

Analysis Of Time And Cost Performance With Earned Value Method In Lecture Building Project Development Of Nutrition Department At East Kalimantan Health Polytechnic

Khoirul Huda, Lalu Mulyadi, Agus Santosa

Abstract: The research is started at the beginning of Lecture Building Project Development of Nutrition Department at Health Polytechnic of East Kalimantan Starting Week 1 (21st June 2016) to 24th week (13th December 2016); cost performance at Lecture Building Development Project of Nutrition Department at Health Polytechnic of East Kalimantan until the 24th week is good and efficient based on the value of ACWP = IDR 9.744.811.962,07, which is smaller than the value of BCWS = IDR 21.583.712.069,60 and the value of BCWP = IDR 13.728.265.040,05 as well as the value of the Cost Performance Index (CPI) = 1,208. For project time performance, it has a delay. It can be seen from the condition of the 24th week of the schedule performance index (SPI) value which is = 0,858 < 1, the value of Schedule variance (SV) = IDR. -1.953.203.330,25. The time for the completion of the rest project is 5 weeks, so the total time for project completion is 31 weeks from the initial schedule of 26 weeks. While the remaining costs needed to complete the work (ETC) after the 24th week is = 4.841.426.269,65 or the cost needed to complete 100% of the work (EAC) is = IDR 11.361.245.034,44.

Index Terms: cost, earned value concept, schedule, variance.

1 INTRODUCTION

The deviation of significant cost and time indicates poor project management. With this cost and time achievement indicator, it is possible to prevent the implementation of the project in accordance with the plans that have been made. Control is one of the functions of project management that has a purpose for the work done in accordance with the goals that have been set without many deviations. The concept of "earned value" is one of the instruments used in project management that integrates cost and time. The purpose of knowing the performance is to monitor the project and to control it, so that if deviation is found, it can be solved immediately. The concept of earned value presents three dimensions: the physical completion of the project (the percent complete) that reflects the budgeted cost plan, the actual cost incurred or the so-called actual cost and what is obtained from the expended cost or so-called earned value. Those the three dimensions, with the concept of earned value, can be connected between the cost performance and time generated from the calculation of variance of cost and time [1].

Mostly projects only rely on the S curve for project control or time performance while the S curve cannot inform the cost. With the performance, the cost is almost unthinkable to be investigated. At this time, the development of the building has a delay in time. By looking at field data at time schedule, project implementation is delayed. The cumulative plan until the end of the 24th week is 94,118%, while the cumulative realization only reached 80,727%, therefore there is a delay of 13,391%. The execution time of the contract starts from 29 June 2016 until 25 December 2016.

2 THEORETICAL BASIS

2.1 Project Management

Management is a process or activity of several people within an organization by utilizing the available resources for the manifestation of objectives that have been determined. In achieving those goals, elements of management are needed which according to Dipohosodo, 1995 consisting of:

- Human power
- Funds or financial resources
- Infrastructure or working tools (method/technology, material, and machine or tool)

Widiasanti [2] defines project as a temporary activity that has clear goals and objectives, runs within a limited time, with a certain allocation of resources. From the above understanding, it can be known the main characteristics of the project which are as follows:

- Having goals and objectives in the form of an end product.
- The project has a temporary nature, i.e. it has clear point of starting and finishing.
- Cost, time, and quality in achieving these goals and objectives have been determined.
- The type and the intensity of activities changing throughout the project lead to the project having non-repetitive properties.

