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ANALYSIS OF IMPLEMENTATION DELAYS USING THE EARNED VALUE METHOD (ON THE PURWOSARI - SEKARMOJO ROAD WORKS, PASURUAN DISTRICT)

Pandji Thoha S. Balido[1*], Hanie Teki Tjendani[2], Budi Witjaksana[3]
[1-3] Master of Civil Engineering, Faculty of Engineering Untag Surabaya
E-mail: [1)] tohapanji@gmail.com

Abstract

Along with the very rapid development of infrastructure and construction in Indonesia in the era of globalization, the Indonesian government has carried out various large-scale projects to achieve the increasingly complex expectations of society. This will trigger the growth of the construction industry in Indonesia and become one of the main goals in the framework of national development. An infrastructure development project is an activity carried out with limited time and resources to achieve a specified final result. One of the construction projects currently being developed is Road Works. The Earned Value method can be used to determine cost performance and implementation time during the project and the indicators used for analysis include: BCWP (Budget Cost of Work Performance), BCWS (Budget Cost of Work Schedule), ACWP (Actual Cost of Work Performance), SV (Schedule Variance), CV (Cost Variance), SPI (Schedule Performance Index), CPI (Cost Performance Index), EAC (Estimated At Complete) and ET (Estimated To Complete) and TE (Time Estimate). Conclusions from this research is to determine the estimated costs and time for project completion. In the data analysis in the 9th week, the project schedule performance (CPI) was 1.14, greater than 1, while (SPI) was 0.587, less than 1. The results of the calculation of projected costs for the remaining work (ETC) were IDR. 1,586,686,537.62 and total project costs (EAC) of IDR. 2,509,041,243.08.

Keywords: *Earned Value Method, Cost, Project Time*

1. INTRODUCTION

Along with the rapid development of infrastructure and construction in Indonesia in the era of globalization, the Indonesian government has made various large-scale projects have been carried out to achieve the expectations of an increasingly complex society. This will trigger the growth of the construction industry in Indonesia and become one of the main objectives in the framework of national development. Infrastructure development project is an activity carried out with limited time and resources to achieve the specified end result. One of the construction projects that is currently developing is Road Works.

Government Regulation of the Republic of Indonesia No. 34 of 2006 concerning roads, as one of the transportation infrastructure in the life of the nation, the position and role of the road network essentially concerns the livelihood of many people and controls the structure of regional development at the national level, especially those concerning the realization of balanced inter-regional development and equitable distribution of development results, as well as increasing national defense and security, in order to realize long-term development plans and medium-term development plans towards a just and prosperous Indonesian society based on Pancasila and the 1945 Constitution.

In the planning of a construction project is always based on estimates of time, cost and quality. the mismatch at the time of implementation of activities in the field with the plan, of course, will cause problems and when it happens it is feared that it will also affect changes in terms of cost, quality and time. in the process of implementing government procurement activities, especially project activities, are often faced with problems that repeatedly occur, one of which is the delay in completion of the work. it seems that the time provided by the provider is always insufficient or insufficient to be used to complete project activities that have been agreed together in accordance with the existing contract.

In construction project activities, it is very necessary to have project management which is expected to help evaluate related to the implementation of the project activities themselves, both evaluations in terms of time, cost, and quality so that the activities of a project can take place in accordance with what has been planned from the start, and if there are obstacles or problems at the time of implementation, it is hoped that they can be immediately recognized and overcome so that losses due to delays can be minimized from the start.which is no less important and is the main thing that must be considered in the implementation of project activities is the schedule for implementing the project activities themselves, based on existing regulations as we all know that if a delay in the implementation of project activities occurs, of course there will be sanctions or fines that must be fulfilled / paid in accordance with the existing contract. this is where it is clear that construction management planning is needed and also project control efforts.

Road construction in Pasuruan Regency is often delayed in its implementation, generally caused by inaccurate resources that are less competent in their fields so that the three parties Government, contractors and consultants must change the implementation process that has been implemented, as for indications of problems that often occur are human resource constraints, scheduling methods, implementation methods, design changes, material availability, equipment availability and poor managerial in contractor organizations, work plans that are not well structured / integrated, incomplete drawings and specifications, and failure of contractors to carry out work so that it has an impact on implementation delays.

