EVALUATION OF PROJECT IMPLEMENTATION PERFORMANCE WITH EARNED VALUE METHODS

CASE STUDY: THE DEVELOPMENT OF SHIMAMOTO RYOSAKU VILLA, SEMINYAK, BADUNG, BALI

Made Sudiarsa [1],
I Gede Sastra Wibawa [2], I Ketut Sutapa [3]

1,2,3) Teaching staff, Civil Engineering, Bali State Polytechnic

Bukit Jimbaran,P.O.Box 1064 Tuban Badung-Bali

Phone :+62-361-701981, Fax : +62-361-701128

Correponding email :
1) madesudiarsa42@yahoo.com
2) g.sastra@yahoo.com
3) ketutsutapa@pnb.ac.id

Abstract. *Planning and controlling the execution of a project is part of the overall construction project management. In addition to assessment in terms of quality, achievement of a project can be assessed in terms of cost and time. Earned value method is the integrated cost control and project schedule. This method provides project performance status information in terms of cost and time in the project reporting period. In evaluating the performance of the development project of Villa Shimamoto Ryosaku, the performance of the cost aspect shows the savings from the plan, This is shown from the value Cost Performance Index (CPI) > 1 On monthly reporting3 = 1.39, the monthly 6 = 1.97, and the monthly 11 = 1.73 While the performance of the schedule aspect shows the delay of the plan, this is shown from the value Schedule Performance Index (SPI) < 1 on monthly reporting 3= 0.79,the monthly 6 = 0.93, and the monthly 11 = 0.94. Estimate Temporary Cost (ETC) is Rp 480,175,422.16, and Estimation At Completion (EAS) is Rp2,026,445,457.16, while Budgeted At Completion (BAC) is Rp3,502,000,000.00 so get Variance at Compeltioan (VAC) is Rp1,409,621,615.49 and Estimation Temporary Schedule (ETS) is 3.2 month, and Estimation At Schedul (EAS) is 14.2 Month while the time specified in the contract during 14 month, So the project is delayed during 0.2 month (1 week).*

Keywords : Cost, Time, Performance, Earned Value

1. INTRODUCTION
1.1 Background

Economic growth in Indonesia today is very exciting for the people, so the need for construction projects is increasing. Implementation of project construction needs good management to achieve maximum results. The development of construction projects cannot be separated from the development of construction management. While the development of construction services industry is closely related to the implementation of development that is currently being actively conducted.

Construction management is planning, scheduling and controlling costs and time to achieve maximum project goals. Good management of a project requires a good cost control system on every job execution. The achievement of a project can be valued in terms of cost and time, in addition to quality. Deviations from the cost and time spent in completing a job should be evaluated to avoid any deviation from the plan. Control is needed in the implementation of a project due to limited resources, cost, and time in completion of a project. [1]

Project control is carried out so that the project can still be implemented in accordance with the time and costs set out in the plan in line with project implementation. There is a difference between planning and control, that is, Planners are processes that try to lay the groundwork of goals and goals including preparing all resources to achieve them. While controlling is a systematic effort to determine standards in accordance with the objectives of planning, designing information systems, comparing the implementation with standards, analyze the possibility of deviations between implementation and standards, then take the necessary corrective actions for resources used effectively and efficiently in achieving the target.

In general, control is done so that work can be carried out efficiently. So we need an analysis that has a system of time and cost control so that the implementation of a project is really efficient. [2] In the execution of a project very rarely found projects that run in accordance with yang planned. Generally the implementation of a project is delayed from the planned schedule, but there is also the implementation of projects that have accelerated from the schedule of the plan. To avoid losses and to know performance project implementation of cost and time completion of the project with the Method of Results Value, so that in the completion of the project can be faced with efforts to further streamline and mengefesiensikan implementation of a project. For that researchers want to know the performance of project implementation by taking the title Evaluation of Project Implementation Performance With Value Method Results with the case study of the Development of Shimamoto Ryosaku Villa, Seminyak, Badung, Bali.

