right method to control project performance, ensuring the project can be completed on time, on quality, and at the right cost (Susanti et al., 2019).

With this method, the project can be thoroughly monitored and evaluated to ensure that all aspects of the work are in accordance with the original plan. EVM will be used to research the Situbondo - Ketapang - Banyuwangi Road and Bridge Preservation project, to determine the duration and cost required until project completion.

RESEARCH METHOD

This research investigates the Situbondo - Ketapang - Banyuwangi Road and Bridge Preservation Project in Fiscal Year 2023/2024. The focus is on evaluating project performance using the Earned Value Management (EVM) method and analyzing cost and time estimates to measure progress and efficiency.

The research took place from the third week of February to March 2024. The initial phase included preparation, preliminary survey, and literature study. Data was collected from various sources including contractors, supervision consultants, project schedules, Cost Budget Plan (RAB), and weekly reports. EVM was used as the main framework, taking into account Planned Value (PV), Earned Value (EV), and Actual Cost (AC). Variance analysis included Cost Variance (CV) and Schedule Variance (SV), with project performance assessed through Schedule Performance Index (SPI) and Cost Performance Index (CPI).

Cost and time estimates used Estimate to Complete (ETC), Estimate at Complete (EAC), and Time Estimate (TE). Project progress or delay factors are analyzed through interviews, observations, and examination of reports. The research steps include determining the background, formulating the problem, collecting and analyzing EVM data, calculating cost and time estimates, and drawing conclusions. The research aims to provide a better understanding of project performance, assisting stakeholders in decision-making related to project management and resource allocation, with the hope of improving the efficiency and effectiveness of project implementation.

RESULT AND DISCUSSION

Discussion

Calculation of Planned Value (PV) / BCWS

This study evaluates the construction performance in the Situbondo - Ketapang - Banyuwangi Road and Bridge Preservation Project Fiscal Year 2023/2024 using the Earned Value Management (EVM) method. The data analyzed includes the project schedule, Budget Plan of Cost (RAB), weekly reports, and actual costs, to calculate Planned Value (PV) or Budgeted Cost of Work Scheduled (BCWS).

Table 1 PV or BCWS

Week To	Plan Progress (%)	Cumulative Plan (%)	Budget (Rp)	PV or BCWS (Rp)
1	0,0430	0,0430	23.200.000.000	52.976.000,00
2	0,1005	0,1435	23.200.000.000	176.844.448,38
3	0,1325	0,2761	23.200.000.000	340.136.396,76
4	0,1194	0,3955	23.200.000.000	487.291.075,24
5	0,1194	0,5150	23.200.000.000	634.445.753,72
6	0,0757	0,5907	23.200.000.000	727.683.540,63
7	0,2605	0,8511	23.200.000.000	1.048.572.123,65
8	0,4495	1,3006	23.200.000.000	1.602.384.519,96
9	0,3223	1,6229	23.200.000.000	1.999.413.079,85
10	0,8275	2,4504	23.200.000.000	52.976.000,00
11	0,9519	3,4023	23.200.000.000	176.844.448,38
12	1,3033	4,7056	23.200.000.000	340.136.396,76
13	1,3238	6,0294	23.200.000.000	3.018.923.515,84
14	1,4685	7,4979	23.200.000.000	4.191.660.128,92
15	1,4706	8,9685	23.200.000.000	5.797.330.290,48

16	1,5221	10,4906	23.200.000.000	7.428.213.566,89
17	3,4536	13,9441	23.200.000.000	9.237.385.927,29
18	1,2422	15,1863	23.200.000.000	1.049.166.302,21
19	3,1825	18,3688	23.200.000.000	2.924.360.260,21
20	2,8871	21,2558	23.200.000.000	7.179.147.782,60
21	0,4730	21,7288	23.200.000.000	8.709.479.059,11
22	4,3263	26,0551	23.200.000.000	2.630.331.471,05
23	4,1623	30,2174	23.200.000.000	6.187.179.493,85
24	2,7025	32,9199	23.200.000.000	6.769.885.075,22
25	2,0128	34,9327	23.200.000.000	2.099.846.663,95
26	0,3613	35,2940	23.200.000.000	7.227.825.190,77
27	2,9107	38,2046	123.200.000.000	40.557.272.011,94
28	0,0003	38,2049	23.200.000.000	3.037.025.400,55
29	0,5210	38,7259	23.200.000.000	3.482.166.062,93
30	0,0496	38,7755	23.200.000.000	7.068.118.478,95
31	2,6986	38,2049	23.200.000.000	7.068.473.801,49
32	0,1508	38,7259	23.200.000.000	7.710.345.801,49
33	1,0571	38,7755	23.200.000.000	7.771.442.188,30
34	0,5262	41,4742	23.200.000.000	1.096.155.121,87
35	0,7363	41,6250	23.200.000.000	1.282.000.000,00
36	1,1399	42,6821	23.200.000.000	2.584.301.175,42
37	0,8901	43,2083	23.200.000.000	3.232.613.753,16
38	0,5924	43,9446	23.200.000.000	4.139.685.918,98
39	0,5924	45,0845	23.200.000.000	5.544.085.113,69
40	1,7628	45,9746	23.200.000.000	6.640.699.393,97