2.2 The Concept of Earned Value

Widiasanti [2] defines the concept of *Earned Value Method*

- *Khoirul Huda is currently pursuing master degree in Civil Engineering, Construction Management Concentration, Malang National Institute of Technology.
E-mail: aurahuda99@yahoo.co.id*
- *Agus Santosa is a lecturer in Civil Engineering, Construction Management Concentration, Malang National Institute of Technology.
E-mail: agusandrianus@yahoo.co.id*
- *Lalu Mulyadi is a lecturer in Civil Engineering, Construction Management Concentration, Malang National Institute of Technology.
E-mail: lalu.mulyadi@gmail.com*

(EVM) as a concept of calculating the cost budget in accordance with the work completed (*budgeted cost of work performed*). In other words, this concept measures the size of the completed work unit, at any given time, when it is valued based on the amount of budget available for the work. The concept of "Earned Value" is one of the instruments used in project management that integrates cost and time. The concept of *Earned Value* presents three dimensions: the physical completion of the project (*the percent complete*) that reflects the budgeted cost plan, the actual cost incurred or the so-called *actual cost* and what is obtained from the expended cost or so-called *earned value* can be connected between the cost performance and time generated from the calculation of variance of cost and time [1]. While the S curve graph of *Earned Value* is illustrated in Fig. 1.

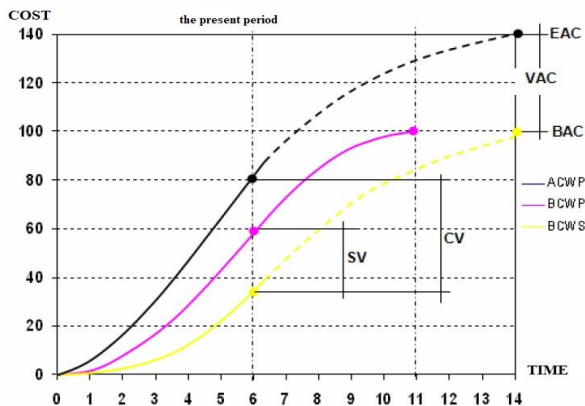


Fig. 1. Figure of Earned Value S Curve [3]

Flemming and Koppelman [1] explain the concept of *Earned Value* compared to traditional cost management. As described in Fig. 2, traditional cost management presents only two dimensions: a simple relationship between the actual cost and the plan cost. With traditional cost management, performance status cannot be known. In Fig. 2a, it can be seen that the actual cost is indeed lower; from this plan, it cannot show that the performance has been done in accordance with the target plan. In contrast, the concept of *Earned Value* provides the third dimension in addition to the actual cost and the plan cost. The third dimension is the amount of physical work that has been completed or called *Earned Value/percent complete*. Given this third dimension, a project manager will be able to understand better how much performance generated from the amount of costs that have been incurred (Fig. 2b).

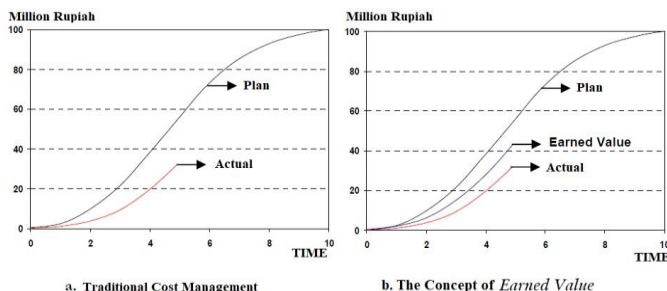


Fig. 2. Comparison of Traditional Cost Management and Earned Value Concept according to Fleming & Koppel [3]

There are three basic elements that become the reference in analyzing the performance of the project based on the concept of Earned Value. The three elements are:

- The Budget Cost for Work Scheduled (BCWS)** is the cost budget allocated based on the work plan that has been prepared on the time or budgeted costs of the work planned to be incurred in an activity between the start date and the end date of the activity.
- Actual Cost for Work Performed (ACWP)** is the actual cost of the work used.
- Budgeted Costs for Work Performed (BCWP)** is the budgeted costs of the work achieved or the value received from the completion of work during a given period of time. BCWP is also called *Earned Value*.

The use of *Earned Value* concept in the assessment of project performance can be explained through Fig. 3.