Geographically Pasuruan Regency is located in East Java Province with an area of 147,401.50 Ha (3.13% of East Java Province area) located between 112o 33'55" to 113o 05'37" east longitude and between 7o 32'34" to 8o 30'20". The local government of Pasuruan Regency has a road network improvement program in Pasuruan Regency which is targeted to be completed in 2023, on the Purwosari - Sekarmojo road section of Pasuruan Regency with a total length of 5 km, on the construction of road maintenance is expected to run well and can be enjoyed by the people of Pasuruan Regency which is one of the regencies that continues to grow its level of development, one of which is the Purwosari - Sekarmojo road maintenance construction project Pasuruan Regency, on the implementation of road projects often experience obstacles in the work process, these obstacles cause delays in the implementation of the project so that the project does not take place as planned.

Planning and controlling time and cost is a part of overall construction project management. The achievement of a project can be assessed in terms of quality, time, cost and safety. So in completing the work time that has been used and the costs incurred must be measured continuously deviation from the plan. With the deviation of time and cost makes the project management of Purwosari - Sekarmojo Road Maintenance worse. With

the existence of project performance indicators in terms of time and cost, it is possible to take preventive measures so that the Purwosari - Sekarmojo Road Maintenance project goes according to plan. This project has a project implementation time plan of 90 days and a project budget plan value of Rp. 2,856,953,000.00- (Two Billion Eight Hundred Fifty Six Million Nine Hundred Fifty Three Thousand Rupiah). In construction services it is necessary to compete and implement the project on time and smoothly in accordance with the work plan and conditions that have been set.

Because in the implementation of construction projects, it is very rare for project performance to run exactly as in the initial planning. Generally there are delays, both in time and increase in work, but there are also some projects that are accelerated from the original planned schedule. To avoid project losses, it can estimate (Forecasting) the cost of completing the project whether it is in accordance with the initial plan of the project schedule in each reporting period and the amount of profit or loss at the end of the project with the Earned Value Method(Maromi & Indryani, 2015).

Project control methods with the earned value concept can provide reports on the position of project progress, and can predict the progress of the next period project, regarding project completion in terms of cost and time(Nurtsani et al., 2017) The Earned Value concept is a project management method used to control cost and time(Castollani et al., 2020). Where, this method provides information about Cost Variance, Schedule Variance, Cost Performance Index, Schedule Performance Index of the project in reporting(Zakariyya et al., 2020). From this method can also be obtained with predictive information about the amount of cost and length of time for completion of all work based on indicators when reporting. The earned value concept provides three elements, namely the actual costs incurred (ACWP), the physical completion of the project that reflects the cost absorption plan (BCWS) and what has been spent (BCWP) or what is referred to as the earned value(Priyo & Zhafira, 2017). By using the concept of earned value, it can be developed to estimate future projects which is a very useful input for management and owners, so that they can have enough time to think of ways to deal with future problems(Kartikasari & Inayaturrochmah, 2018). Therefore, the author will analyze how the cost and time of the Purwosari - Sekarmojo Road Improvement project using the earned value method(Kharina & Sambowo, 2019).

One of the objectives of a construction development project is the timely completion of the project in accordance with the planned implementation schedule. In the planning and scheduling process, what needs to be understood are the factors behind the making of the project schedule. Understanding the factors is done by examining the stages, including scheduling project activities which basically determines when an activity must start and end. The series of activities with their respective durations that have been sorted will form a series of scheduling activities that become the project implementation schedule.

Often in a project implementation, unwanted and unknown delays occur. These delays are very detrimental to the parties related to the consultant, contractor and project owner itself. So that it results in changes in various components of project work, including in terms of project costs that have been planned will experience greater changes. Project delays can come from service providers or from service users or other parties which have an impact on adding time and costs beyond the plan. If the delay comes from the

contractor (service provider), the contractor can be fined as well as if the delay comes from the service user, the service user will pay for the losses incurred by the service provider, the amount of which is stipulated in the contract in accordance with applicable legislation. Many studies have been conducted to determine the factors of delay in project completion. Everything in a project that does not add value, but instead adds costs is called waste.

