International Journal Of Health, Engineering And Technology (IJHET) *E-ISSN 2829 - 8683*
Volume 5, Number 2, July 2026, *Page. 1357 - 1367*
Email : editorijhess@gmail.com

Evaluation Of Time Control Of Drainage Channel Project Using Earned Value Method (Case Study: Rehabilitation of Drainage Channels in Ngronggo Village, Kediri City)

Mukhamad Roichuddin[1)], Olvi Pamadya Utaya Kusuma[2)], Susilowati [3)], Monica Dewi[4)]
[1,2,3,4)]Civil Engineering, Faculty of Engineering, Kahuripan University, Kediri

*Corresponding Author
Email : mukhamad.roichuddin@students.kahuripan.ac.id

Abstract

The success of a construction project is influenced by the management of three main components: cost, time, and quality. Time control is an important aspect so that project implementation can run according to the planned schedule. This study aims to evaluate the time performance of the Drainage Channel Rehabilitation Project in Ngronggo Village, Kediri City using the Earned Value method. The Earned Value method is used to analyze project performance by comparing the planned schedule with the work progress that has been achieved during project implementation. The parameters used in this study include the Budgeted Cost of Work Scheduled (BCWS), Budgeted Cost of Work Performed (BCWP), Schedule Variance (SV), and Schedule Performance Index (SPI). The results of the analysis show that the Schedule Variance (SV) value is negative, indicating that the project implementation has been delayed compared to the planned schedule. In addition, the Schedule Performance Index (SPI) value obtained is less than 1 (SPI <1), indicating that the project's time performance is running poorly. Based on the analysis of the estimated project completion time usingEstimate to Completion(ETC) and Estimate At Completion (EAC), the estimated project completion time is 16 weeks, while the project's planned duration is 13 weeks. Therefore, it can be concluded that the project is 3 weeks behind schedule.

Keywords: Time Control, Earned Value Method, BCWS, BCWP, SPI

INTRODUCTION

A project is a series of temporary activities that last for a limited period of time, with specific resource allocations, and is intended to carry out tasks with clearly defined objectives. In project implementation, there are several important components that determine the success of a project, also known as the initial project objectives. These components are cost, time, and quality, which are interrelated. These three components must be managed as optimally as possible to achieve benefits in accordance with the plan.(Satrio, 2020).

The success of a project is inseparable from a series of project activities, including planning, implementation, and monitoring, to achieve the stated objectives. To ensure the success of a construction project, sound management techniques and methods are required to improve efficiency, productivity, and work quality. Therefore, it is necessary to implement monitoring and control measures across all sectors, particularly time management.(Satrio, 2020).

Project time or duration is the length of time a project takes to produce a planned product. In a project, time planning is done by creating a time schedule, which divides the time sequence of project work from the beginning to the end, thus obtaining an estimate of the project's completion time. Time control in a project is essential to ensure the project can be completed on time or perhaps earlier than planned.(Satrio, 2020).

To avoid losses and delays, project control is necessary, which can be implemented through performance evaluation and identifying when corrective action is needed. One way to manage time and costs in a project is by using the concept of Earned Value Analysis. The earned value method combines cost, schedule, and work performance. The earned value method can provide information on the project's progress within a specific timeframe and can estimate project progress in the following period, both in terms of cost and completion time. This method allows corrective action to be taken if there are deviations from the initial plan.(Sulaiman, 2021).

Based on this, the author conducted a study entitled "Evaluation of Drainage Channel Project Time Control Using the Earned Value Method (Case Study: Drainage Channel Rehabilitation in

Ngronggo Village, Kediri City)" This study aims to evaluate the performance of the drainage channel rehabilitation project. The Earned Value method is used to analyze project performance in terms of implementation time. The analysis focuses on the comparison between the schedule plan and the work progress that has been achieved. The parameters used in this study include BCWS (Budgeted Cost of Work Scheduled), BCWP (Budgeted Cost of Work Performed), Schedule Variance (SV), and Schedule Performance Index (SPI) to determine whether the project implementation is delayed or ahead of the planned schedule.