Source: Processed by Researchers 2024.

The analysis shows the project progress from week to week. Starting from 0.0430% with PV of IDR52,976,000 in the first week, until it reached 45.9746% with PV of IDR56,640,699,393.97 in week 40. There was a significant increase especially in week 22 and 23, where the cumulative progress reached 30.2174% and the PV reached Rp26,187,179,493.85. The project showed stability with planned improvements, signaling effective resource allocation. This analysis provides important insights for project improvement to stay within the set budget and schedule.

Earned Value (EV) or BCWP Calculation

This study evaluates the performance of a construction project using the Earned Value Management (EVM) method. The focus of the analysis lies on the comparison between the initial plan and actual results, including weekly progress and budget utilization. The data analyzed includes weekly progress, cost realization, and Budgeted Cost of Work Performed (BCWP) for a 40-week period.

Table 2 EV or BCWP

Week To	Progress		Budget (RP)	Ev or BCWP	
	Realization	Cumulative		Realization (Rp)	Cumulative(Rp)
1	0,0000	0,0000	123.200.000.000,	-	-
2	0,0498	0,0498	123.200.000.000,	61.368.856,36	61.368.856,36
3	0,0493	0,0991	123.200.000.000,	60.702.856,36	122.071.712,73

4	0,0393	0,1383	123.200.000.000,	48.362.485,09	170.434.197,82
5	0,0300	0,2113	123.200.000.000,	36.946.242,55	207.380.440,36
6	0,1077	0,3190	123.200.000.000,	132.688.340,90	340.068.781,26
7	0,3439	0,6629	123.200.000.000,	423.644.974,09	763.713.755,35
8	0,3345	0,9974	123.200.000.000,	412.152.371,42	1.175.866.126,77
9	0,3813	1,3787	123.200.000.000,	469.735.958,04	1.645.602.084,82
10	0,4921	1,8708	123.200.000.000,	606.261.792,70	2.251.863.877,52
11	0,6494	2,5202	123.200.000.000,	800.012.635,47	3.051.876.512,99
12	0,7557	3,2759	123.200.000.000,	931.082.030,05	3.982.958.543,04
13	2,2644	5,5403	123.200.000.000,	2.789.751.466,9	6.772.710.010,00
14	2,4951	8,0355	123.200.000.000,	3.073.996.623,9	9.846.706.633,92
15	0,5865	8,6220	123.200.000.000,	722.612.968,67	10.569.319.602,5
16	1,1126	9,7346	123.200.000.000,	1.370.781.784,6	11.940.101.387,2
17	5,5048	15,2394	123.200.000.000,	6.781.863.412,7	18.721.964.800,0
18	0,8021	16,0415	123.200.000.000,	988.187.200,00	19.710.152.000,0
19	0,2456	16,2871	123.200.000.000,	302.579.200,00	20.012.731.200,0
20	0,2982	16,5853	123.200.000.000,	367.428.671,83	20.380.159.871,8
21	2,7571	19,3424	123.200.000.000,	3.396.748.298,6	3.776.908.170,5
22	4,0148	23,3572	123.200.000.000,	4.946.213.990,1	28.723.122.160,6
23	3,7640	27,1212	123.200.000.000,	4.637.233.176,0	33.360.355.336,7
24	2,0157	29,1369	123.200.000.000,	2.483.317.392,9	35.843.672.729,6
25	2,4771	31,6139	123.200.000.000,	3.051.731.765,3	38.895.404.495,0
26	3,5557	35,1696	123.200.000.000,	4.380.617.983,9	43.276.022.478,9
27	3,9397	39,1093	123.200.000.000,	4.853.650.230,1	48.129.672.709,1
28	0,0000	39,1093	123.200.000.000,	-	48.129.672.709,1
29	0,0000	39,1093	123.200.000.000,	-	48.129.672.709,1
30	0,5283	39,6376	123.200.000.000,	650.913.005,13	48.780.585.714,2
31	0,5283	40,1660	123.200.000.000,	650.913.005,13	49.431.498.719,3
34	0,1570	42,5057	123.200.000.000	193.445.968,56	52.314.055.745,8
35	0,4118	42,9175	123.200.000.000,	507.335.390,03	52.821.391.135,8
36	1,2487	44,1662	123.200.000.000,	1.538.387.337,3	54.359.778.473,2
37	0,6640	44,8302	123.200.000.000,	818.031.375,21	55.177.809.848,4
38	0,1828	45,0130	123.200.000.000,	225.266.490,77	55.403.076.339,1
39	0,2594	45,2724	123.200.000.000,	319.569.357,97	55.722.645.697,1
40	2,8798	48,1522	123.200.000.000	3.547.926.859,5	59.270.572.556,7