With the result value method, it is expected that the performance of the project implementation, the deviations occurring in terms of time and cost, and the amount of cost and time at the end of the project implementation can be found out.

1.2 Research Problems
a. How is the performance of development of Villa Shimamoto Ryosaku Seminyak with method of result value when it is reported?
b. What is the remaining cost and time required to complete the Villa Shimamoto Ryosaku Seminyak project?

1.3 Research Objectives
a. It can be known implementation performance of the project from facet of time and cost.
b. It can be known the cost and time required to complete the project.

1.4 Literature Review
a. Project Management

Project Management is a process of planning, arrangement, leadership, and control of a project by utilizing resources optimally to achieve the specified goals. By the existence of a good project management, it will be achieved the project in which the cost is appropriate to the plan. [1].

b. Cost Management

Project cost management is ensured in accordance with the planned and approved cost budget in the management of project implementation involving all required processes. There are several things to consider in project cost management, i.e. resources that require a cost to complete the project, among others: [3]

c. The Definition of Earned Value

The "Eaned Value" method is a control methods used to control the cost and schedule of projects in an integrated way. This method provides project performance status information over a reporting period and provides the required cost prediction information and the time for completion of all jobs based on performance indicators when reporting.

2. METHODS

Research methods are the methods of research a problem or a case with a scientific way to get a rational answer. The research method is based on the research objectives and becomes something to get a settlement in order to achieve successful research.

The method used in this research is qualitative descriptive, research that describes the condition of the project by analyzing existing data. Analysis is processing existing data so as to produce a conclusion. Descriptive is the explanation of the existing problems. To examine the trend of variant of schedule and variant of cost in a period of time during the project implemented used the concept of Results Value.

2.1 Determination of Data Sources

a. Primary Data

Primary data used is Actual Cost in the form of raw data which is the actual cost of the work that has been implemented. This cost is derived from the accounting and financial data of the project at the time of reporting or the amount of expenditure and funds used to carry out the work for a certain period of time. Expenditures used as an Actual Cost consists of reports of wages for Workers, Employee Salaries, Materials and Tools which are still in the form of expenditure reports in accordance with the date of payment.

b. Secondary Data

Secondary data is the source of research data obtained through intermediate media or indirectly in the form of books, records, existing evidence, or archives whether published or unpublished in general. In order to perform the analysis required data related to the project. The data I use include:

1) Budget Plan
2) Time Schedule
3) Monthly Report

c. Stages of Data Analysis

Stages in data analysis is a sequence of steps that are implemented systematically according to the basic theory of the problem to obtain an accurate analysis to achieve the purpose of the author. Stages in this study are as follows:

1) Stage I

At this stage a literature study is conducted to deepen the science related to the topic of research and making the formulation of the problem about which will be the topic of research.

2) Stage II

This is the stage where the data is taken as reference data for the next calculation.

3) Stage III

Stage of data analysis, following stages of data analysis:
1. Calculate BCWP with actual weight to contract value, Calculate BCWS with plan weight to cost budget plan. Calculations BCWS cumulative, Calculation BCWP cumulative.
2. Calculating Cost Variance (CV) = BCWP – ACWP
3. Calculating Schedule Variance (SV) = BCWP - BCWS
4. Calculating Cost Performance Index (CPI) = BCWP / ACWP
5. Calculating Schedule Performance Index (SPI) = BCWP / BCWS
6. Estimated Costs for Remaining Jobs (ETC) = (BAC - BCWP) / CPI
7. Predicted Final Settlement Costs Project / Estimate at Completion (EAC) = ACWP + ETC
8. Estimated time of completion of all work ETS = (time remaining) / SPI EAS = End time + ETS
9. Calculating Variance at Completion (VAC) = BAC – EAC

4) Stage IV

Conclusion is also called decision making. At this stage, the data that has been analyzed is made a conclusion related to the research objectives.