RESEARCH METHODS

Research methods

The research method used in this study is the Earned Value method. The Earned Value method is a project performance control and evaluation method that quantitatively integrates aspects of cost, time, and work progress. Through this method, project implementation performance can be analyzed based on a comparison between the planned and actual work.

Research Location

This research was conducted on a drainage channel rehabilitation project located in Ngronggo Village, Kediri City. The location was selected based on the availability of project data, including the Cost Budget Plan (RAB) and the planning S-curve required for project performance analysis using the Earned Value method.

Figure 1 Research Location Map

(Source: Google Map, 2026)

Research Procedures

The research procedures in this study were carried out in stages to obtain analytical results that align with the research objectives. The stages of the research procedure are as follows:

1. Identification of problems

Identifying problems related to the performance of construction project implementation, especially from the cost and time aspects.

2. Data collection

The data used in this study are primary and secondary data.The primary data in this study consists of project progress data for each implementation period. This data is used to determine the actual condition of the project implementation and the progress of the work over time. Primary data collection was conducted through observation. Secondary data in this study consists of project documents related to the implementation of the work, including the Cost Budget Plan (RAB) and the planning S-curve. This data is used as a basis for calculating and analyzing project performance from a cost aspect. Secondary data collection was carried out through documentation techniques, namely by collecting and studying existing project documents.

3. Data processing

The data processing stages in this study are as follows:

a. Job Weight Calculation

The cumulative percentage of realization is the actual results in the field. The results of the work realized at a certain time can be compared with the planned curve. If the results are above the S-curve, then achievement has occurred, but if they are below the S-curve, then achievement has not been achieved as planned. From the S-curve, the percentage (%) of work that must be completed at a certain time can be determined. To determine the weight of each task, the work volume and cost must first be calculated, as well as the nominal cost of the entire task. This S-curve is very effective for evaluating and controlling project time and costs.(Yuliana, 2019).

The weight of the work or weight factor is the value of the price or one unit of work compared to the total cost of the work.(Satrio, 2020). The weight of this factor can be formulated in percentage form as in equation 1 below:

$$\text{Work weight (WF)} = \frac{\text{Anggaran proyek}}{\text{Total Anggaran Proyek}} \times 100\ \% \quad \text{.....(1)}$$

The concept of earned value is the concept of calculating the amount of costs according to the budget in accordance with the work that has been completed or carried out (Budgeted Cost of Work Performed). Thus, the formula for the concept of earned value is(Septiyanto, 2018)

Yield Value = % Completion x Budget ..... (2)

b. Determination of BCWP

According toSuryadinata (2023),BCWP (Budgeted Cost Work Performed) is the value received from completing work over a specific time period. BCWP is calculated based on the accumulation of completed work. In traditional management, BCWP is known as the implementation S-curve, which is an S-curve created based on work completed over a specific time period. To calculate BCWP, the equation is as shown in Equation 3:

BCWP = % Actual x Budget.....(3)

With :

BCWP = Budget Cost For Work Performed

% Actual = Realization Progress

Budget Plan = Contract Value

c. Determination of BCWS

According toSuryadinata (2023), *Budgeted Cost for Work Scheduled*(BCWS) is a cost allocated based on a work plan prepared over time. BCWS is calculated by summing the planned costs for work over a specific time period. The BCWS at project completion is called the Budget at Completion (BAC). In other words, BCWS describes the budget for a work package linked to the implementation schedule. Thus, it is a combination of costs, schedules, and scope of work. In traditional management, BCWS is known as the planning S-curve, which is an S-curve created before carrying out work. To calculate the BCWS value, use equation 4.

BCWS = % Plan x Budget Plan.....(4)

With :

BCWS = Budget Cost For Work Schedule

% Plan = Plan Progress

Budget Plan = Contract Value

d. Schedule Variance (SV) Calculation

According toPriyo (2012)*Schedule variance*used to calculate the deviation between BCWS and BCWP. A positive value indicates that more project work packages were completed than planned.

Conversely, a negative value indicates poor project performance because fewer work packages were completed than planned.

SV = BCWS - BCWP..... (5)

e. Schedule Performance Index (SPI) Calculation

According toPriyo (2012), The efficiency factor of performance in completing work can be shown by a comparison between the value of work that has been physically completed (BCWP) with the planned expenditure of costs incurred based on the work plan (BCWS).