Source: Processed by Researchers 2024.

Based on table 2 states that in the second week, the project achieved a progress of 0.0498% with BCWP IDR61,368,856.36. Until week 10, the cumulative progress reached 1.8708% with BCWP IDR 2,251,863,877.52. A significant increase occurred in week 17 (15.2394% cumulative progress with BCWP IDR 18,721,964,800.00) and weeks 22 and 23 (progress of 23.3572% and 27.1212% respectively with cumulative BCWP IDR 33,360,355,336.70). In week 40, the project reached a cumulative progress of 48.1522% with a BCWP of IDR59,270,572,556.70. Despite a few weeks without significant progress, the project showed a steady increase in progress. This analysis helps monitor resource allocation and adjust strategies to maintain project adherence to budget and schedule targets.

Actual Cost (AC) Calculation

This analysis assesses the 40-week project performance using the Earned Value Management (EVM) method, focusing on the comparison between Planned Value (PV), Earned Value (EV), and Actual Cost (AC).

Table 3 Comparison of PV, EV, and AC

Week to	PV or BCWS (Rp)	EV or BCWP (Rp)	Actual Cost (Rp)
1	52.976.000,00	-	
2	176.844.448,38	61.368.856,36	
3	340.136.396,76	122.071.712,73	
4	487.291.075,24	170.434.197,82	
5	634.445.753,72	207.380.440,36	
6	727.683.540,63	340.068.781,26	
7	1.048.572.123,65	763.713.755,35	
8	1.602.384.519,96	1.175.866.126,77	
9	1.999.413.079,85	1.645.602.084,82	
10	3.018.923.515,84	2.251.863.877,52	
11	4.191.660.128,92	3.051.876.512,99	
12	5.797.330.290,48	3.982.958.543,04	
13	7.428.213.566,89	6.772.710.010,00	
14	9.237.385.927,29	9.846.706.633,92	
15	11.049.166.302,21	10.569.319.602,59	
16	12.924.360.260,21	11.940.101.387,25	
17	17.179.147.782,60	18.721.964.800,00	155.535.750,00
18	18.709.479.059,11	19.710.152.000,00	1.234.202.250,00
19	22.630.331.471,05	20.012.731.200,00	1.234.202.250,00
20	26.187.179.493,85	20.380.159.871,83	7.124.011.500,00
21	26.769.885.075,22	23.776.908.170,51	7.124.011.500,00
22	32.099.846.663,95	28.723.122.160,68	12.946.810.500,00
23	37.227.825.190,77	33.360.355.336,77	25.982.046.197,60
24	40.557.272.011,94	35.843.672.729,67	25.982.046.197,60
25	43.037.025.400,55	38.895.404.495,03	25.982.046.197,60
26	43.482.166.062,93	43.276.022.478,95	25.982.046.197,60
27	47.068.118.478,95	48.129.672.709,14	39.267.286.950,60
28	47.068.473.801,49	48.129.672.709,14	40.978.107.352,20
29	47.710.345.801,49	48.129.672.709,14	40.978.107.352,20
30	47.771.442.188,30	48.780.585.714,27	40.978.107.352,20
31	51.096.155.121,87	49.431.498.719,39	40.978.107.352,20
32	51.282.000.000,00	50.512.000.000,00	40.978.107.352,20
33	52.584.301.175,42	52.120.609.777,29	40.978.107.352,20
34	53.232.613.753,16	52.314.055.745,85	40.978.107.352,20
35	54.139.685.918,98	52.821.391.135,88	42.184.352.968,20
36	55.544.085.113,69	54.359.778.473,21	42.184.352.968,20
37	56.640.699.393,97	55.177.809.848,42	42.184.352.968,20
38	57.370.523.512,43	55.403.076.339,19	42.184.352.968,20
39	58.100.347.630,90	55.722.645.697,16	42.184.352.968,20
40	60.272.113.645,19	59.270.572.556,73	8.597.173.030,20

