

PERFORMANCE ANALYSIS OF THE SANTA LAZARUS MULTIPURPOSE BUILDING CONSTRUCTION PROJECT USING *EARNED VALUE MANAGEMENT (EVM)*

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ABSTRACT

Discrepancies in project implementation against the plan are generally caused by time and cost factors. This study aims to evaluate project performance analyzed using the Earned Value Management (EVM) method through the calculation of indicators such as BCWS, BCWP, ACWP, CV, SV, CPI, SPI, EAC, ETC, TCPI, and TE. Evaluation is carried out every month to identify cost and time deviations. The analysis results show that in the 7th month, the ACWP value is Rp 2,502,643,000.00 and the EAC is Rp 3,182,000,000.00 of the total funds allocated Rp 3,440,000,000.00. The project is estimated to be completed in 12 months or the project has accelerated the implementation time and efficiency in the use of the budget.

Keywords: *Earned Value, Cost, Time*

1. INTRODUCTION

Infrastructure development, including multipurpose buildings, has a strategic role in supporting economic growth and community welfare. The multipurpose building not only functions as a public facility, but also contributes to economic growth and community welfare improving the quality of life of citizens. For this reason, effective project management is needed so that the project is completed on time, at the planned cost, and the quality of work is maintained. One of these projects is the Construction of the Santa Lazarus Multipurpose Building in Banjarmasin, South Kalimantan.

This project is valued at IDR 3,440,000,000.00 (without VAT because it is managed by the foundation), funded by Father Albertus Jamlean as the service user, and has an implementation duration of 365 calendar days by the contractor CV Wiko. However, the implementation in the field has accelerated compared to the planned schedule. The mismatch between the plan and realization is influenced by time and cost factors, so the evaluation of project performance is important to ensure that the acceleration does not

cause cost overruns.

The evaluation was conducted by considering the management of cost and time as the main components in project management. Significant discrepancies in these two aspects can indicate suboptimal performance. Therefore, the author analyzed the performance of the Santa Lazarus Multipurpose Building Construction project using the *Earned Value Management* (EVM) approach to assess the efficiency and effectiveness of project implementation in terms of cost and time.

The main objective of this research is to assess the performance of the construction project that has been carried out, namely the Santa Lazarus Multipurpose Building Construction Project based on cost and schedule aspects using the *Earned Value Management* (EVM) approach, and estimate the total budget requirements and project completion time. This research contributes to increasing the understanding of the author and academics, especially students, regarding the *Earned Value Management* (EVM) method, and has the potential to become a reference for related agencies in assessing project performance from the aspects of cost and time.

2. THEORITICAL STUDY

2.1 Performace

Based on research (Luthfiyah et al., 2022) that the performance of a project can be assessed through several indicators, such as cost, quality, time, and work safety. To obtain optimal results, thorough, meticulous, and coordinated planning of all resources, including labor, equipment, materials, and budget, in accordance with project needs. The planning must be in line with predetermined success parameters. In addition, setting clear and precise performance standards during project implementation is very important to reduce the possibility of deviations in terms of cost, quality, and time, so that the project can be carried out efficiently and effectively.

2.2 Cost Budget Plan (RAB)

The Cost Budget Plan or known as RAB is a prediction of the total cost that will be incurred to complete the construction work, consisting of material costs, labor payments, and other financial aspects related to project implementation (Rosmayati, 2023).

2.3 Definition of *Earned Value*

According to (Febrianti & Alfandi, 2023) *Earned Value Management* (EVM) is an approach used to evaluate project progress by assessing whether its implementation is above or below budget, as well as faster or slower than the predetermined schedule. This method integrates three main elements, namely planned costs (*Planned Budget*), actual costs that have been incurred (*Actual Cost*), and the value of work results achieved in accordance with the costs that have been spent, referred to as *Earned Value*. *Earned Value Management* (EVM) is an approach applied in project management to support the process of controlling time and cost during project implementation. Through the application of this method, the progress of the work (percentage of completion) can be known more accurately, based on the comparison between the planned *cost* allocation (*budgeted cost*) and the *actual* costs that have been incurred (*actual cost*) (Castollani et al., 2020). In evaluating project performance with *Earned Value Management* (EVM) is one approach in project management that is used to support the process of controlling time and cost during project implementation. The indicator shows the status of project progress in the current period and serves as a basis for predicting future performance. According to Research (Pamadi et al., 2021) Some of the main indicators used include:

1. BCWS (*Budgeted Cost of Work Schedule*)

BCWS is a budget that is planned as the basis for carrying out work within a certain period of time. This indicator is also known as PV

2. BCWP (*Budgeted Cost of Work Performed*)

BCWP refers to the initial estimate of funds prepared for the implementation of work that has been completed within a certain period of implementation. The calculation is based on the accumulated work that has actually been completed. This indicator is also known as EV.