SPI = BCWP/BCWS ..... (6)

According toWilanata & Waty (2024)The SPI value indicates how much work can be completed (relative to the overall project) relative to the planned work units. An SPI value of less than 1 indicates that the work performance is not as expected because it is unable to achieve the planned work targets. The following table shows the Schedule Performance Index.

Table 1. Analysis of Schedule Performance Index

Analysis of Schedule Performance Index	
>1	*Ahead of Schedule*
=1	*On Time*
<1	*Behind Schedule*

(Source: Wilanata and Waty, 2024)

f. Analysis and Interpretation of Results

The results of the Earned Value calculation are analyzed to determine the condition of project implementation performance, whether the project is experiencing delays or acceleration in terms of time.

g. Estimated Project Completion

The importance of calculating SPI is to statistically predict the time needed to complete a project, by using BCWP and BCWS the estimated completion time at the end of the project can be calculated using the following formula.(Abma, 2016):

Estimated time for remaining work (Estimate To Completion) ETC is an estimate of the remaining work schedule of the project. ETC can be calculated as follows:

$$ETC = \frac{(Rencana - Waktu\ Pelaporan)}{SPI} \quad \text{.....(7)}$$

Estimated time to completion (EAC) is the estimated project completion schedule. EAC can be calculated using the following formula:

EAC = Reporting Time + ETC.....(8)

Based on the SPI value, Estimate To Complete (ETC) and Estimate At Completion (EAC) to estimate the completion time of the project are carried out as material for evaluating the overall performance of the project implementation

RESULTS AND DISCUSSION

Recapitulation of Budget Plan

The drainage channel construction project is planned to be completed within 13 weeks. The project budget is based on a Cost Budget Plan (RAB), which details the costs for each type of work. Based on this RAB, the weight of each task relative to the total project budget is calculated. A summary of the cost budget plan and work weights can be seen in Table 2.

Table 2. Summary of Budget Plan

NO	JOB DESCRIPTION	AMOUNT (Rp)	WEIGHT (%)
1	**2**	**3**	**4**
I	General	Rp. 3,135,000.00	1.75
II	Drainage	Rp. 99,720,000.00	55.74
III	Earthworks and Geosynthetics	Rp. 6,529,050.00	3.65
IV	Structure	Rp. 9,339,684.00	5.22
V	Daily Jobs & Miscellaneous Jobs	Rp. 60,175,470.00	33.64
	TOTAL	**Rp. 178,899,204.00**	

Source: Data Processing Results (2026)

BCWS (Budget Cost For Work Schedule)

Budgeted Cost of Work Scheduled(BCWS) is used to indicate the planned cost for work scheduled up to a certain period from the start of the project. The BCWS value is obtained from the planned S-curve, which is compiled based on the work weights in the Cost Budget Plan (RAB). The following is an example of a BCWS calculation for week 2.

Week 2 Plan Weight = 0.65%

Contract value =Rp. 178,899,204.00

BCWS = Weekly Plan Weight xContract value
= 0.68 % xRp. 178,899,204.00
= Rp. 1,162,844.83

The recapitulation of the overall BCWS calculation results can then be seen in Table 3.

Table 3 Summary of BCWS Data Processing Results

BCWS Analysis Recapitulation			
Sunday	**Project Budget Value**	**Weight (%)**	**BCWS (Rp)**
1	Rp. 178,899,204.00	0.28	Rp. 500,917.77
2	Rp. 178,899,204.00	0.65	Rp. 1,162,844.83
3	Rp. 178,899,204.00	1.46	Rp. 2,611,928.38
4	Rp. 178,899,204.00	2.46	Rp. 4,400,920.42
5	Rp. 178,899,204.00	5.56	Rp 9,946,795.74
6	Rp. 178,899,204.00	9.72	Rp. 17,389,002.63
7	Rp. 178,899,204.00	15.63	Rp. 27,961,945.59
8	Rp. 178,899,204.00	22.63	Rp. 40,484,889.87
9	Rp. 178,899,204.00	35.63	Rp. 63,741,786.39
10	Rp. 178,899,204.00	49.57	Rp. 88,680,335.42

11	Rp. 178,899,204.00	64.52	Rp. 115,425,766.42
12	Rp. 178,899,204.00	80.73	Rp. 144,425,327.39
13	Rp. 178,899,204.00	100	Rp. 178,899,204.00

Source: Data Processing, 2026

BCWP (Budget Cost For Work Performance)

Budgeted Cost of Work Performed(BCWP) is the cost of work actually completed during a specific period. The weekly BCWP is obtained based on the work progress schedule data listed in the weekly project report. The following is an example of a BCWP calculation for work in week 2.