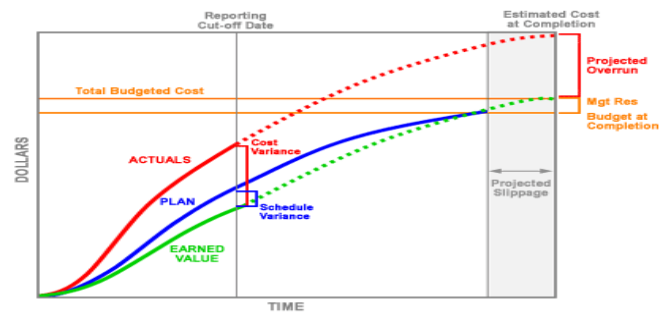


Fig. 3. Figure of Earned Value Curve S [3]

By using the 3 indicators aforementioned above, it can be calculated various factors that show the progress and performance of project implementation, such as:

- Integrated Cost Variance (CV) and Schedule Variance (SV)
- Monitor changes in variance on standard numbers.
- Productivity and performance indexes
- Estimated project cost.

3 RESEARCH METHOD

3.1 General

The research is conducted in Lecture Building Development Project of Nutrition Department at East Kalimantan Health Polytechnic in Samarinda addressed at Kurnia Makmur Street, Harapan Baru Sub-district, Loa Janan Ilir District, Samarinda, East Kalimantan. By referring to the existing contract, the project is realized from 29 June to 25 December 2016.

3.2 Data Collection

Primary data is obtained from related institutions and literature review such as:

- Cost Plan of the contract attachment that has been agreed between the executor and the employer.
- Implementation Schedule
- Work Progress Report.
- Accounting Report from the executing party.
- Monthly Certificate
- Plan Description

Secondary data is obtained from related agencies, as well as through literature studies in libraries and the internet.

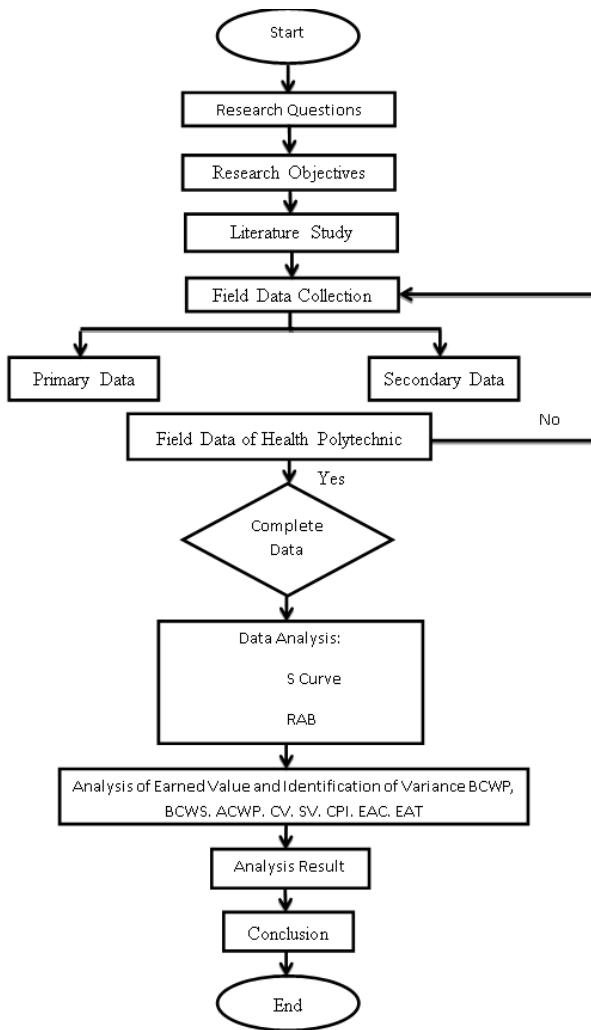


Fig. 4. Scheme of Study Flow

4 RESEARCH RESULT AND DISCUSSION

4.1 Analysis of Project Control Using Earned Value Method

In calculating using *Earned Value Method*, the first step to do is to determine the indicators of *Earned Value* method which are BCWS, BCWP, ACWP, CPI and SPI.