Delays in project completion are things that must be avoided by any project contractor. Because in addition to adversely affecting the credibility of the project contractor, delays in project completion also cause penalties to be incurred by the contractor, so that the benefits to be obtained are reduced. To prevent delays and wasteful use of costs in a project, it is necessary to improve the schedule of activities and budgeting to a minimum, so that the completion time and costs used can provide maximum benefits for the contractor.(Meliasari et al., 2011)

Cause of Delay and Overruns Projects in Developing Countries, examines the causes of delays in construction projects in developing countries during project planning and at the construction stage. The research was conducted where the construction project workers generally appeared and it can be concluded that careful planning at all stages of the construction project is very important to minimize project delays and cost overruns in construction projects in developing countries. Observing this, it is necessary to study scientifically through several approaches that can be used as material to decide on the handling of road projects so as to reduce delays. In its implementation in terms of time, there are often projects that experience acceleration, delay and on time according to the planned schedule. Likewise, in terms of cost, a project can experience profit or loss. The Earned Value concept is a control that will discuss how to control the completion of the project in terms of time and cost to find out whether the project is in accordance with the initial plan of the project schedule, within a certain period of reporting and the amount of profit or loss at the end of the project. (Chalibi and camp, 1984)

Large-scale projects that require good project management, namely control. Control of project time and cost must be carried out in order to measure the performance of project implementation, to know the time and cost of project implementation and to know the estimated completion time and cost of the project. so that if there is a delay in the project it can be controlled appropriately and well. There are several methods of controlling project time and cost that have been developed. A good control method used is the earned value method(Maromi, 2015).

Construction service companies also need to think about the best strategy when experiencing delays in the project work schedule, so that the cost overruns that occur can be minimized, so that the cost is still in the range agreed upon with the owner and the construction work can be completed on time. Performance in the implementation of a construction project that is lacking will cause delays, one of which is in the Purwosari Road Maintenance project - Sekarmojo Pasuruan Regency which is experiencing delays in implementation against a predetermined time, resulting in cost overruns, especially if the strength of the existing funds (capital) is limited, it will be very troublesome for the contractor.

Based on the description above, we will examine and analyze the control of project time and cost performance using the earned value method to overcome project delays(Witjaksana & Reresi, 2012).

2. RESEARCH METHODS

This research was conducted on the Road Maintenance project located on Purwosari - Sekarmojo Road, Pasuruan Regency. This research was conducted to analyze the delay in project implementation using Earned Value Method. Data was taken from the Purwosari - Sekarmojo Road Maintenance Project by requesting data directly to the consultant. Secondary data in the form of data collected from authorized agencies and also direct observation in the field.

Data obtained from two sources, namely secondary data in the form of data from the Dr. Wahidin Sudirohusodo area. Secondary data is obtained indirectly. Data taken to be used as input and reference in conducting Earned Value analysis(Irfanur, 2010).

The data analysis techniques carried out include collecting, analyzing to obtain information that occurs in the work of the Purwosari - Sekarmojo Road Maintenance Project, Pasuruan Regency, collecting the necessary data, analyzing the performance and final project forecasts based on weekly progress reporting. (Maulidi et al., n.d.)Next is to calculate cost and time forecasts until the final achievement of the project with a forecast method based on existing data at the time of reporting using the results of reporting every week on an ongoing basis and then making new forecast methods based on actual circumstances and field applications. Analysis of Project Progress or Delay Factors To analyze the factors causing project progress or delay, it is carried out by:

1. Interviews with the implementing contractor (Site Engineer Manager, supervisors and logistics) and direct observation of daily project performance.
2. Checking material delivery whether it is in accordance with the material arrival schedule.
3. Checking the weekly report to find out the percentage of work that has been done for one week.
4. Checking daily reports to determine patterns of labor use, tool use, material use, weather conditions and field work hours.

3. ANALYSIS AND DISCUSSION

3.1. Calculation of Budgeted Cost of Work Schedule (BCWS)

BCWS is obtained from multiplying the percentage of the work plan by the total project cost budget or contract value and then accumulating each period / in this case the weekly period. Where BCWS week 9 according to the time schedule is as follows:

BCWS calculation at week 9 BCWS = (%plan weight x budget)
= 62.526% x 2,856,953,000.00
= 1.786.338.432,78

Analysis of BCWS calculations from week 1 to week 9 can be done with the same calculation as the equation above. Based on these calculations, the BCWS values from week 1 to week 9 can be seen in the following table

Table 1. Recapitulation of BCWS Value Analysis Results

Period	Plan Weight (%)		BCWS	
	Weekly	Cumulative	Weekly	Cumulative
M-1	0,359	0,359	10.256.461,27	10.256.461,27
M-2	0,359	0,718	10.256.461,27	20.512.922,54
M-3	0,359	1,077	10.256.461,27	28.769.516,71
M-4	0,007	1,084	199.986,71	28.769.516,71
M-5	8,952	10,035	255.754.432,56	286.695.233,55
M-6	8,952	18,987	255.754.432,56	542.449.666,11
M-7	8,952	27,939	255.754.432,56	798.204.098,67
M-8	8,952	36,891	255.754.432,56	1.053.958.531,23
M-9	25,635	62,526	732.379.901,55	1.786.338.432,78
M-10	17,836	80,362	509.566.137,08	2.295.904.569,86
M-11	17,907	98,268	511.594.573,71	2.807.470.574,04
M-12	1,732	100,00	49.482.425,96	2.856.953.000,00
M-13	-	100,00	-	2.856.953.000,00
M-14	-	100,00	-	2.856.953.000,00