Total Project Budget =Rp. 178,899,204.00
BCWP Weight Week 2 =0.28%

BCWP = BCWP Weight xContract value
= 0.28 % xRp. 178,899,204.00 = Rp. 500,917.77

The recapitulation of the overall BCWP calculation results can then be seen in Table 4.

Table 4 Summary of BCWP Data Processing Results

BCWP Analysis Recapitulation			
Sunday	**Project Budget Value**	**Weight (%)**	**BCWP (Rp)**
1	Rp. 178,899,204.00	0.00	Rp -
2	Rp. 178,899,204.00	0.28	Rp. 500,917.77
3	Rp. 178,899,204.00	0.28	Rp. 500,917.77
4	Rp. 178,899,204.00	0.38	Rp. 679,816.98
5	Rp. 178,899,204.00	0.38	Rp. 679,816.98
6	Rp. 178,899,204.00	1.09	Rp. 1,950,001.32
7	Rp. 178,899,204.00	3.37	Rp. 6,028,903.17
8	Rp. 178,899,204.00	21.34	Rp. 38,177,090.13
9	Rp. 178,899,204.00	21.93	Rp. 39,232,595.44

(Source: Data Processing, 2026)

Time Variance Analysis (SV)

The calculation of the deviation against time for work in week 2 is as follows:

BCWS2 = Rp. 1,162,844.83
BCWP2 = Rp. 500,917.77
SV2 = $BCWP_2$- BCWS2
= Rp 500,917.77 - Rp 1,162,844.83
= - Rp. 661,927.05

From the calculation results above, it can be seen that the implementation was behind schedule from week 2, as seen from the negative SV value. A summary of the overall SV calculation results can be seen in Table 5.

Table 5 Summary of SV Data Processing Results

Calculation of Time Variance (SV) Value				
Sunday	**BCWP (Rp)**	**BCWS (Rp)**	**SV (Rp)**	**Note**
1	Rp -	Rp. 500,917.77	-Rp 500,917.77	Late
2	Rp. 500,917.77	Rp. 1,162,844.83	-Rp 661,927.05	Late
3	Rp. 500,917.77	Rp. 2,611,928.38	-Rp 2,111,010.61	Late
4	Rp. 679,816.98	Rp. 4,400,920.42	-Rp 3,721,103.44	Late
5	Rp. 679,816.98	Rp 9,946,795.74	-Rp 9,266,978.77	Late
6	Rp. 1,950,001.32	Rp. 17,389,002.63	-Rp 15,439,001.31	Late
7	Rp. 6,028,903.17	Rp. 27,961,945.59	-Rp 21,933,042.41	Late
8	Rp. 38,177,090.13	Rp. 40,484,889.87	-Rp 2,307,799.73	Late
9	Rp. 39,232,595.44	Rp. 63,741,786.39	-Rp 24,509,190.95	Late

(Source: Data Processing, 2026)

Project Performance and Achievement Analysis (SPI)

The calculation of project achievements and performance for work in week 2 is as follows:

BCWS2 = Rp. 1,162,844.83
BCWP2 = Rp. 500,917.77

$$SPI2 = \frac{BCWP_2}{BCWS_2} = \frac{Rp\ \ 500,917.77}{Rp\ \ 1,162,844.83} = 0.431$$

This value indicates that the SPI value in week 2 was <1, meaning that project implementation was slower than planned. A summary of the SPI calculations for the previous and following weeks is shown in Table 6.