Flow chart can be seen in figure 1 below:
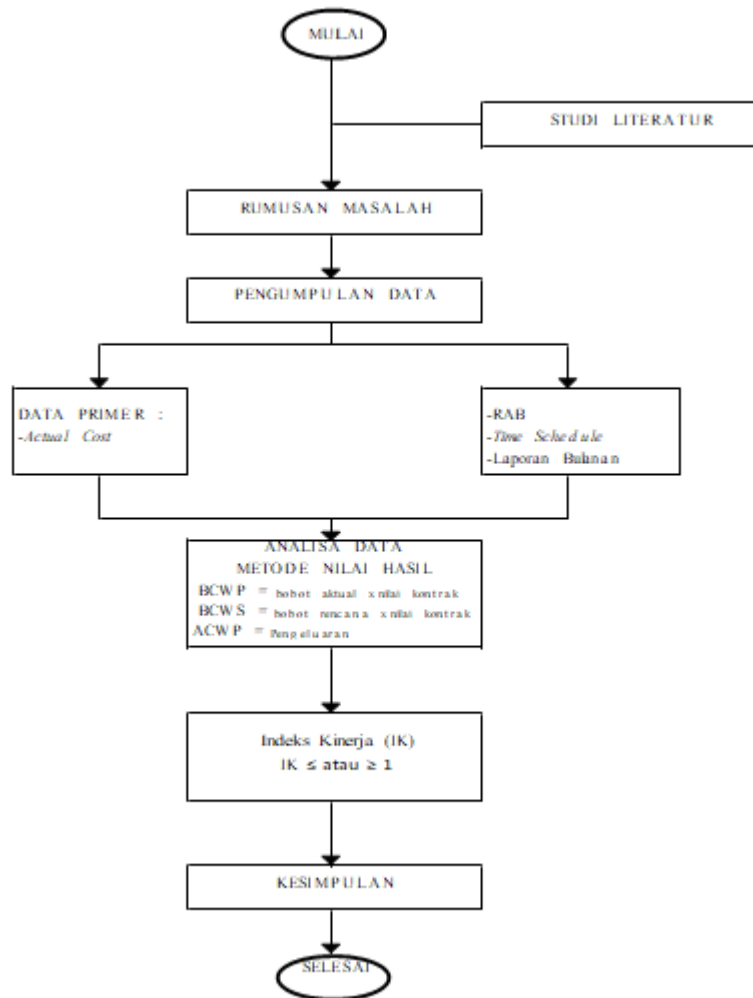
Picture 1. Flowchart of Research Stages

3. RESULT AND DISCUSSION
3.1 Indicator of the Earned Value Method
a. Analysis of BCWP (Budgeted Cost of Work Performed)

The value of the result or Budgeted Cost Of Work Performed (BCWP) is the value of a job that has been completed against the budget provided for carrying out a job. BCWP is calculated based on progress (actual weight) of completed work in the field then multiplied by the cost budget used to complete the project, so that the BCWP value is known. To be able to compare the BCWP value with BCWS and ACWP then look for the cumulative value of BCWP. Here's the formula to be able to find the BCWP value: BCWP = Actual Weight (%) x Budget Plan For BCWP value per month is displayed in table 1 below:

Tabel 1 Nilai *Budgeted Cost Of Work Performed* (BCWP) setiap Bulan

Bulan Ke	Bobot Aktual (%)	Nilai Kontrak (Rp)	BCWP (Rp)	BCWP Komulatif (Rp)
1	0.43	3,502,000,000.00	15,000,000.00	15,000,000.00
2	1.56	3,502,000,000.00	54,531,466.67	69,531,466.67
3	4.31	3,502,000,000.00	150,861,010.00	220,392,476.67
4	6.00	3,502,000,000.00	210,165,310.00	430,557,786.67
5	7.50	3,502,000,000.00	262,493,663.33	693,051,450.00
6	13.49	3,502,000,000.00	472,328,619.33	1,165,380,069.33
7	13.54	3,502,000,000.00	474,217,201.67	1,639,597,271.00
8	5.47	3,502,000,000.00	191,670,473.33	1,831,267,744.33
9	7.74	3,502,000,000.00	270,956,350.00	2,102,224,094.33
10	8.18	3,502,000,000.00	286,314,503.33	2,388,538,597.67
11	8.10	3,502,000,000.00	283,646,653.33	2,672,185,251.00
12		3,502,000,000.00	-	
13		3,502,000,000.00	-	
14		3,502,000,000.00	-	