3. ACWP (*Actual Cost of Work Performed*)

ACWP shows the total real cost or actual cost used in a certain period to complete the project work, also known as AC.

2.4 *Earned Value* Concept on Project Performance

Three main indicators, namely BCWP, ACWP, and BCWS, can be used to calculate various parameters that describe the progress and performance of the project during its

implementation (Putra et al., 2023).

a. CV (*Cost Variance*)

CV serves to measure the difference between the value of work that has been achieved based on the budget (BCWP) and the actual expenditure of the project (ACWP). With the following formula:

$$CV = BCWP - ACWP \quad (1)$$

b. SV (*Schedule Variance*)

SV comparison of BCWP and BCWS values produces an indicator used to monitor the project. The calculation formula is:

$$SV = BCWP / BCWS \quad (2)$$

c. CPI (*Cost Performance Index*)

CPI is the ratio between BCWP and ACWP which is used as a project control tool to measure the efficiency of using costs. The formula for calculating CPI is:

$$CPI = BCWP / ACWP \quad (3)$$

d. *Schedule Performance Index* (SPI)

Schedule Performance Index (SPI) is an indicator used in project control to evaluate schedule performance, by comparing the value of BCWP against BCWS. The calculation formula is:

$$SPI = BCWP / BCWS \quad (4)$$

e. *Memperkirakan Estimate to Complate* (ETC)

ETC is an estimate of the cost required to complete the remaining work, assuming that the project performance will run consistently until the end.

$$ETC = (\text{Total Anggaran} - BCWP) / CPI \quad (5)$$

f. *Memperkirakan EAC*

EAC represents the total projected budget until project completion, calculated by adding the actual cost utilized (ACWP) to the estimated cost of the remaining work (ETC).

$$EAC = ACWP + ETC \quad (6)$$

g. TE

$$TE = ATE + (OD - (ATE \times SPI)) / SPI \quad (7)$$

h. *To Complete Performance Index (TCPI)*

To analyze the forecast using the formula:

$$TCPI = (BAC - BCWP) / (EAC - ACWP) \quad (8)$$

3. METHODS

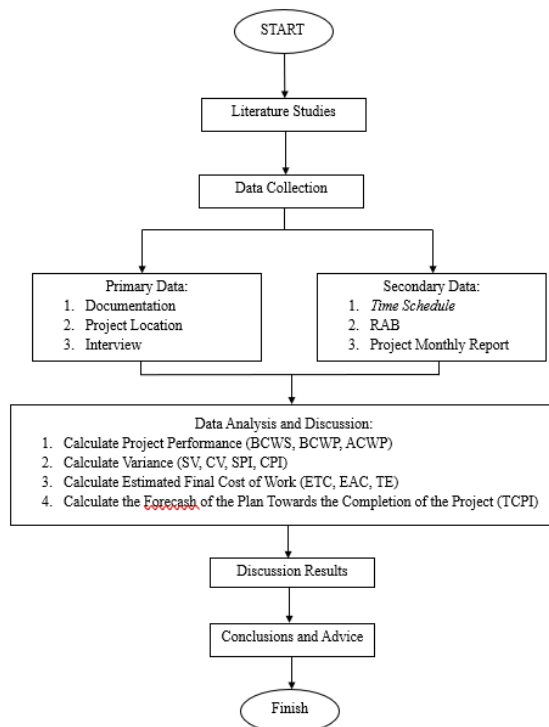


Figure 1. Research Flow Chart

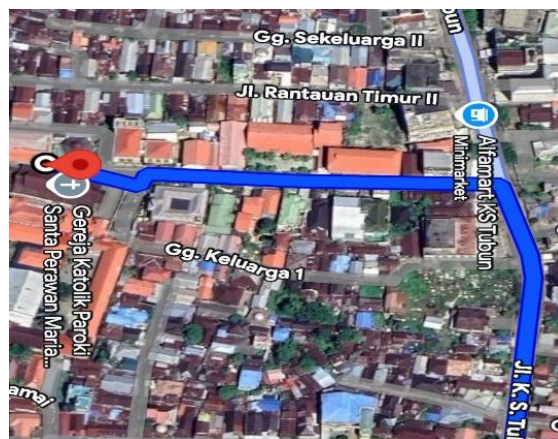


Figure 2. Place of Research Implementation

4. RESULT AND DISCUSSION

4.1 Project Data

Project Name : Construction of Santa Lazarus Multipurpose Building
 Contact Value : IDR 3,440,000,000.00
 Address : Jl. Rantauan Timur I Rt.15C, Kel.Kelayan Barat South
 Banjarmasin
 Implementation Time : 365 calendar days

