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Cost Performance Analysis of the Drainage and Sidewalk Rehabilitation Project of Jalan Teuku Umar Package Iwith Earned Value Method

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ABSTRACT

In the implementation of construction projects requires a good management so that the project can achieve a planned goal. The accuracy of cost, time and quality is very influential on the success of a project. One of the project targets that needs to be considered is the cost factor. The object of this research was the Drainage and Sidewalk Rehabilitation project of JalanTeuku Umar Package I located in Tuban District, Tuban Regency, East Java Province, Indonesia. This study aims to determine the value of variables, indicators and index value results, namely BCWS, BCWP, ACWP, CV, SV, and CPI; thereby generating an estimate of the profit or loss on the ongoing project. Observations for data collection consisted of the 1st week period to the 13th week period with a total work duration of 13 periods. From the results of the analysis using the earned value method from the 1st period to the 13th period, the CV value was not found to be negative. This indicates that during the course of the project from each observation, the actual costs are always lower than the budget costs. Then the SV value has a negative value between the 4th and 12th periods, this informs that during the period the project is running, the progress process is slower than planned even though in the last week the project can be completed according to the deadline. For the CPI value, no value <1 is found. Thus, it can be seen that the estimated final cost of the EAC project (estimate at complete) is the total cost of Rp. 1,367,150,467.79 of the planned budget of Rp. 1,444,139,145,55 with a profit of Rp. 76,988,677,76 so that it can be stated that the work is completed with a 5.3% more cost-effective (cost underrun).

Keywords: Project, performance, cost, and result value analysis.

I. INTRODUCTION

The development of a construction project that is getting bigger and more complicated today, both in terms of cost and physical form. In practice a construction project has limited resources, either in the form of labor, equipment, methods, materials or costs. With these limitations, a project management is needed from the initial phase to the project completion phase. Planning, cost and time control is the scope of the overall construction project management. Apart from the quality aspect, achievement in a project can also be assessed in terms of cost. The costs used in completing a job must be measured carefully, especially if there is a deviation from a plan. The existence of significant cost deviations is a symptom of poor project management. The existence of performance indicators in terms of costs can allow preventive actions so that a project is carried out according to plan.

In construction management; planning, implementation and control of construction services can be arranged in accordance with existing resources. Therefore, it is required to be able to compete and be able to carry out projects on time, on budget and smoothly according to job specifications. Construction projects have unique characteristics or are not repetitive, require resources, and are in an organizational setting to realize project goals and objectives. Projects that occur in a particular project will not be repeated onother projects. This is because the conditions that affect the process of

a construction project differ from one another. Natural conditions such as geographical location, rainfall, earthquakes and soil conditions, are factors that also affect the uniqueness of a construction project.

Making a work plan is one of the first steps of planning. Planning is made to achieve high effectiveness and efficiency of the resources that will be used during the implementation of the construction project. The planned resources include labor, equipment/machine, materials, and money. These resources must be planned as efficiently and effectively as possible in order to obtain implementation costs that are within the budget (saving budget), meet quality targets and planned deadlines. This is because in the implementation of a project it is sometimes rare to find a project that goes exactly as planned. Generally experiencing delays than planned, both time and progress of work if in project implementation there is no good control effort. On the other hand, there are also projects that have accelerated from the initial planned schedule and even budget costs can be achieved more efficiently than planned because there are effective control efforts because every deviation from the plan there is room for the deviation to be corrected immediately.

Reksohadiprojo (1983) states that project management is an effort to plan, organize, direct, coordinate and supervise activities in the project in such a way that it is in accordance with the time schedule and budget that has been set. Similarly, Pastiarsa (2015) states that the objective of project management is to manage a project in such a way that a result (derivables) is obtained that meets the technical scope and requirements according to the budget and time limits that have been determined and at the level of risk, quality, safety and security that is acceptable tolerable. Furthermore, Handoko (1999) explains in more detail that the objectives of project management are as follows:

1. Right on budget, namely costs that must be spent in accordance with a predetermined budget
2. On time, namely the time or schedule which is one of the main targets of the project, delays will result in losses, such as additional costs, lost product opportunities to enter the market.
3. Exact specifications, where the project must be in accordance with the quality specifications that have been set.