Sumber : Hasil Analisis

b. BCWS (Budgeted Cost Of Work Schedule) Analysis

Budgeted Cost Of Work Schedule (BCWS) is a budget for a work package that is compiled and associated with the implementation schedule. BCWS is calculated based on the planned implementation of the work to be achieved as planned in the time schedule multiplied by the cost budget used to complete the project. So in can budget against schedule plans of implementation of the project according to time schedule. To compare BCWS value with BCWP and ACWP then look for the cumulative value of BCWS. Here's the formula to be able to calculate the BCWS value: BCWS = Plan Weight (%) x Budget Plan

For BCWS value every month is displayed in table 2 below:

Tabel 2 Nilai *Bugeted Cost Of Work Schedule* (BCWS) setiap Bulan

Bulan	Bobot Rencana (%)	Nilai Kontrak (Rp)	BCWS (Rp)	BCWS Komulatif (Rp)
1	0.87	3,502,000,000.00	30,450,000.00	30,450,000.00
2	1.56	3,502,000,000.00	54,619,400.00	85,069,400.00
3	5.59	3,502,000,000.00	195,673,780.00	280,743,180.00
4	7.88	3,502,000,000.00	275,798,400.00	556,541,580.00
5	7.10	3,502,000,000.00	248,507,850.00	805,049,430.00
6	12.66	3,502,000,000.00	443,454,000.00	1,248,503,430.00
7	11.66	3,502,000,000.00	408,225,625.00	1,656,729,055.00
8	8.56	3,502,000,000.00	299,642,325.00	1,956,371,380.00
9	7.54	3,502,000,000.00	264,058,252.86	2,220,429,632.86
10	9.75	3,502,000,000.00	341,286,300.00	2,561,715,932.86
11	7.78	3,502,000,000.00	272,289,400.00	2,834,005,332.86
12	7.50	3,502,000,000.00	262,634,000.00	3,096,639,332.86
13	8.02	3,502,000,000.00	281,026,220.00	3,377,665,552.86
14	3.55	3,502,000,000.00	124,334,447.14	3,502,000,000.00

Sumber : Hasil Analisis

c. ACWP Analysis (Actual Cost Of Work Performed)

In the calculation of project costs construction is divided into two major groups, namely: Direct cost (direct cost) which is the cost associated with the physical project. Indirect cost (inderect cost) is a cost that is not directly related to the project but must exist and can not be separated from the project [4].

The actual cost of the work that has been performed for a certain reporting period is the actual cost of Actual Cost Of Work Performed (ACWP). The ACWP value is derived from the direct and indirect costs of expenditure

records in the form of wage expenditures, materials and tools used to carry out the work at any given time. From the expenditure of wages, materials and tools each month is added then the value of ACWP per month.