Table 6 Summary of SPI Data Processing Results

Sunday	BCWP (Rp)	BCWS (Rp)	SPI	Note
1	Rp -	Rp. 500,917.77	0	>1
2	Rp. 500,917.77	Rp. 1,162,844.83	0.431	>1
3	Rp. 500,917.77	Rp. 2,611,928.38	0.192	>1
4	Rp. 679,816.98	Rp. 4,400,920.42	0.154	>1
5	Rp. 679,816.98	Rp 9,946,795.74	0.068	>1
6	Rp. 1,950,001.32	Rp. 17,389,002.63	0.112	>1
7	Rp. 6,028,903.17	Rp. 27,961,945.59	0.216	>1
8	Rp. 38,177,090.13	Rp. 40,484,889.87	0.943	>1
9	Rp. 39,232,595.44	Rp. 63,741,786.39	0.615	>1

(Source: Data Processing, 2026)

Estimated Time for Remaining Work (ETC)

To obtain the ETC (Estimate to Completion) value, a calculation must be performed using the reporting time, planning time, and SPI value. The following is the ETC calculation for week 9:

Reporting Time = Week 9

Plan Time = Week 13
SPI value week 9 = 0.615
ETC = $\frac{(\text{Waktu Rencana} - \text{Waktu Pelaporan})}{\text{SPI}}$
= $\frac{(13-9)}{0.615}$
= 6,499 Weeks

A recapitulation of the overall ETC calculation can be seen in Table 7.

Table 7 Summary of Estimated Time for Remaining Work (ETC)

Sunday	SPI	ETC (Sunday)
1	0	0
2	0.431	25,536
3	0.192	52,143
4	0.154	58,263
5	0.068	117,053
6	0.112	62,422
7	0.216	27,828
8	0.943	5,302
9	0.615	6,499

(Source: Data Processing, 2026)

Estimated Total Project Time (EAC)

To obtain the EAC (Estimate At Completion) value, a calculation is required using the reporting time and the ETS value. The following is the EAC value calculation.

Reporting Time = Week 9
ETC Value = 6,499 Weeks
EAC = reporting time + ETC
= 9 Weeks + 6,499 Weeks
= 15,499 Weeks
= 16 Weeks

A recapitulation of the overall EAC calculations can be seen in Table 8.

Table 8 Summary of Estimated Total Project Time (EAC)

Sunday	ETC (Sunday)	EAC (Sunday)
1	0	1
2	25,536	27,536
3	52,143	55,143
4	58,263	62,263
5	117,053	122,053
6	62,422	68,422
7	27,828	34,828
8	5,302	13,302
9	6,499	15,499

(Source: Data Processing, 2026)

Project Condition Review Based on BCWS and BCWP Data

BCWP is the total cost incurred for the weight of work that has been carried out. BCWS is the total cost planned for the weight of work planned.

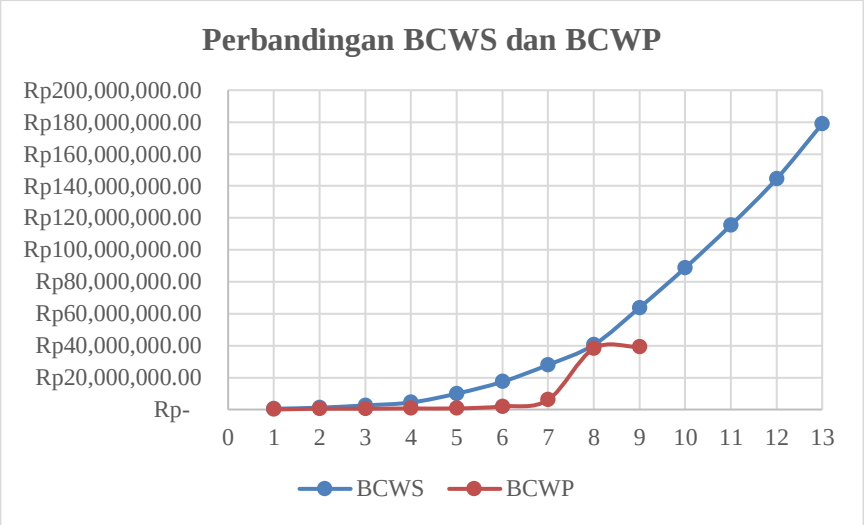

Figure 1. Comparison Chart of BCWS and BCWP

(Source: Data Processing, 2026)

From Figure 1, the comparison of BCWS and BCWP values shows that the BCWS value is above the BCWP value in week 1 to week 9, the BCWS value is above the BCWP value, this indicates that the indicator of the value of the results from the perspective of the value of the work that has been completed to carry out the work is not in accordance with the planned implementation schedule. It can be seen that in week 5 to week 7 the BCWP value is far behind compared to the BCWS value, which means that quite a lot of work weight has not been done according to what has been scheduled or planned.