In the implementation of a project may experience delays, acceleration, or on time according to the project plan schedule. In terms of costs, the implementation of a project may experience advantages or disadvantages. In the concept of the value of the results (earned value) can be used to predict whether the project completion 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. Husen (2011) stated that the project evaluation to control time and cost is the result value method. In the application of this method is the application of the use of the S curve for control in the implementation of a project. The shape of the S curve is a yield value curve to evaluate the use of project costs and time schedules at once and is more realistic than the conditions that occur in the field. The S curve will describe the progress of the volume of work carried out throughout the project cycle. The S curve is very useful for use as monthly reports and reports to project leaders, because this curve can clearly show the progress of the project in an easy-to-understand form.

The concept of yield value is a project management method used to control costs and time. This method provides information about cost variance, schedule variance, cost performance index, and project schedule performance index in the reporting period. This method also obtains information on the prediction of the amount of costs and the length of time for the completion of all work based on performance indicators at the time of reporting. The earned value concept presents three dimensions, namely the actual costs that have been incurred which are called actual costs, the physical completion of the project that reflects the planned cost absorption and what has been spent or what is called earned value. Thus, there are 3 (three) variables that become references in analyzing projects based on earned value cost (EVC), namely:

1. Budgeted cost for work scheduled (BCWS)

   BCWS is a budget that is allocated based on a work plan that has been prepared according to

time. BCWS is calculated from the accumulated budget for the work planned for a certain period of time. BCWS is also a benchmark for the time performance of project implementation. BCWS reflects the cumulative absorption of plan costs for each work package based on the sequence according to the planned schedule.

2. Actual cost for work performed (ACWP)
   ACWP is a representation of the overall expenses incurred to complete the work in a certain period. ACWP can be cumulative up to a performance calculation period or the amount of expenses incurred in a certain period of time.
3. Budgeted cost for work performed (BCWP)
   BCWP is the value received from the completion of work over a certain period of time. This BCWP is called earned value. This BCWP is calculated based on the accumulation of completed works. By using the yield value concept method, it can be developed to make estimates or projections of the future state of the project which is very useful input for managers and owners, because then they have enough time to think about ways to deal with all problems in the future come. For example to project whether the remaining funds are sufficient to complete the project.

Regarding the development activities carried out by the Tuban Regency government with the 2021 APBD budget sources, one of which is the drainage and pavement rehabilitation work on JalanTeuku Umar Package I which is an important project to overcome drainage problems, especially when it rains. With the construction of an object that is classified as very vital and requires a large budget, it is necessary to plan work from the initial stage of the activity to completion using the result value method so that the cost performance in implementing the project can be known. Therefore, a research entitled "Analysis of Cost Performance in the Implementation of Drainage and Sidewalk Rehabilitation Works on JalanTeuku Umar Package I with the Result Value Method" is very necessary.

II. RESEARCH METHODS

To facilitate the analysis and processing of data, in the implementation of this research the observation process is carried out in a weekly period (data per week). The project implementation time starts from July 16, 2021 until the deadline for project completion on October 14, 2021, then 13 weeks of observation/reporting data will be obtained consisting of the period:

1. 1st week = July 16 to July 21, 2021 (Duration of 6 days)
2. 2nd week = July 22 to July 28, 2021 (Duration of 7 days)
3. 3rd week = July 29 to August 04, 2021 (Duration of 7 days)
4. 4th week = August 05 to August 11, 2021 (Duration of 7 days)
5. 5th week = August 12 to August 18, 2021 (Duration of 7 days)
6. 6thweek= August 19 to August 25, 2021 (Duration of 7 days)
7. 7th week = August 26 to September 01, 2021 (Duration of 7 days)
8. 8th week = September 02 to September 08, 2021 (Duration of 7 days)
9. 9th week = September 09 to September 15, 2021 (Duration 7 days)
10. 10th week = September 16 to September 22, 2021 (Duration of 7 days)
11. 11th week = September 23 to September 29, 2021 (Duration of 7 days)
12. 12th week = September 30 to October 06, 2021 (Duration 7 days)
13. 13th = October 07 to October 14, 2021 (Duration of 7 days)

Total project observation schedule = 13 weeks (Total project duration 90 working days)

The method of data collection in the implementation of this research can be explained as follows:

1. Primary Data, consisting of:
   a. Project Expenses
      This data represents the actual cost of implementing the project in the application of the yield value method, which is obtained from parties who have the authority to record/administrate project expenditures (accounting department). To facilitate data processing, in the implementation of this study, the calculation of project expenditure costs was recorded from the

project running to completion and was recapitulated every day, compiled and recapitulated according to a predetermined weekly period, then accumulated into the total cost of project expenditure.

b. Project Runtime

This data is obtained directly from the running time of the project, by monitoring the actual condition of completion of each project period with the need for analysis using the yield value method, calculating the time required for completion of each period. Recording is carried out starting from the beginning of project implementation until the time the project is declared complete and well received by the project owner.