Source: Processed by Researchers 2023

Based on table 1 above, the BCWS value or cost budget for the planned work until week 14 is IDR 2,856,953,000.00. In the first week the value of the planned cost allocation that must be incurred by the implementing contractor is Rp. 10,256,461.27 for the progress of the cumulative plan weight value of 0.359%. While the value of the plan expenditure allocation in week 9 is Rp. 732,379,901.55 for the progress of the plan weight value of 25.635% and the cumulative value of the plan expenditure allocation in week 9 is Rp. 1,786,338,432.78 with a progress plan weight of 62.526%. For the calculation of the BCWS value

As the implementation time increases, the implementation cost also increases. This increase is due to the growth of work for each planned week. The growth of work is shown in the weight of work for each week.

3.2. Calculation of Budgeted Cost Of Work Performed (BCWP)

BCWP is obtained from multiplying the percentage of cumulative progress realization per week by the total budget plan for a job or contract value. The percentage of cumulative realization progress is obtained from the project's performance against the work that has been done for one week contained in the S curve graph(Romadhonnia et al., 2018). The calculation of BCWP in week 9 can be calculated using the following data.

BCWP = (%weighted realization x budget)
= 36,687 % x 2.856.953.000,00
= 1.048.130.347,11

Table 2. Recapitulation of BCWP Value Analysis Results

Period	Realization Weight (%)		BCWP	
	Weekly	Cumulative	Weekly	Cumulative
M-1	-	-	-	-
M-2	-	-	-	-
M-3	-	-	-	-
M-4	-	-	-	-
M-5	1,339	1,339	38.254.600,67	38.254.600,67
M-6	1,821	3,220	52.025.114,13	91.993.886,60
M-7	3,592	6,812	102.621.751,76	194.615.638,36
M-8	6,941	13,753	198.301.107,73	392.916.746,09
M-9	22,934	36,687	655.213.601,02	1.048.130.347,11

Source: Processed by Researchers 2023

Based on Table 2 above, the BCWP value in the fifth week is Rp. 38,254,600.67. This means that the progress made in realization in the field is still 1.339%. While the realization in week 9 was 22.934% with a BCWP value of Rp. 655,213,601.02. This value is the achievement of the work carried out by the implementing contractor and with a cumulative value in week 9 of Rp. 1,048,130,347.11 for a realization weight of 36.687. For the calculation of the BCWS value in the following week is done in the same way as the calculation above.

The value of the results from the point of view of the value of the work that has been completed against the budget that has been provided to carry out the work has increased costs, this is because in its implementation, the work carried out is more than the planned work.

3.3. Calculation of Actual Cost Work Performance (ACWP)

ACWP is the actual amount of costs that have been incurred by the project in completing a job and can be used as a project cost and time evaluation tool, so that it can be known whether the actual costs are in accordance with the budget plan or not(Pratiwi, 2012).

Table 3. Recapitulation of ACWP Value Analysis Results

Period	Realization Weight (%)		ACWP	
	Weekly	Cumulative	Weekly	Cumulative
M-1	-	-	-	-
M-2	-	-	-	-
M-3	-	-	-	-
M-4	-	-	-	-
M-5	1,339	1,339	47.818.250,84	47.818.250,84
M-6	1,821	3,220	44.221.347,01	78.194.803,61
M-7	3,592	6,812	97.490.664,17	84.884.856,44
M-8	6,941	13,753	178.470.996,96	353.625.071,48
M-9	22,934	36,687	576.587.968,90	922.354.705,46

Based on Table 3 above, the ACWP value or cost realization for work achieved up to week 9 is Rp. 922,354,705.46.

Based on these three indicators (BCWS, BCWP, ACWP), calculations can be analyzed regarding factors that show the achievement and progress of project implementation performance, such as cost variance (CV) and schedule variance (SV). The cost and time variants can monitor if there is a change in variance in the standard number(Diasz, 2023). In addition, it can also determine the productivity index and project performance as well as estimate the cost and time in completing a construction project(RAHAYU, 2016).