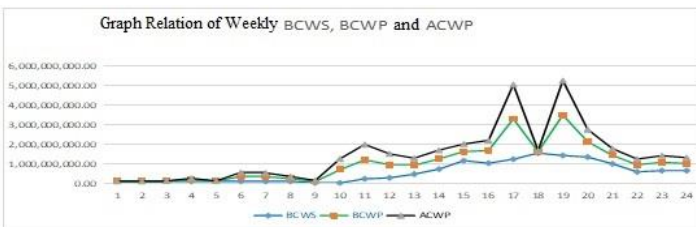


Fig. 5. Graph of the Relationship among Weekly BCWS, BCWP and ACWP

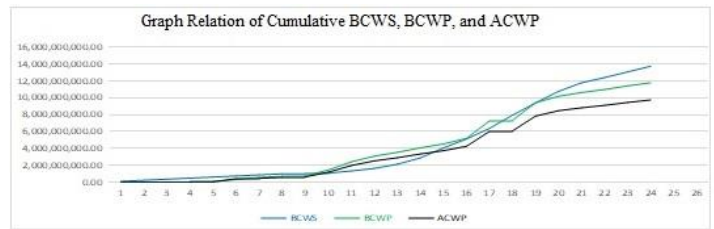


Fig. 6. Graph of BCWS, BCWP and Cumulative ACWP Relation; Description: The execution period is slower, The execution period is faster

4.2 Discussion of BCWP, BCWS, and ACWP Relation Graph

Based on the analysis of the *earned value* shown in Fig. 5 graph of BCWP, BCWS, and ACWP relation, it can be seen the difference between the cost of the plan (BCWS) and the realization cost of the project implementation (BCWP) and the actual cost (ACWP), where there is a physical delay until 9 weeks. For instance, the budget value (BCWS) at 9th week = IDR 1.057.647.870,02 progress value (BCWP) = IDR 784.768.789,34 and the actual expenses incurred (ACWP) = IDR 647.499.159,97. Then, when it reviewed at week 24, where the budget value (BCWS) at week 24 = IDR 13.728.265.040,05, the value of BCWP = IDR 11.775.061.709,80, and ACWP = IDR 9.744.811.962,07; from these values, it can be concluded that until week 24, the contractor gains a profit or CV = IDR 2.030.249.747,73 while the unfinished work is of 13,810% or with budget of SV = IDR 1.953.203.330,25.

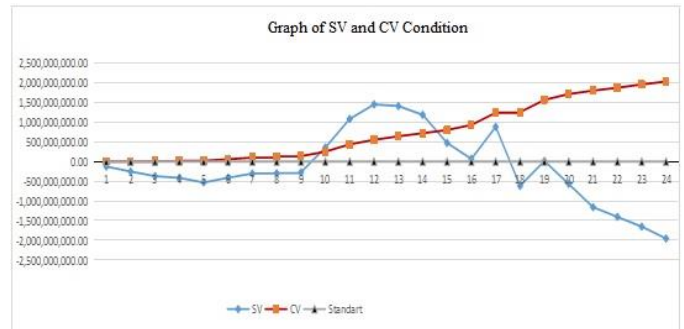


Fig. 7. Graph of SV and CV Condition

4.3 Discussion of Variance Analysis

- a) Calculation of variance analysis of both *Schedule Variance* (SV) and *Cost Variance* (CV) shows that there is a change of *Schedule Variance* (SV) starting from week 1 to week 24. At week 1 to week 9, the SV value is always negative or the work execution is always late from the schedule. Then, at week 10 to week 17, the SV value changes positively which means that the implementation of the work is faster than the schedule of the plan. At the 18th week until the 24th week, the execution is delayed again except for the 19th week.
- b) Besides, for *Cost Variance* (CV), from week 1 to week 24, it is always positive or the contractor has a good performance because the cost is always lower than the budgeted costs.