2. Secondary Data, consisting of:

Secondary data, namely data that is already available from other parties, so we must try to get the data as needed. Secondary data in this study are:

a. Project Time Scheduling Data

The project time schedule contains descriptions of activities/activities along with the time requirements and when the project must be completed.

b. Project Budget Plan

Consists of a list of cost recapitulation, volume and unit price of work, priceunit wages, quantity and unit price of materials, analysis of work unit prices,administration & general, management and other expenses.

c. Work plan and conditions for project implementation

Is a document that contains the name of the project along with an explanation in the form of: type, size and location, as well as procedures for implementation, work requirements,requirements for quality of work and other information that can only bedescribed in writing.

d. Job load

This data is in the form of the work weight of the project implementation plan which is expressed in % of each project activity.

The measurement of variables carried out in the implementation of this research consists of the following:

1. Calculation of Budgeted Cost Of Work Schedule (BCWS) variables

This variable is obtained by calculating the percentage of the work plan multiplied by the total project cost that has been planned based on the following formula:

$$\mathbf{BCWS = \%\,Planning \times BAC}$$

2. Calculation of the variable Budgeted Cost Of Work Performance (BCWP)

This variable is obtained by calculating the percentage of completion/realization multiplied by the total project cost that has been planned based on the following formula:

$$\mathbf{BCWP = \%\ Actual \times BAC}$$

3.Calculation of the Actual Cost Of Performance (ACWP) variable

This variable is obtained by calculating the actual budget (actual costs) used for the activities that have been carried out.

4. Calculation of the Schedule Variance (SV) indicator

This indicator is calculated by subtracting the value of the BCWP variable with the value of the BCWS variable according to the following formula:

$$\mathbf{SV = BCWP - BCWS}$$

5. Calculation of the Cost Variance (CV) indicator

This indicator is calculated by subtracting the value of the BCWP variable with the ACWP variable

value according to the following formula:

$$CV=BCWP – ACWP$$

6. Calculation of Schedule Performance Index (SPI)
   This indicator is calculated by dividing the value of the BCWP variable by the value of the BCWS variable according to the following formula:

$$SPI=BCWP: BCWS$$

7. Calculation of Cost Performance Index (CPI)
   This indicator is calculated by dividing the value of the BCWP variable by the ACWP variable value according to the following formula:

$$CPI=BCWP/ACWP$$

Processing and analyzing data in the implementation of this research is to use the following software:

1. Descriptive quantitative analysis using microsoft excel. This analysis is to calculate and process quantitative data consisting of budget data, value results, details of costs on project implementation, calculation of cost and schedule performance indicators, and calculation of cost and schedule performance indexes.
2. Qualitative descriptive analysis using microsoft word. This analysis is to obtain a graphic visualization of the S curve that describes the progress of the project being researched. The shape of the S curve consists of integrating progress over time to obtain the cumulative progress used in job monitoring. The measure of progress is emphasized on work progress and costs. The X axis shows the time scale (duration of project implementation), while the Y axis represents the cost or work performance scale, which consists of the variables BCWS, ACWP and BCWP.

III. RESULTS AND DISCUSSION

1. Analysis of Project Cost Performance Based on Earned Value Variables

Based on data from data sources (second parties) obtained in the draft budget on the implementation of the drainage and sidewalk rehabilitation project for JalanTeuku Umar packageI, it can be shown in Table 1 below:

Table 1. Draft Budget for Drainage and Sidewalk Rehabilitation of JalanTeuku Umar Package I