Source: Processed by Researchers 2024.

At the start of the project, the PV reached IDR52,976,000 and the EV started to be measurable in the second week. During the first 10 weeks, EV consistently increased but was below the PV, indicating steady but slow progress. A significant improvement occurred in week 17 with EV surpassing PV, indicating accelerated project implementation. However, cost spikes occurred from week 20 onwards. By week 40, the project was almost complete with a PV of Rp60,272,113,645.19, EV of Rp59,270,572,556.73, and AC of Rp8,597,173,030.20. Overall, the project is on track with some manageable cost deviations.

Calculation of Project Performance, Cost Estimation and Project Completion Time

This analysis assesses the 40-week project performance using the Earned Value Management (EVM) method, focusing on the comparison between Planned Value (PV), Earned Value (EV), and Actual Cost (AC).

Table 4 PV or BCWS, EV or BCWP, Actual Cost, Schedule Variance (SV) and Cost Variance (SV)

Sunday	PV or BCWS (Rp)	EV or BCWP(Rp)	Actual Cost (Rp)	Schedule Variance (SV)
1	52.976.000,00	-	-	-52.976.000,00
2	176.844.448,38	61.368.856,36	-	-115.475.592,02
3	340.136.396,76	122.071.712,73	-	-218.064.684,03
4	487.291.075,24	170.434.197,82	-	-316.856.877,42
5	634.445.753,72	207.380.440,36	-	-427.065.313,35
6	727.683.540,63	340.068.781,26	-	-387.614.759,36
7	1.048.572.123,65	763.713.755,35	-	-284.858.368,29
8	1.602.384.519,96	1.175.866.126,77	-	-426.518.393,19
9	1.999.413.079,85	1.645.602.084,82	-	-353.810.995,03
10	3.018.923.515,84	2.251.863.877,52	-	-767.059.638,32
11	4.191.660.128,92	3.051.876.512,99	-	-1.139.783.615,93
12	5.797.330.290,48	3.982.958.543,04	-	-1.814.371.747,44
13	7.428.213.566,89	6.772.710.010,00	-	-655.503.556,89
14	9.237.385.927,29	9.846.706.633,92	-	609.320.706,63
15	11.049.166.302,21	10.569.319.602,59	-	-479.846.699,62
16	12.924.360.260,21	11.940.101.387,25	-	-984.258.872,96
17	17.179.147.782,60	18.721.964.800,00	155.535.750,00	1.542.817.017,40
18	18.709.479.059,11	19.710.152.000,00	1.234.202.250,00	1.000.672.940,89
19	22.630.331.471,05	20.012.731.200,00	1.234.202.250,00	-2.617.600.271,05
20	26.187.179.493,85	20.380.159.871,83	7.124.011.500,00	-5.807.019.622,02
21	26.769.885.075,22	23.776.908.170,51	7.124.011.500,00	-2.992.976.904,71
22	32.099.846.663,95	28.723.122.160,68	12.946.810.500,00	-3.376.724.503,27
23	37.227.825.190,77	33.360.355.336,77	25.982.046.197,60	-3.376.724.503,27
24	40.557.272.011,94	35.843.672.729,67	25.982.046.197,60	-3.867.469.854,01
25	43.037.025.400,55	38.895.404.495,03	25.982.046.197,60	-4.713.599.282,27
26	43.482.166.062,93	43.276.022.478,95	25.982.046.197,60	-4.141.620.905,51
27	47.068.118.478,95	48.129.672.709,14	39.267.286.950,60	-206.143.583,98
28	47.068.473.801,49	48.129.672.709,14	40.978.107.352,20	1.061.554.230,19
29	47.710.345.801,49	48.129.672.709,14	40.978.107.352,20	1.061.198.907,65
30	47.771.442.188,30	48.780.585.714,27	40.978.107.352,20	419.326.907,65
31	51.096.155.121,87	49.431.498.719,39	40.978.107.352,20	1.009.143.525,97
32	51.282.000.000,00	50.512.000.000,00	40.978.107.352,20	-1.664.656.402,47
33	52.584.301.175,42	52.120.609.777,29	40.978.107.352,20	-770.000.000,00