Tabel 3 Nilai *Actual Cost Of Work Performed* (ACWP) pada setiap bulan

Bulan Ke	Pengeluaran		ACWP (Rp)	ACWP Komulatif (Rp)
	Bahan dan Alat (Rp)	Upah Kerja (Rp)		
1	33,000,000.00	18,200,000.00	51,200,000.00	51,200,000.00
2	1,770,000.00	12,000,000.00	13,770,000.00	64,970,000.00
3	27,704,100.00	65,500,000.00	93,204,100.00	158,174,100.00
4	72,829,750.00	48,500,000.00	121,329,750.00	279,503,850.00
5	122,882,850.00	56,500,000.00	179,382,850.00	458,886,700.00
6	57,443,950.00	76,000,000.00	133,443,950.00	592,330,650.00
7	360,000.00	60,000,000.00	60,360,000.00	652,690,650.00
8	339,353,175.00	43,000,000.00	382,353,175.00	1,035,043,825.00
9	60,768,905.00	41,000,000.00	101,768,905.00	1,136,812,730.00
10	263,693,014.00	80,000,000.00	343,693,014.00	1,480,505,744.00
11	38,764,291.00	27,000,000.00	65,764,291.00	1,546,270,035.00
12	-	-	-	-
13	-	-	-	-
14	-	-	-	-

Sumber : Hasil Analisis
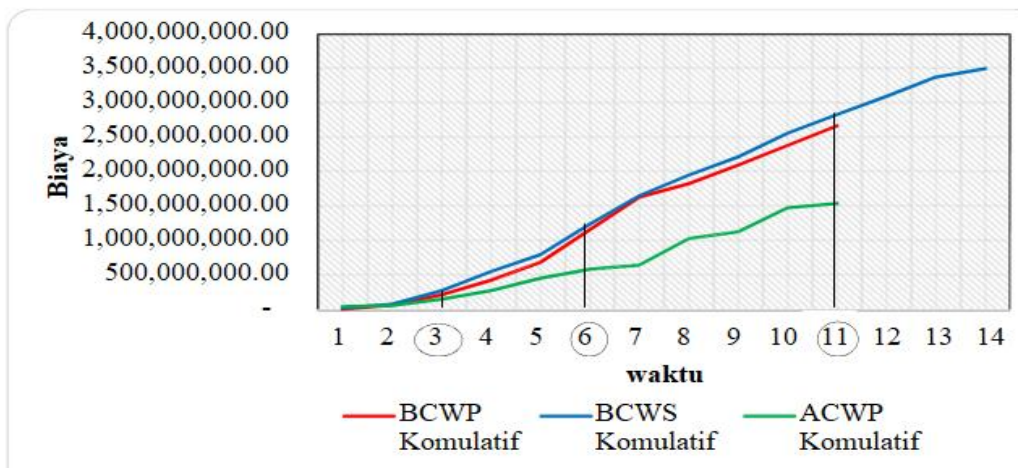
Picture 2 Monthly indicator graphic of earned value method

In Figure 2 we can see the results of a composite graph of the indicators used for the evaluation of project implementation performance with the earned value method are Budgeted Cost Of Work Performed (BCWP), Actual Cost Of Work Performed (ACWP), and Budgeted Cost Of Work Schedule (BCWS). These indicators are the basic concepts of value of results that can be used to evaluate project implementation performance in order to achieve the project objectives. [5]

3.2 Variations of Integrated Cost and Schedule

a. Cost Variance (CV)

Difference between values earned after completing the work item (BCWP) with the actuary cost incurred during the project implementation (ACWP) is cost variance. Here's the formula to calculate the cost variance (CV).

CV = BCWP – ACWP

The value of cost variance (CV) is determined based on the following:

> Positive (+) = implementation cost is lower than the budget
> Zero (0) = implementation cost is appropriate to the budget
> Negative (-) implementation cost is higher than the budget.

1) Calculation of *cost variance* (CV) in the third month, is as follows:
   Cumulative value of *Budgeted Cost Of Work Performed* (BCWP)
   =Rp 220,392,476.67
   Cumulative value of *Actual Cost Of Work Performed* (ACWP)
   =Rp 158,174,100.00
   Thus the value of *cost variance* (CV) in the third month can be calculated as:
   CV = Rp 220,392,476.67 – Rp 158,174,100.00
   = Rp 62,218,376.67