Observation Period		Project Cost Budget Draft (BCWS Varaible)	
Week-	Days to-	Budget per week (Rp)	Cumulative budget (Rp)
1	6	81.836.376,82	81.836.376,82
2	13	130.315.645,04	212.152.021,86
3	20	130.315.645,04	342.467.666,91
4	27	68.903.403,76	411.371.070,67
5	34	109.229.107,79	520.600.178,46
6	41	68.903.403,76	589.503.582,21
7	48	68.903.403,76	658.406.985,97
8	55	68.903.403,76	727.310.389,72
9	62	68.903.403,76	796.213.793,48
10	69	130.315.645,04	926.529.438,52
11	76	130.315.645,04	1.056.845.083,57
12	83	191.727.886,33	1.248.572.969,90
13	90	195.566.175,65	1.444.139.145,55

Source: Barokah, CV (2021)

In Table 1, it is shown that the project budget plan is scheduled for a 90 calendar day working period starting from July 16, 2021 until the deadline for project completion on October 14, 2021. Based on the project schedule, to facilitate data analysis and processing, the duration is divided into periods per week so that 13 (thirteen) weeks of observation data are obtained. In each of these week periods, the amount of the budget for each period per week is distributed with the largest activity in the 12th and 13th weeks requiring a budget of Rp. 191,727,886.33 and Rp. 195,566,175,65. The table also presents data on a cumulative project budget value of Rp. 1,444,139,145,55 (#One billion four hundred forty-four million one hundred and thirty-nine thousand one hundred forty-five point fifty five rupiah#). The amount of the budget value, in the sum of all periods/cumulative (duration of 90 days) is called the Budgeted Cost for Work Schedule (BCWS) variable.

Rani (2016) said that management in the implementation of construction is carried out by planning and scheduling, which is a process that tries to lay the basis for goals and objectives, including preparing all resources to achieve project goals and objectives. The purpose of the construction is to complete the work and benefit from the total costs incurred. The targets in the construction implementation are business development and productivity improvement. In connection with the implementation of the research on project cost performance, the actual expenditure on the implementation of the Teuku Umar Road drainage and sidewalk rehabilitation project package I consists of a recapitulation of costs consisting of: labor, materials, general administration and management and others. Based on the results of the recapitulation of the actual project costs on the object under study, it can be presented in Table 2 below:

Table 2. Actual Cost of Drainage and Sidewalk Rehabilitation of JalanTeuku Umar Package I

Observation Period		Actual cost project implementation (ACWP variable)	
Week-	Days to-	Actual cost per week (Rp)	Actual cost cumulative (Rp)
1	6	6.300.162,31	6.300.162,31
2	13	133.569.494,52	139.869.656,83
3	20	179.095.228,07	318.964.884,90
4	27	102.535.435,92	421.500.320,81
5	34	113.472.549,08	534.972.869,89
6	41	71.091.235,57	606.064.105,46
7	48	76.559.792,15	682.623.897,61
8	55	86.129.766,17	768.753.663,78
9	62	66.716.390,30	835.470.054,08
10	69	190.852.624,72	1.026.322.678,80
11	76	130.698.502,31	1.157.021.181,12
12	83	172.259.532,34	1.329.280.713,46
13	90	37.869.754,33	1.367.150.467,79

Source: Barokah, CV (2021)

In Table 2 above, the actual cost of the project is shown according to the recording in the accounting for project implementation, which consists of expenditures per week and in cumulative totals. For activities in the 3rd week and 10th week, they differed sharply from planning and recorded the largest actual expenditure among other week periods with a value of Rp. 179,095,228.07 and Rp. 190,852,624.72. Likewise, in the 13th week, the budgeted cost for planning is Rp. 195,566,125,65 but in actual implementation the project completion only requires Rp. 37,869,754.33 so that there is a difference of Rp. 157,696,421.32. With the achievement of the difference or the difference between the planned costs and the actual costs used in project implementation, illustrates the dynamic dynamics due to conditions that are influenced by the ability of project management to achieve project goals. However, it is the results of the analysis of the project's cost performance that will later be able to provide an assessment of whether project management is effective enough in achieving project

goals and objectives.

In Table 2 it is also obtained that the value of the actual expenditure on the project object studied cumulatively is Rp. 1,367,150,467.79 (#One billion three hundred sixty-seven million one hundred and fifty thousand four hundred sixty-seven point seventy-nine rupiah#). The amount of the project's actual expenditure costs in a cumulative amount for a 90-day duration of project implementation, in the concept of resultant value is called the Actual Cost for Work Performed (ACWP) variable.