The actual cost line (ACWP) from week 1 to week 9 is below BCWP, meaning that the realized cost does not exceed the planned cost in each week until Week 9.

3.4. Cost and Time Variant Analysis

3.4.1. Cost Variance (CV) Calculation

Cost variance (CV) is used to determine the difference between the planned cost and the actual cost of the work that is / has been running. CV can determine that the ongoing project is still within the planned budget limit or not. Cost variance (CV) in week 9 can be calculated with the following formula.

CV = BCWP - ACWP
= 1.048.130.347,11 - 922.354.705,46
= 125.775.641,65

A positive value on the cost variance (CV) indicates that the costs incurred in the implementation of the project are lower than the planned budget, otherwise known as cost underrun.

Table 4. Recapitulation of CV Value Analysis Results

Period	BCWP	ACWP	CV
	A	b	a-b
M-1	-	-	-
M-2	-	-	-
M-3	-	-	-
M-4	-	-	-
M-5	38.254.600,67	47.818.250,84	-9.563.650,17
M-6	91.993.886,60	78.194.803,61	13.799.082,99
M-7	194.615.638,36	84.884.856,44	9.730.781,92
M-8	392.916.746,09	353.625.071,48	39.291.674,61
M-9	1.048.130.347,11	922.354.705,46	125.775.641,65

Source: Processed by Researchers 2023

3.4.2. Schedule Variance (SV)

Schedule variance (SV) is used to determine the duration of work on an ongoing project in accordance with the schedule plan or vice versa . Schedule variance (SV) in week 9 can be calculated by the following formula.

SV = BCWP - BCWS
= 1.048.130.347 - 1.786.338.432,78

= -738.208.085,78

A negative value on the schedule variance (SV) indicates that the project implementation is slower than the planned schedule or the work packages are less than the planned work packages. Conversely, if the SV is positive, it indicates that the work packages are carried out more than planned or it can be said that the work is progressing faster than planned. Meanwhile, if the SV value is equal to zero, it means that the work is carried out according to the schedule on the planned work packages. The table below shows the recapitulation of schedule variance (SV) from week 1 to week 9 with the same calculation formula.

Table 5. Recapitulation of SV Value Analysis Results

Period	BCWP	BCWS	SV
	a	b	a-b
M-1	-	10.256.461,27	-
M-2	-	20.512.922,54	-
M-3	-	28.769.516,71	-
M-4	-	28.769.516,71	-
M-5	38.254.600,67	286.695.233,55	-248.440.632,88
M-6	91.993.886,60	542.449.666,11	-450.455.779,51
M-7	194.615.638,36	798.204.098,67	-603.588.460,31
M-8	392.916.746,09	1.053.958.531,23	-661.041.785,14
M-9	1.048.130.347,11	1.786.338.432,78	-738.208.085,67

Source: Processed by Researchers 2023

3.5. Productivity and Performance Index

3.5.1. Cost Performance Index (CPI)

CPI is done by comparing the value of physically completed work (BCWP) with the costs that have been incurred in the same period (ACWP) in the time span that has been implemented. The CPI calculation in week 9 can be calculated using the following data:

$$CPI = \frac{BCWP}{ACWP}$$
$$= \frac{1.048.130.347,11}{922.354.705,46}$$
$$= 1,14$$

From the analysis, the CPI value obtained in week 9 is 1.035. This shows that in week 9 the cost productivity of this project is profitable, because if the CPI value indicator> 1 then the implementation costs incurred by the service provider are smaller than the planned costs. To analyze the CPI value from week 1 to week 9 can be seen in the following table.

Table 6. Recapitulation of CPI Value Analysis Results

Period	BCWP	ACWP	CPI
	a	b	a/b
M-1	-	-	-
M-2	-	-	-
M-3	-	-	-
M-4	-	-	-
M-5	38.254.600,67	47.818.250,84	0,80
M-6	91.993.886,60	78.194.803,61	1,18
M-7	194.615.638,36	84.884.856,44	1,05
M-8	392.916.746,09	353.625.071,48	1,11
M-9	1.048.130.347,11	922.354.705,46	1,14

Source: Processed by Researchers 2023

3.5.2. Schedule Performance Index (SPI)

Schedule Performance Index (SPI) can be used as a reference in estimating the performance of construction work implementation time by comparing the BCWP value with BCWS. The value of SPI can describe the good / bad performance of time productivity in construction work. The SPI calculation in week 9 can be calculated using the following data.