Data on the Cost Budget Plan for the Santa Lazarus Multipurpose Building Construction Project amounting to Rp. 3,440,000,000.00- (without VAT because of the foundation) can be seen in Table 4.1 Recapitulation of the following Work Items.

Tabel 4.1. Recapitulation of Work Items

Santa Lazarus Work Item Recapitulation		Total
A	Preparatory Work	64,341,300
B	25x25 MiniPile Pile Work	557,100,000
C	Earthwork	18,346,663
D	Concrete Structure Work	1,427,242,174
E	Steel Roof Structure Work	341,802,681
F	Architectural Works	758,387,501
G	Other Other Work	131,347,471
H	Mechanical Electrical Work	144,146,455
Grand Total		3,442,714,246
Three Billion Four Hundred Forty Million Rupiah		Rp3.440.000.000

4.2 ACWP (*Actual Cost Work Performed*)

ACWP calculation for 7 months of implementation. Table 4.2 below presents data on the *Actual Cost Work Performed* Calculation Results

Table 4.2 *Actual Cost Work Performed* Calculation Results

Month	AC Estimation	Weight	ACWP
1	Rp3,182,000,000.00	18,37%	Rp584,533,400.00
2	Rp3,182,000,000.00	31,12%	Rp990,238,400.00
3	Rp3,182,000,000.00	41,91%	Rp1,333,576,200.00
4	Rp3,182,000,000.00	56,25%	Rp1,789,875,000.00
5	Rp3,182,000,000.00	61,58%	Rp1,959,475,600.00
6	Rp3,182,000,000.00	68,40%	Rp2,176,488,000.00
7	Rp3,182,000,000.00	78,65%	Rp2,502,643,000.00

Table 4.2 shows the ACWP value for 7 months of project implementation. The

estimated project cost remains at IDR 3,182,000,000.00, while the ACWP value is calculated based on the progress weight every month. The ACWP value increases as the weight of the work increases, from Rp584,533,400.00 in the first month to reach Rp2,502,643,000.00 in the seventh month.

This statement shows that project expenditure is in line with physical progress in the field, and reflects that the budget is used in a controlled manner and in accordance with the plan during the implementation period.

4.3 Determining *BCWP*, *ACWP*, *BCWS*, *CV*, *SV*, *SPI*, *CPI*, *ETC*, *EAC*, *TCPI* and *TE*

The BCWP, ACWP, and BCWS calculations obtained are recapitulated using *Microsoft Excel* and presented in Table 4.3 *Earned Value* Calculation Results for 7 Months of Review.

Table 4.3. *Earned Value* Calculation Results During Which Review

INDEKS	1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month
BCWS	Rp460,272,000.00	Rp725,496,000.00	Rp994,160,000.00	Rp1,253,536,000.00	Rp1,715,184,000.00	Rp1,966,304,000.00	Rp2,177,520,000.00
BCWP	Rp631,928,000.00	Rp1,070,528,000.00	Rp1,441,704,000.00	Rp1,935,000,000.00	Rp2,118,352,000.00	Rp2,352,960,000.00	Rp2,705,560,000.00
ACWP	Rp584,533,400.00	Rp990,238,400.00	Rp1,333,576,200.00	Rp1,789,875,000.00	Rp1,959,475,600.00	Rp2,176,488,000.00	Rp2,502,643,000.00
CV	Rp47,394,600.00	Rp80,289,600.00	Rp108,127,800.00	Rp145,125,000.00	Rp158,876,400.00	Rp176,472,000.00	Rp202,917,000.00
SV	Rp171,656,000.00	Rp345,032,000.00	Rp447,544,000.00	Rp681,464,000.00	Rp403,168,000.00	Rp386,656,000.00	Rp528,040,000.00
CPI	1.08	1.08	1.08	1.08	1.08	1.08	1.08
SPI	1.37	1.48	1.45	1.54	1.24	1.20	1.24
ETC	Rp2,597,466,600.00	Rp2,191,761,600.00	Rp1,848,423,800.00	Rp1,392,125,000.00	Rp1,222,524,400.00	Rp1,005,512,000.00	Rp679,357,000.00
EAC	Rp3,182,000,000.00	Rp3,182,000,000.00	Rp3,182,000,000.00	Rp3,182,000,000.00	Rp3,182,000,000.00	Rp3,182,000,000.00	Rp3,182,000,000.00
TCPI	1.08	1.08	1.08	1.08	1.08	1.08	1.08
TE	54	247	252	236	296	305	294