Suharto (1995) explained that the earned value method is used to measure project performance by comparing the budgeted work value with the actual completed work to determine whether the cost performance is still as planned. Based on the data obtained in this study, the results of the calculation of the earned value are shown in Table 3 as bellow:

Table 3. Actual Cost of Drainage and Sidewalk Rehabilitation of JalanTeuku Umar Package I

Observation Period		Weight of Completion of Actual Project Implementation (%)	Result Value according to Project Actual Implementation (BCWP Variable) (Rp)
Week-	Days to-		
1	6	0,46	6.643.040,07
2	13	10,23	147.735.434,59
3	20	23,33	336.917.662,66
4	27	30,83	445.228.098,57
5	34	39,13	565.091.647,65
6	41	44,33	640.186.883,22
7	48	49,93	721.058.675,37
8	55	56,23	812.039.441,54
9	62	61,11	882.513.431,84
10	69	75,07	1.084.115.256,56
11	76	84,63	1.222.174.958,88
12	83	97,23	1.404.136.491,22
13	90	100,00	1.444.139.145,55

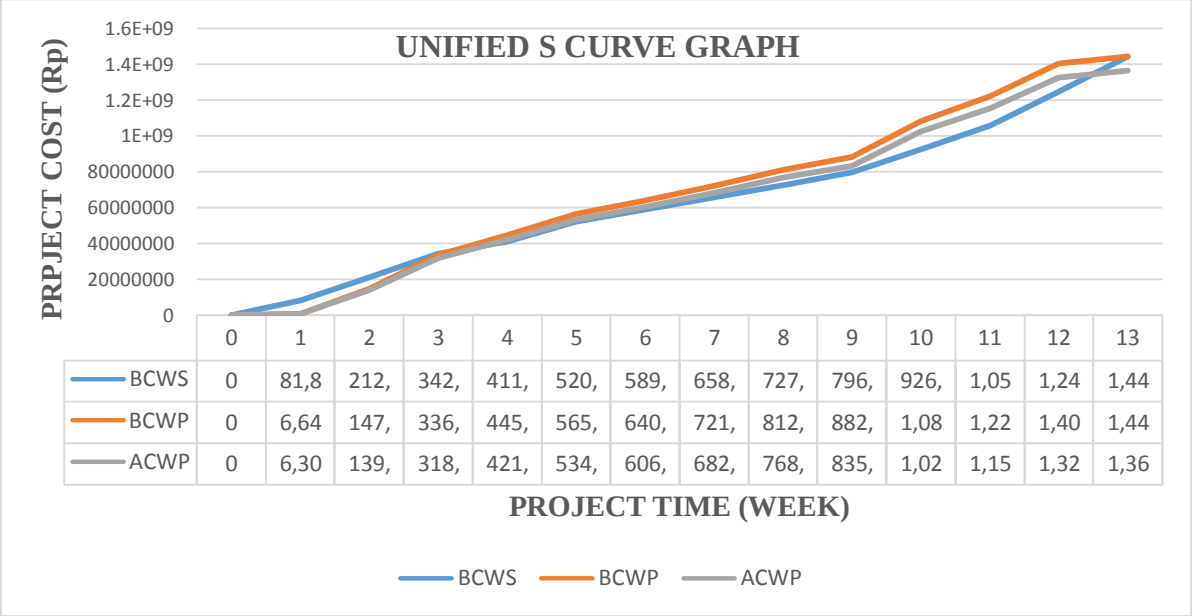
Source: Barokah, CV (2021)

As presented in Table 3 above, it can be observed that the percentage of work completion weight (%) and the results of calculating the results obtained are in accordance with the completion weights in the implementation of the project under study. In the table it can be explained that based on the weight of project completion (%) it is known that at the beginning of the implementation in the 1st week the project was running slowly, then increased in the 2nd week to the 9th week, and peaked at the 10th, 11th week. and the 12th experienced an unusually fast pace until the 13th week the project was completed. The earned value is the result obtained based on the work that has been completed and is calculated based on the percentage of weight obtained multiplied by the cumulative budget (contract value). Based on the earned value that have been obtained in the implementation of the project on the object under study in the cumulative sum obtained the amount of Rp. 1,444,139,145,55 (#One billion four hundred forty-four million one hundred and thirty-nine thousand one hundred and forty-five point fifty-five#), in the earned value concept is called the Budgeted Cost for Work Performed (BCWP) variable. To get the result value in the 10th week and 69th day of observation period as shown in Table 3 above, it can be obtained in the following calculation:

CALCULATING FORMULA BCWP VARIABLE
BCWP calculation =Completion weight (%)x Comulative budget
= (75,07%: 100%) xRp. 1.444.139.145,55
=Rp. 1.084.115.256,56

In this study, according to the object of the project being studied, the shape of the S curve is

obtained which consists of a combination of the X axis which represents the observation period from the 1st week to the 13th week (13 weeks of observation) and the Y axis which represents the result value variables can already be observed regarding the cost performance of project implementation. Based on the data obtained in the research on the implementation of the Teuku Umar Road drainage and sidewalk rehabilitation project package I, the shape of the S curve can be presented in Figure1 on the following as:



	0	1	2	3	4	5	6	7	8	9	10	11	12	13
BCWS	0	81,8	212,	342,	411,	520,	589,	658,	727,	796,	926,	1,05	1,24	1,44
BCWP	0	6,64	147,	336,	445,	565,	640,	721,	812,	882,	1,08	1,22	1,40	1,44
ACWP	0	6,30	139,	318,	421,	534,	606,	682,	768,	835,	1,02	1,15	1,32	1,36

Figure 1. S Curve of Cost Performance of the Analyzed Project

In Figure 1 above, it is shown that the BCWS variable, ACWP variable and BCWP variable reflect the project's cost performance status. The curve shows that the actual cost of project implementation (ACWP variable) is marked with a gray line, the project implementation budget cost (BCWS variable) is marked with a blue line, and the project yield value (BCWP) is marked with an orange line. In the integrated analysis of variance presented with the S curve, the X axis represents the duration of project implementation consisting of 13 observation periods (1st period to 13th period) and the Y axisrepresents the cost of project expenditure which consists of the project plan budget, the actual cost of project expenditure and the value of the results of project implementation. With the achievement of the position of the 3 variables shown on the formed S curve, the 3 variables are seen to form a curve that shows the image of all three in gray, blue and orange. In the formed S curve, it is shown that the ACWP variable runs lower than the BCWP variable starting at week 7, week 8 until it continues until week 13 and the distance continues to widen until the end of the project duration. This indicates that the cost performance status of the project in the implementation of the drainage and sidewalk rehabilitation of JalanTeuku Umar package I shows that the actual costs are smaller than the planned budget and a cost underrun position can be achieved with a project cost savings of Rp. 76,988,677,76. As for the Budgeted Cost of Work Schedule (BCWS) variable, the budget value for a work package combined with its implementation schedule marked with a blue line looks slightly different from the first two variables, namely the Actual Cost of Work Performed (ACWP) variable and the the second is the Budgeted Cost of Work Performed (BCWP) variable because the planning value with the work is not appropriate in completing the work implementation as a result of the progress formed from the physical weight of the work, materials and wages of workers but with the same results at the end of the 13th week period according to obtained from the image of the S curve above.

2. Project Cost Performance AnalysisBased on Earned Value Indicator

To be able to show the status of project cost performance in more depth in the

implementation of the drainage and sidewalk rehabilitation of JalanTeuku Umar package I, the analysis is continued by calculating the cost variance indicator. This indicator shows the status of the project related to project cost performance, which can state how much the actual cost of project implementation exceeds the planned budget cost, the condition of project implementation that reaches right on budget, or even status can be determined if it occurs budget savings in project expenditures (cost underrun). Cost variance is the difference between the value obtained after completing work packages and the actual costs incurred during project implementation. A positive cost variance indicates that the value of the work packages obtained is greater than the costs incurred to work on these work packages, whereas a negative value indicates that the value of the completed work packages is lower than the costs already incurred.

Based on the formula for calculating the value of the cost variance indicator and its probability/opportunity, it can be a negative number, a positive number, or a 0. Based on the values obtained in these indicators, the project cost performance status will be explained. By using this formula, it can be used in the project analyzed in this case study. Based on the results of the analysis of project cost performance on the implementation of the drainage and sidewalk rehabilitation of JalanTeuku Umar package I, the results of the cost variance indicators are obtained as observed in Table 4 on the following:

Table 4. Indicators of Cost Variance for Rehabilitation of Drainage and Sidewalks for JalanTeuku Umar Package I