2) Calculation of *cost variance* (CV) in the sixth month, is as follows:
   Cumulative value of *Budgeted Cost Of Work Performed* (BCWP)
   = Rp 1,165,380,069.33
   Cumulative value of *Actual Cost Of Work Performed* (ACWP)
   = Rp 592,330,650.00
   Thus the value of *cost variance* (CV) in the sixth month can be calculated as:
   CV = Rp 991,461,325.00 - Rp 592,330,650.00
   = Rp 573,049,419.33

3) Calculation of *cost variance* (CV) in the eleventh month, is as follows:
   Cumulative value of *Budgeted Cost Of Work Performed* (BCWP)
   = Rp 1,165,380,069.33
   Cumulative value of *Actual Cost Of Work Performed* (ACWP)
   = Rp 1,546,270,035.00
   Thus the value of *cost variance* (CV) in the sixth month can be calculated as:
   CV = Rp 2,672,185,251.00 - Rp 1,546,270,035.00
   = Rp 1,125,915,216.00

b. Schedule Variance (SV)

Schedule Variance (SV) is used to calculate the deviation between BCWS and BCWP. Here's the formula for calculating Schedule Variance (SV).

SV = BCWP - BCWS

The Value of Schedule Variance (SV) is determined based on the following:

> Positive (+)= implementation time is faster than the plan
> Zero (0)= implementation time is appropriate to the plan
> Negative (-)= implementation time is slower than the plan

1) Calculation of Schedule Variance (SV) in the third month is as follows:
   Cumulative value of *Budgeted Cost of Work Performed*=
   Rp 220,392,476.67
   Cumulative value of *Budgeted Cost of Work Schedule* (BCWS)=
   Rp 280,743,180.00
   Thus, value of *Schedule Variance* (SV) in the third month is:
   SV = Rp 220,392,476.67 - Rp 280,743,180.00
   = Rp - 60,350,703.33

2) Calculation of Schedule Variance (SV) in the sixth month, is as follows:
   Cumulative value of *Budgeted Cost of Work Performed*=
   Rp 1,165,380,069.33
   Cumulative value of *Budgeted Cost of Work Schedule* (BCWS)=
   Rp 1,248,503,430.00
   Thus, value of *Schedule Variance* (SV) in the third month is:
   SV = Rp 1,165,380,069.33 - Rp 1,248,503,430.00
   = Rp - 83,123,360.67

3) Calculation of Schedule Variance (SV) in the eleventh month, is as follows:
Cumulative value of *Budgeted Cost of Work Performed*=
Rp 2,672,185,251.00
Cumulative value of *Budgeted Cost of Work Schedule* (BCWS)=
Rp 2,834,005,332.86
Thus, value of *Schedule Variance* (SV) in the eleventh month is:
SV = Rp 2,672,185,251.00 - Rp 2,834,005,332.86
= Rp - 161,820,081.86

3.3 Index of Productivity and Performance

Project managers often want to know the use of power sources, which can be expressed as a productivity index or performance index. By knowing that use of resources so that project management becomes better. This performance index consists of performance index Cost Performance Index (CPI) and performance index Schedule Performance Index (SPI).

Performance index values can be translated by index criteria, as follows:
a. The performance index <1, means the spending greater than the budget or execution time is longer than the planned schedule.
b. Performance index > 1, means the expenditure is less than planned budget or schedule is faster than what had been planned.
c. The
d. more different the performance index is from number 1, the greater the deviation from the basic planning or budget is. If the number is too high, it means that the achievement of the work is very good, it needs to be carried out a deeper assessment; whether the planning or budget may be unrealistic.

a. Cost Performance Index (CPI)

Cost efficiency factors can be identified by comparing the value of the physically completed work (BCWP) at the cost of the same period (ACWP). The following formula calculates the Cost Performance Index (CPI).

$$CPI = \frac{BCWP}{ACWP}$$

1) Calculation of CPI in the third month, is as follows:
Cumulative Value of Budgeted Cost of Work Performed (BCWP)
= Rp 220,392,476.67
Cumulative Value of Actual Cost of Work Performed (ACWP)
= Rp 158,174,100.00

So the Cost Performance Index in the third month can be calculated as:
$$CPI = \frac{Rp\ 220,392,476.67}{Rp\ 158,174,100.00} = 1.39 > 1$$
Thus, in the third month, the expense was lower than the budgeted cost.