According to the data analyzed, the project calculations showed positive performance for seven months. The BCWP value is always higher than BCWS and ACWP, indicating the project is running faster and more cost-effective. CPI and SPI values above 1 indicate cost and schedule efficiency. The estimated final cost (EAC) remained stable, indicating good cost control. The project is considered to be running effectively and efficiently. Based on the data in table 4.3 can be displayed in the form of Figure 4.1 BCWS, BCWP and ACWP Relationship Graph as follows:



Figure 4.1 Relationship Graph of BCWS, BCWP and ACWP

Figure 4.1 The BCWP line above BCWS and ACWP is an indicator that the project shows superior performance, both in terms of timeliness and cost control. The difference between BCWP and BCWS reflects schedule excellence (*Schedule Variance*), while the difference with ACWP shows cost efficiency (*Cost Variance*). Overall, the project is running effectively and efficiently.

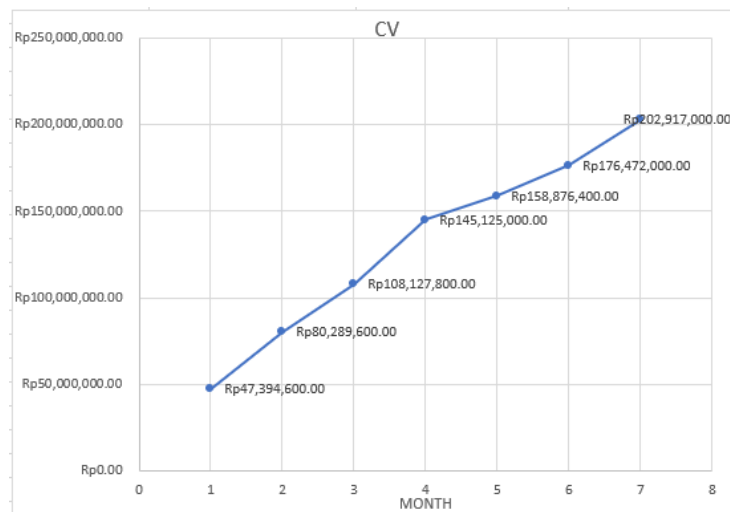


Figure 4.2 Cost Variance (CV)



Figure 4.3 Schedule Variance (SV)

In Figure 4.2 the Cost Variance (CV) Graph shows a positive trend in the CV value from month 1 to month 7, which means that the actual cost continuously shows a smaller value compared to the budgeted cost for the work achieved. From month 1 to month 6, considerable growth was recorded reflecting the increasing cost efficiency of the project, with a peak in month 6 of Rp208,917,000.00.

In Figure 4.3 the Schedule Variance Graph (SV) also shows a positive value over time, indicating that the work was completed ahead of schedule. The highest variation occurred in the 4th month amounting to Rp681,464,000.00. Although there is a slight decrease in month 5, the overall trend still shows excellence in schedule performance.

5. CONCLUSION

Based on the results of the analysis for seven months of project implementation, it was found that the actual expenditure (ACWP) increased as the work progressed, reaching Rp2,502,643,000.00 in the seventh month. The estimated total cost (EAC) remained stable at Rp3,182,000,000.00, indicating good cost control. When BCWP shows a value that is consistently higher than BCWS and ACWP, it indicates time and cost efficiency in project implementation. CPI and SPI indicators that are above 1, reflect efficiency in terms of budget and time. The graphs of cost variance (CV) and schedule variance (SV) also show a positive trend, where the highest CV value is reached in month 6 and the value of schedule variance (SV) is reached in month 6 SV

was highest in month 4. Overall, the project demonstrated effective and efficient performance, with implementation under control and according to plan.

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