34	53.232.613.753,16	52.314.055.745,85	40.978.107.352,20	-918.558.007,31
35	54.139.685.918,98	52.821.391.135,88	42.184.352.968,20	-1.318.294.783,10
36	55.544.085.113,69	54.359.778.473,21	42.184.352.968,20	-1.184.306.640,47
37	56.640.699.393,97	55.177.809.848,42	42.184.352.968,20	-1.462.889.545,55
38	57.370.523.512,43	55.403.076.339,19	42.184.352.968,20	-1.967.447.173,24
39	58.100.347.630,90	55.722.645.697,16	42.184.352.968,20	-2.377.701.933,73
40	60.272.113.645,19	59.270.572.556,73	48.597.173.030,20	-1.001.541.088,46

Source: Processed by Researchers 2024.

At the start of the project, progress was slow with PV reaching Rp52,976,000.00 and EV starting to be measured in the second week. During the first 10 weeks, EV increased consistently but was below the PV, indicating steady but slow progress. A significant improvement occurred in week 17 with EV surpassing PV, indicating an acceleration in project implementation. However, a spike in actual costs was seen from week 20 onwards.

At week 40, the project was nearing completion with a PV of Rp60,272,113,645.19, EV of Rp59,270,572,556.73, and AC of Rp8,597,173,030.20. Overall, the project is on track with some manageable cost deviations.

Achievement Index Calculation

Analysis of project performance for 40 weeks using the Earned Value Management (EVM) method aims to evaluate the effectiveness of project implementation by comparing Planned Value (PV), Earned Value (EV), and Actual Cost (AC), as well as measuring Schedule Performance Index (SPI) and Cost Performance Index (CPI).

Table 5 Time Performance Index (SPI) and Cost Performance Index (CPI)

Sunday	PV or BCWS	EV or BCWP	ACWP	SPI	CPI
1	52.976.000,00	-	-	0,000	0,000
2	176.844.448,38	61.368.856,36	-	0,347	0,000
3	340.136.396,76	122.071.712,73	-	0,359	0,000
4	487.291.075,24	170.434.197,82	-	0,350	0,000
5	634.445.753,72	207.380.440,36	-	0,327	0,000
6	727.683.540,63	340.068.781,26	-	0,467	0,000
7	1.048.572.123,65	763.713.755,35	-	0,728	0,000
8	1.602.384.519,96	1.175.866.126,77	-	0,734	0,000
9	1.999.413.079,85	1.645.602.084,82	-	0,823	0,000
10	3.018.923.515,84	2.251.863.877,52	-	0,746	0,000
11	4.191.660.128,92	3.051.876.512,99	-	0,728	0,000
12	5.797.330.290,48	3.982.958.543,04	-	0,687	0,000
13	7.428.213.566,89	6.772.710.010,00	-	0,912	0,000
14	9.237.385.927,29	9.846.706.633,92	-	1,066	0,000
15	11.049.166.302,21	10.569.319.602,59	-	0,957	0,000
16	12.924.360.260,21	11.940.101.387,25	-	0,924	0,000
17	17.179.147.782,60	18.721.964.800,00	155.535.750,00	1,090	#####
18	18.709.479.059,11	19.710.152.000,00	1.234.202.250,00	1,053	15,970
19	22.630.331.471,05	20.012.731.200,00	1.234.202.250,00	0,884	16,215
20	26.187.179.493,85	20.380.159.871,83	7.124.011.500,00	0,778	2,861
21	26.769.885.075,22	23.776.908.170,51	7.124.011.500,00	0,888	3,338
22	32.099.846.663,95	28.723.122.160,68	12.946.810.500,00	0,895	2,219