2) Calculation of CPI in the sixth month, is as follows:
Cumulative Value of Budgeted Cost of Work Performed (BCWP)
= Rp 1,165,380,069.33
Cumulative Value of Actual Cost of Work Performed
= RP 592,330,650
Thus the Cost Performance Index in the sixth month can be calculated as:
$$CPI = \frac{Rp\ 1,165,380,069.33}{Rp\ 592,330,650.00} = 1.97 > 1$$
So in the sixth month, the expense was lower than the budgeted cost.

3) The calculation of CPI in the eleventh month is as follows:
Cumulative Value of Budgeted Cost of Work Performed (BCWP)
= Rp 2,672,185,251.00
Cumulative Value of Actual Cost of Work Performed (ACWP)
= Rp 1,546,270,035.00

So the Cost Performance Index (CPI) in the eleventh month can be calculated as:

$$CPI = \frac{Rp\ 2,672,185,251.00}{Rp\ 1,546,270,035.00} = 1.73 > 1$$

Thus, in the eleventh month, the expense was lower than the budgeted cost.

b. Scheduled Performance Index (SPI)

The factor of time performance efficiency can be found out by comparing the Budgeted Cost of Work Performed (BCWP) to the Budgeted Cost of Work Schedule (BCWS). Here is a formula to count the Schedule Performance Index (SPI):

$$SPI = \frac{BCWP}{BCWS}$$

1) The calculation of SPI in the third month is as follows:
Cumulative Value of the Budgeted Cost of Work Performed (BCWP)
= Rp 220,392,476.67
Cumulative Value of the Budgeted Cost of Work Schedule (BCWS)
= Rp 280,743,180.00

So the Schedule Performance Index (SPI) in the third month can be calculated as:

$$SPI = \frac{Rp\ 220,392,476.67}{Rp\ 280,743,180.00} = 0.79 < 1$$

Thus, in the third month, the implementation schedule is longer than the planned schedule.

2) The calculation of SPI in the sixth month is as follows:
Cumulative Value of the Budgeted Cost of Work Performed (BCWP)
= Rp 1,165,380,069.33
Cumulative Value of the Budgeted Cost of Work Schedule (BCWS)
= Rp 1,248,503,430.00

So the Schedule Performance Index (SPI) in the sixth month can be calculated as:

$$SPI = \frac{Rp\ 1,165,380,069.33}{Rp\ 1,248,503,430.00} = 0.93 < 1$$

Thus, in the sixth month, the implementation schedule was longer than the planned schedule.

3) The calculation of SPI in the eleventh month is as follows:
Cumulative Value of the Budgeted Cost of Work Performed (BCWP)
= Rp 2,672,185,251.00
Cumulative Value of the Budgeted Cost of Work Schedule (BCWS)
= Rp 2,834,005,332.86

So the Schedule Performance Index (SPI) in the eleventh month can be calculated as:

$$SPI = \frac{Rp\ 2,672,185,251.00}{Rp\ 2,834,005,332.86} = 0.94 < 1$$

Thus, in the eleventh month, the implementation schedule was longer than the planned schedule.

Table 4 Recapitulation of the Project Implementation Performance Status

Earned Value Method	Calculation	Calculation Result	Description
I. Cost Parameter			
1 *Cost Varians* (CV)	= BCWP - ACWP = Rp 2,672,185,251.00 - 1,546,270,035.00	= Rp	Positive (+), The cost is lower than the budget
2 *Cost Performance Index* (CPI)	$=$ $\dfrac{BCWP}{\text{Rp } 1,546,270,035.00}$ = Rp 2,672,185,251.00	= 1.73	CPI > 1, The cost is lower than the budget
II. Time Parameter			
1 *Schedule Varians* (SV)	= BCWP - BCWS = Rp 2,672,185,251.00 - Rp 2,834,005,332.86	= Rp -161,820,081.86	Negative (-), the implementation time is slower than the planned time
2 Schedule Performance Index (SPI)	$=$ $\dfrac{BCWP}{}$ = Rp 2,672,185,251.00	= 0.94	SPI < 1, The implementation time is longer than the planned time