$$SPI = \frac{BCWP}{BCWS} = \frac{1.048.130.347,11}{1.786.338.432,78} = 0,587$$

The analysis results above show that the SPI value in week 9 is 0.587. From this index, it shows that the productivity of time performance on the Purwosari - Sekarmojo Road Construction Project, Pasuruan Regency in week 9 is delayed, because if the SPI value is less than 1, the project implementation time is delayed from the planned time. Analysis of SPI values for week 1 to week 9 in the table below

Table 7. Recapitulation of SPI Value Analysis Results

Period	BCWP	BCWS	SPI
	a	B	a/b
M-1	-	10.256.461,27	-
M-2	-	20.512.922,54	-
M-3	-	28.769.516,71	-
M-4	-	28.769.516,71	-
M-5	196.254.600,67	286.695.233,55	0,133
M-6	431.279.714,80	542.449.666,11	0,170
M-7	704.901.466,56	798.204.098,67	0,244
M-8	392.916.746,09	1.053.958.531,23	0,373
M-9	1.048.130.347,11	1.786.338.432,78	0,587

Source: Processed by Researchers 2023

3.6. Project Cost and Time Estimation

There are 3 variants that need to be analyzed to determine the estimate of the cost and time required to complete a job, these variants consist of ETC (Estimate To Complete), EAC (Estimate At Complete), and ETS (Estimate at Schedule).

3.6.1. ETC (Estimate To Complete)

ETC is used to estimate the costs required for the completion of a project, the completion of the project is planned at a cost of Rp. 2,856,953,000.00 . The ETC calculation in week 9 can be calculated using the following formula:

$$ETC = \frac{BAC - BCWP}{CPI}$$

$$= \frac{2.856.953.000,00 - 1.048.130.347,11}{1,14}$$

$$= \frac{1,808.822.652,89}{1,14}$$

$$= 1.586.686.537,62$$

From the results of the ETC calculation above, the amount of remaining costs that will be incurred until the project completion time in week 9 is Rp. 1,586,686,537.62.

3.6.2. EAC (Estimate At Complete)

EAC serves as a variant for evaluating the total cost estimate for completing construction work based on field work. To calculate EAC in week 9 can be calculated with the following formula;

$$EAC = ACWP + ETC$$

$$= 922.354.705,46 + 1.586.686.537,62$$

$$= 2.509.041.243,08$$

The estimated profit earned until the work has been completed is Rp. 347,911,756.92.

3.6.3. TE (Time Estimate)

TE is used to estimate the time to complete a project based on field performance. Analysis (TE) is calculated using the following formula:

$$TE = ATE + \frac{OD - (ATE \times SPI)}{SPI}$$

$$= 9 + \frac{14 - (9 \times 0,587)}{0,587}$$

$$= 9 + 14.850$$

$$= 23,850 \text{ weeks} \sim 24 \text{ weeks}$$

The results of the calculation of the estimated time of construction work can be seen in the table below.

Table 8. Recapitulation of ETS Score Analysis Results

Period	SPI	TE (Week)	TE (Week)
M-1	-	-	-
M-2	-	-	-
M-3	-	-	-
M-4	-	-	-
M-5	0,133	88,19549	89

M-6	0,170	67,63529	68
M-7	0,244	47,53689	48
M-8	0,373	32,9437	33
M-9	0,587	23,85009	24

Source: Processed by Researchers 2023

On project performance based on the project implementation schedule in the last week of work experiencing delays in work. This is due to a delay in the start of work. Of course this should be a concern for management, because it affects the company's image, although not all delays are caused by internal company factors. Management must take action to reduce the factors that cause project delays for the next project.

4. CONCLUSION

Based on the research conducted, the things that can be concluded from this research are as follows:

1. Cost performance based on the calculation of the Purwosari - Sekarmojo road maintenance project Pasuruan Regency, in week 9 the project cost performance (CPI) is 1, 14 more than 1,
2. Time performance based on the calculation of the Purwosari - Sekarmojo road maintenance project Pasuruan Regency, in week 9 the project time performance (SPI) is 0.58 less than 1, so the project is delayed.

5. ADVICE

Suggestions from the research conducted are as follows:

1. It is hoped that there will be good coordination between the implementing contractor, sub- contractor, supervisory consultant and owner to overcome delays in work progress.
2. For the implementing contractor, it is hoped that from the beginning of the implementation, it can apply the Earned Value Method as a cost and time control measure, so that if there is a deviation in cost or time from the plan, the implementer is able to control and prevent early on to avoid cost losses or time delays on the project(Intan et al., 2020).

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