23	37.227.825.190,77	33.360.355.336,77	25.982.046.197,60	0,896	1,284
24	40.557.272.011,94	35.843.672.729,67	25.982.046.197,60	0,884	1,380
25	43.037.025.400,55	38.895.404.495,03	25.982.046.197,60	0,904	1,497
26	43.482.166.062,93	43.276.022.478,95	25.982.046.197,60	0,995	1,666
27	47.068.118.478,95	48.129.672.709,14	39.267.286.950,60	1,023	1,226
28	47.068.473.801,49	48.129.672.709,14	40.978.107.352,20	1,023	1,175
29	47.710.345.801,49	48.129.672.709,14	40.978.107.352,20	1,009	1,175
30	47.771.442.188,30	48.780.585.714,27	40.978.107.352,20	1,021	1,190
31	51.096.155.121,87	49.431.498.719,39	40.978.107.352,20	0,967	1,206
32	51.282.000.000,00	50.512.000.000,00	40.978.107.352,20	0,985	1,233
33	52.584.301.175,42	52.120.609.777,29	40.978.107.352,20	0,991	1,272
34	53.232.613.753,16	52.314.055.745,85	40.978.107.352,20	0,983	1,277
35	54.139.685.918,98	52.821.391.135,88	42.184.352.968,20	0,976	1,252
36	55.544.085.113,69	54.359.778.473,21	42.184.352.968,20	0,979	1,289
37	56.640.699.393,97	55.177.809.848,42	42.184.352.968,20	0,974	1,308
38	57.370.523.512,43	55.403.076.339,19	42.184.352.968,20	0,966	1,313
39	58.100.347.630,90	55.722.645.697,16	42.184.352.968,20	0,959	1,321
40	60.272.113.645,19	59.270.572.556,73	48.597.173.030,20	0,983	1,220

The project initially experienced significant delays, indicated by SPI below 1. However, starting from week 13, the project showed improvement with SPI close to 1. By week 14, the project achieved excellence with SPI above 1, signaling schedule efficiency. Despite facing cost challenges, especially in week 20 with a drastically reduced CPI, the project managed to maintain a CPI above 1 after week 26, indicating better cost control. At the end of the period, the project was nearing completion with PV of IDR60,272,113,645.19, EV of IDR59,270,572,556.73, and AC of IDR48,597,173,030.20. SPI was at 0.983 and CPI at 1.220, indicating relative efficiency with controlled costs, despite challenges throughout the project.

Calculation of Estimated Project Time and Cost

The calculation of cost forecasts and project completion schedules provides an overview of the cost at the end of the project (Estimate at Completion = EAC) and the estimated project completion time (Estimate all Schedule = EAS).

1. Project Time Forecast
   In week 40, the estimated remaining work time (ETS) is calculated using the formula ETS = (remaining time) / SPI. With an SPI value of 0.98338, ETS is calculated to be 178 days. Then, to calculate the estimated time to complete all work (EAS), ETS was added to the finish time, resulting in an EAS of 453 days. Thus, the project work time is estimated to be 3 days longer than the original schedule, which can be anticipated by increasing working hours.

2. Final Project Cost Forecast
   In week 65, the estimated remaining cost (ETC) is calculated using the formula ETC = (Budget - BCWP) / SPI. With an SPI value of 0.9919, the ETC is calculated to be Rp 914,061,685. Then, the estimated final project cost (EAC) is calculated by adding the ETC to the actual cost (ACWP), resulting in an EAC

of Rp 112,439,121,070.91. This cost is less than the contract value of IDR 123,200,000,000, indicating potential savings at the end of the project.

CONCLUSION

Based on the Earned Value analysis of the Situbondo - Ketapang - Banyuwangi Road and Bridge Preservation Project, it is concluded: 1. Cost performance (CPI > 1) indicates good cost management, but time performance (SPI < 1) indicates delay from planned. 2. The estimated cost through Estimate Temporary Cost is Rp 914,061,685, while the estimated final cost of the project is Rp 112,439,121,070.91. The estimated completion time is 178 days (Estimate Temporary Schedule) with an overall estimate of 453 days, 3 days longer than the original schedule.

Based on the above conclusions, there are several suggestions that can be given, among others: 1. Service providers should use the Earned Value Method from the beginning of the project to avoid cost and time mismatches. The use of the CPM method with Microsoft Project can improve scheduling. 2. The author is advised to expand the literature review and references to explore influential work and cost calculations to avoid delays.

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