Project Condition Review Based on SV Analysis Results

In time control, the variance calculation results show the project's performance each week. A negative integrated variance indicates that work is running behind schedule. The SV values can be seen in Figure 2 below.

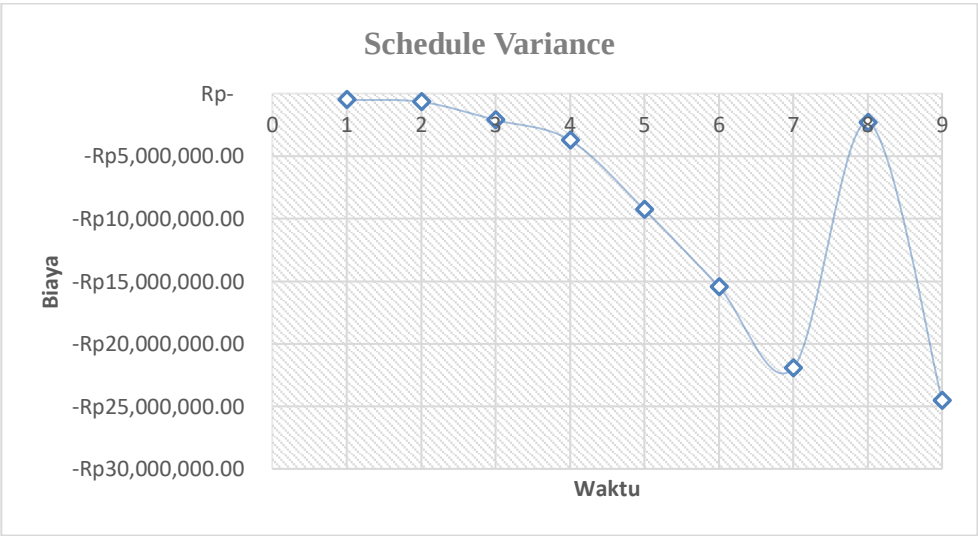

Figure 2 SV Graph (Schedule Variance)

(Source: Data Processing, 2026)

Figure 2 above shows that the schedule variance value from week 1 to week 9 is negative, which means that the work is late or does not match the planned schedule.

Project Condition Review Based on SPI Analysis Results

In project time management, a schedule performance index (SPI) value of less than one indicates that the project is not performing as expected and is unable to meet the planned targets. The greater the difference from 1, the greater the deviation from the baseline or budget. Even if the value is too high, indicating excellent project performance, an assessment should be conducted to determine whether the plan is unrealistic. A comparison of SPI values can be seen in Figure 3.

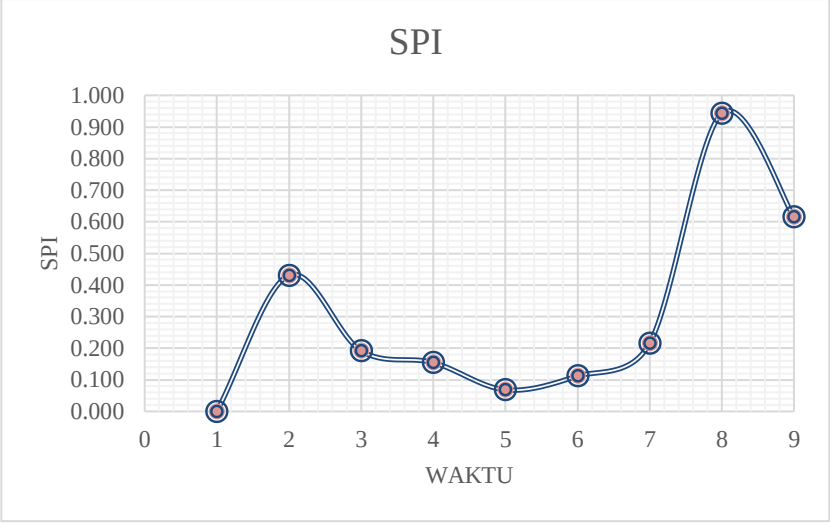

Figure 3 SPI Graph (Schedule Performance Index)