Table 5 Recapitulation of the Estimation on Project Completion Cost and Time

Earned Value Method	Calculatio	Calculation	Description
I. Cost Estimation			
1 *Estimate Temporary Cost* (ETC) / Estimation for the cost of the remaining work	$= \dfrac{(BAC - BCWP)}{CPI}$ (RP 3,502,000,000.00 − Rp 2,672,185,251.00)	= Rp 480,175,422.00	Thus, the cost to finish the remaining work = Rp 480,175,422.16
2 *Estimate At Completion* (EAC) / The cost on the end of the project	= ACWP + ETC = Rp 1,546,270,035.00 + Rp 480,175,422.00	= Rp 2,026,445,457.16	So, the cost in the end of the project = Rp 2,026,445,457.16
3 *Varia nce At Completion* (VAC) / The difference between the budgeted cost and the final cost in accordance with the accomplished work	= BAC - EAC = Rp 3,502,000,000.00 - Rp 2,026,445,457.16	=Rp 1,475,554,542.84	So, the difference between the budgeted cost and the final cost= Rp
II. Time Estimation			
1 *Estimate Temporary Schedule* (ETS) / Time estimation for the remaining work	$= \dfrac{(\text{the remaining time})}{SPI}$ (3 months) $=$	= 3.2 months	So, the time spent to finish the remaining work = 3.2 months
2 *Estimate At Schedule* (EAS) / Time estimation for the completion of whole project	= completion time + ETS = 11 months + 3.2 months	= 14.2 months	So, the total of the time spent for the whole project= 14.2

4. CONCLUSION AND SUGGESTION
4.1 Conclusion

The analysis results of the implementation performance of the development project of Shimamoto Ryosaku Villa, Seminyak, Bali, by applying Earned Value Method are:

a. Project implementation performance dealing with cost and time matter:

1) Performance in terms of cost shows savings from the budgeted cost, this is shown from the value of Cost Performance Index (CPI) > 1 in the report of the third month = 1.39, sixth month= 1.97, and in eleventh month= 1.73 in accordance with the positive Cost Variance (CV) value in the report of the third month =

Rp 62,218,376.67, in the report of the sixth month= Rp 573,049,419.33, and in the report of the eleventh month= Rp 1,125,915,216.00.

2) Performance in terms of schedule shows delay of the plan, this is shown by the value of Schedule Performance Index (SPI) < 1 in the third month report= 0.79, in the sixth month report= 0.93, and in the eleventh month report = 0.94, Based on the value of the negative Schedule Variance (SV) in the third month report = Rp - 60,350,703.33; in the sixth month report= Rp - 83,123,360.67; and in the eleventh month report = Rp - 161,820,081.86.

b. The remaining cost and time needed to finish the project:

1) In terms of cost, the estimation of cost to finish the remaining job (ETC) is Rp 480,175,422.16, and the cost calculated in the end of the project is Rp 2,026,445,457.16, meanwhile the contract value (BAC) is Rp 3,502,000,000.00. So the estimation of difference obtained between the contract value and the cost of project completion in accordance with the achieved work performance (VAC) is Rp 1,409,621,615.49.

2) In terms of time, the estimation of time to finish the remaining jobs (ETS) is 3.2 months, and the estimation of total time of project completion is 14.2 months. The time specified in the contract is 14 months, so the project is delayed for 0.2 month (1 week).

4.2 Suggestion

a. This research can be developed further by using Microsoft Project program in the data analysis.
b. To overcome delays, it can be done workers addition and technological innovation, so the best and the fastest working methods can be chosen.

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