Week of observation	Variable		CV indicator	Project implemention cost performance
	BCWP (Rp)	ACWP (Rp)		
1	6.643.040,07	6.300.162,31	342.877,76	Budget cost>actual cost
2	147.735.434,59	139.869.656,83	7.865.777,76	Budget cost > actual cost
3	336.917.662,66	318.964.884,90	17.952.777,76	Budget cost > actual cost
4	445.228.098,57	421.500.320,81	23.727.777,76	Budget cost > actual cost
5	565.091.647,65	534.972.869,89	30.118.777,76	Budget cost > actual cost
6	640.186.883,22	606.064.105,46	34.122.777,76	Budget cost > actual cost
7	721.058.675,37	682.623.897,61	38.434.777,76	Budget cost > actual cost
8	812.039.441,54	768.753.663,78	43.285.777,76	Budget cost > actual cost
9	882.513.431,84	835.470.054,08	47.043.377,76	Budget cost > actual cost
10	1.084.115.256,56	1.026.322.678,80	57.792.577,76	Budget cost > actual cost
11	1.222.174.958,88	1.157.021.181,12	65.153.777,76	Budget cost > actual cost
12	1.404.136.491,22	1.329.280.713,46	74.855.777,76	Budget cost > actual cost
13	1.444.139.145,55	1.367.150.467,79	76.988.677,76	Budget cost > actual cost

Source: Processed data (2021)

In Table 4 above, based on the calculation of the BCWP variable value minus the ACWP variable value, a cost performance indicator is obtained which is called cost variance. In the table, the CV size is shown starting from the 1st week, 2nd week, 3rd week to the next weekthe end of the project implementation in the 13th week everything went on a positive number. The increasing duration of project implementation, the value of the CV indicator also increases, starting in the 1st week of Rp. 342.877.76, 2nd week of Rp. 7,865,777.76 and until the 13th week of Rp. 76,988,677,76. With the achievement of the cumulative CV indicator value of Rp. 76,988,677,76 on the object of the project under study, then the actual cost of project financing is more efficient than the project budget plan. Thus, it can be said that in the implementation of the project the actual cost was saved in the amount of Rp. 76,988,677,76. To get the value of the savings that occur, it is done by calculating the value of the CV indicator in the 13th week of observations of the project that is the object of research, then it is obtained by calculating the following formula:

CALCULATING FORMULACOST VARIANCE INDICATOR
CV indicator = BCWP variable –ACWP variable
=Rp. 1.444.139.145,55 – Rp. 1.367.150.467,79
=Rp. 76.988.677,76

According to Ervianto (2005), it is stated that the actual volume cost is smaller than the actual cost, resulting in project cost savings, this condition is called cost underrun. Likewise, Patiarsa (2015) states the same thing regarding CV has a positive value, namely that in project implementation there are more costssmaller than budget. Thus, the performance of the cost performance carried out on the project has shown that work has been optimal and costs can be controlled very well.

3. Project Cost Performance AnalysisBased on Earned Value Index

The next project cost performance analysis shows the project cost performance status on the implementation of the drainage and sidewalk rehabilitation of JalanTeuku Umar package I, then the analysis continues with the calculation of the CPI index. To further demonstrate and increase confidence that there have been savings in project implementation on the object under study, the analysis needs to be continued by calculating the cost performance index (CPI). The cost performance index is calculated by dividing the BCWP variable with the ACWP variable. The cost performance index (CPI) shows that the cost efficiency factor that has been spent can be shown by comparing the value of the work that has been physically completed (BCWP) with the costs that have been spent in the same period (ACWP). This CPI value shows the weight of the value obtained (relative to the overall project value) against the costs incurred. CPI less than 1 indicates poor cost performance, because the costs incurred (ACWP) are greater than the value obtained (BCWP) or in other words waste occurs. Based on the value of the BCWP variable and the ACWP variable value on the object under study, the results of the calculation using the concept methodthe value of the results obtained by the index of the cost performance index (CPI) as presented in Table 5 as follows:

Table 5. Cost Performance Index (CPI) for Drainage and Sidewalk Rehabilitation of JalanTeuku Umar Package I