(Source: Data Processing, 2026)

Figure 3 shows a comparison of SPI values from week 1 to week 9. It can be seen that the SPI values from weeks 1 to 8 are significantly less than one, indicating significant deviations in implementation. However, for week 8, the SPI is very close to 1, indicating no significant deviations in implementation. The SPI value from week 9 again shows significant deviations.

Project Condition Review Based on ETC Analysis Results

Based on the analysis conducted from week 1 to week 9, the ETC value showed an increasing trend. This was due to the schedule performance index (SPI) value remaining below one (SPI <1). An SPI value of less than one indicates that the project implementation is progressing slower than the planned schedule. In week 9, the SPI value still had not reached one, resulting in a longer timeframe for completing the remaining work. This condition indicates that the project implementation is experiencing delays and requires corrective measures to ensure project completion is closer to the planned schedule.

Project Condition Review Based on EAC Analysis Results

The results of the EAC analysis are not much different from the ETC because EAC uses ETC as the main indicator in estimating the project completion duration. Based on the analysis results, the EAC value in the 9th week indicates a project completion duration of 16 weeks. This indicates that the project is estimated to experience delays compared to the planned duration of 13 weeks. Therefore, it can be concluded that the Drainage Channel Construction Project is experiencing delays and requires corrective action to the work implementation. If corrective action or work acceleration is not taken, the project schedule is estimated to experience a delay from the planned duration of 13 weeks to approximately 16 weeks.

CONCLUSION

Based on the research conducted on the Drainage Channel Rehabilitation Project in Ngronggo Village, Kediri City, it can be concluded that the project performance from the time aspect shows less than good results, marked by a negative schedule variance (SV) value indicating that the project implementation is slower than planned, as well as a schedule performance index (SPI) that is less than 1 indicating suboptimal time efficiency; in addition, based on the results of the time forecast analysis, it was obtained that the estimated project completion time (EAC) at the time of reporting in the 9th week was 16 weeks, while the initial project plan was targeted for completion in the 13th week, so it can be concluded that the project experienced a delay of 3 weeks from the planned schedule.

REFERENCES

Abma, V. (2016). Analisis Pengendalian Waktu Dengan Earned Value Pada Proyek Pembangunan Hotel Fave Kotabaru Yogyakarta. *Jurnal Teknisia*, *XXI*(2).

Priyo, M. (2012). *Metode "Earned Value" Pada Jasa Konstruksi* (1 ed.). Universitas Muhammadiyah Yogyakarta.

Satrio, N. B. (2020). *Evaluasi Waktu dan Biaya Menggunakan Metode Earned Value Pada Proyek Pelebaran Jembatan Sail Ruas Jalan Pekanbaru*.

Septiyanto, Y. I. (2018). *Evaluasi Kinerja Waktu dan Biaya Pada Proyek Konstruksi Gedung Asrama Sekolah Dengan Pendekatan EVA dan Percepatan Proyek Dengan PDM*.

Sulaiman. (2021). *Analisis Pengendalian Waktu dan Biaya Dengan Menggunakan Metode Earned Value (Studi Kasus: Pada Proyek Pembangunan Perumahan Panam Madani Regency)*.

Suryadinata, M. A. (2023). *Analisis Pengendalian Proyek Menggunakan Earned Value Method (EVM) (Studi Kasus Proyek Pembangunan Laboratorium Kesehatan Kabupaten Lombok Barat)*.

Wilanata, C., & Waty, D. M. (2024). Analisis Metode Earned Value Untuk Prediksi Penyelesaian Proyek Konstruksi Apartemen X di Tangerang. *Agustus*, *7*(3), 873–884.

Yuliana, C. (2019). *Buku Ajar Manajemen Konstruksi(HSPB-604)* (1 ed.). Universitas Lambung Mangkurat.