Week of observation	Variable		CPI index	Project implemention cost performance
	BCWP (Rp)	ACWP (Rp)		
1	6.643.040,07	6.300.162,31	1,05	Cost underrun
2	147.735.434,59	139.869.656,83	1,06	Cost underrun
3	336.917.662,66	318.964.884,90	1,06	Cost underrun
4	445.228.098,57	421.500.320,81	1,06	Cost underrun
5	565.091.647,65	534.972.869,89	1,06	Cost underrun
6	640.186.883,22	606.064.105,46	1,06	Cost underrun
7	721.058.675,37	682.623.897,61	1,06	Cost underrun
8	812.039.441,54	768.753.663,78	1,06	Cost underrun
9	882.513.431,84	835.470.054,08	1,06	Cost underrun
10	1.084.115.256,56	1.026.322.678,80	1,06	Cost underrun
11	1.222.174.958,88	1.157.021.181,12	1,06	Cost underrun
12	1.404.136.491,22	1.329.280.713,46	1,06	Cost underrun
13	1.444.139.145,55	1.367.150.467,79	1,06	Cost underrun

Source: Processed data (2021)

As shown in Table 5, it is shown that the cost performance index in the 1st week until the end of the project in the 13th week of the project that is the object of research is entirely scored more than 1. 1st week achieved index = 1.05, in the 2nd week index = 1.06 and the 3rd week index = 1.06 until the last week, namely the 13th week, the index = 1.06. With the achievement of the cost performance index and cumulatively obtained a CPI index of 1.06 has provided clear and convincing instructions that it is true that there have been cost savings in the implementation of the object that is the object of research. This is in accordance with what was stated by Pastiarsa (2015) that with the achievement of a cost performance index (CPI) > 1, it means that the project is running at a cost that is more efficient than the budget. To get the CPI index value as listed in the table at week 13, it can be obtained by calculating the following formula:

CALCULATING FORMULACOSTPERFORMANCEINDEX
CPI Index =BCWPvariable :ACWP variable
=Rp. 1.444.139.145,55 :Rp. 1.367.150.467,79
=1,06

Cost performance index (CPI) is used to determine the cost status of project implementation, the magnitude of the achievement of this value can be explained by the conditions that can be observed on the following page.The conditions for achieving the CPI index score are as follows:

1. CPI = 1, meaning that the project implementation costs are in accordance with the planned budget.
2. CPI > 1, meaning that the project implementation cost is smaller than the planned budget.
3. CPI < 1, meaning that the project implementation cost is greater than the planned budget.

Thus, the actual cost savings of the project will occurbudget on the project that became the object of research with the achievement of a cost performance index of 1.06 and a cost variance of Rp. 76,988,677.76 (#Seventy-six million nine hundred eighty-eight thousand six hundred seventy-seven point seventy-six rupiah#) indicates that the project implementer will definitely benefit from the project being undertaken. With the budget in accordance with the Draft Budget for the implementation of the Teuku Umar Road drainage and sidewalk rehabilitation project package I, the occurrence of budget savings can be calculated as follows:

PROJECT COST SAVINGS CALCULATION
Cost savings (%) =(Rp. 76.988.677,76: Rp. 1.444.139.145,55)x100%
=5,33 %

With the acquisition of cost performance which has shown a budget savings of 5.33%, it is sufficient to provide a proud work performance for construction service providers or can be called project implementers. This must continue to be maintained in an effort to control costs on the project so thatthe occurrence of cost performance performance will always show budget cost savings in project implementation.

IV. CONCLUSION

Based on the results of the performance analysis using the earned value analysis method obtained in this study, several conclusions can be drawn regarding the implementation of the drainage and sidewalk rehabilitation project of JalanTeuku Umar package I, including the following:

1. The results of the CV (cost variance) calculation starting from the 1st week, 2nd week, 3rd week until the end of the project implementation period on the 13th week all run in positive numbers. The increasing duration of project implementation, the value of the CV indicator also increases, starting in the 1st week of Rp. 342.877.76, 2nd week of Rp. 7,865,777.76 and until the 13th week of Rp. 76,988,677,76. With the achievement of the cumulative CV indicator value of Rp. 76,988,677,76 on the object of the project under study, then the actual cost of project financing is more efficient than the project budget plan. Thus, it can be said that in the implementation of the project the actual cost was saved in the amount of Rp. 76,988,677,76.
2. Cost performance index (CPI), resulting in an analysis of cost performance for thirteen weeks of project implementation starting from the 1st week to the 13th week showing a stable CPI value of more than 1 (one) means that in week 1 to week 13 the actual costs incurred are less than the budgeted allocation of funds. In other words, the construction service provider/contractor/project implementer still has a very good level of sensitivity in controlling project implementation cost performance and can achieve a cost underrun position.

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