TABLE 1: SUMMARY OF TIME PERFORMANCE (SPI) AND COST (CPI) ANALYSIS

Week	PERFORMANCE INDEX		Time and Cost Performance			Note
	SPI	CPI	(4)	(5)	(6)	
1	0,000	0,000	The execution time is ineffective	The project cost is inefficient	cost is	Due to labor factor
2	0,000	1,235	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
3	0,026	1,248	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
4	0,185	1,249	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
5	0,163	1,197	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
6	0,459	1,206	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
7	0,657	1,214	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
8	0,710	1,212	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
9	0,742	1,209	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
10	1,324	1,219	The execution time is effective	The project cost is efficient	cost is	
11	1,800	1,216	The execution time is effective	The project cost is efficient	cost is	
12	1,877	1,220	The execution time is effective	The project cost is efficient	cost is	
13	1,657	1,214	The execution time is effective	The project cost is efficient	cost is	
14	1,410	1,213	The execution time is effective	The project cost is efficient	cost is	
15	1,116	1,218	The execution time is effective	The project cost is efficient	cost is	
16	1,013	1,206	The execution time is effective	The project cost is efficient	cost is	
17	1,138	1,206	The execution time is effective	The project cost is efficient	cost is	
18	0,922	1,199	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
19	1,002	1,202	The execution time is ineffective	The project cost is efficient	cost is	
20	0,947	1,204	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
21	0,902	1,205	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
22	0,887	1,207	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
23	0,874	1,208	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor
24	0,858	1,203	The execution time is ineffective	The project cost is efficient	cost is	Due to labor factor

4.4 Discussion of Variance Analysis

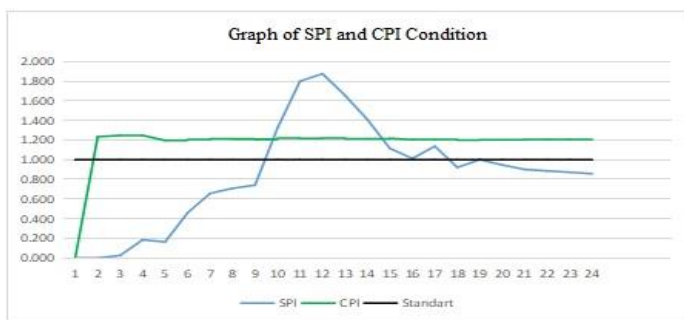


Fig. 8. Graph of SPI and CPI Condition

4.5 Identifying Time Needs for Project Completion

As an illustration, the calculation of remaining project completion time *Estimate Time At Completion* (ETAC) is given Based on contractor performance or on *schedule performance index* (SPI).

$$ETAC = \frac{1 - \frac{BCWP}{BCWS}}{SPI} = \frac{1 - \frac{11.775.061.709,80}{13.728.265.040,05}}{0,858} = 30,3 \sim 31 \text{ Weeks}$$

Therefore, the time needed to complete the rest of the project of 19,691% is 5 weeks or the total initial contract time of 26 weeks to be 31 weeks.

4.6 Identifying Cost Needs for Project Completion

At the end of week 24, the total progress of the completed work is 80,727% with the value of BCWP of 11.775.061.709,80. There is 19,691% work that will be completed within 2 (two) weeks of the total contract time of 26 weeks. The cost needs to complete the work of 19,691% is estimated of: 19,691% x IDR 14.586.238.231,72 in which the value is equivalent to IDR 2.872.176.170,21. Thus, the remaining cost required for the work completion of 19,691% is IDR 2.872.176.170,21; *Cost Performance Index* (CPI) at the end of the 24th week is 1,208, so that the real cost required for completion of the remaining work is: In addition, overall, the cost needed to complete 100% of this work is estimated as follows:

$$EAC = ACWP + ETC$$

$$= IDR 294.642.012,28 + IDR 4.841.426.269,65$$

$$= IDR 5.136.068.281,93$$

From the calculation, the contractor is estimated to have residual funds or profits after completing 100% of this work which is of IDR 14.586.238.231,72- IDR 11.361.245.034,22= IDR 3.224.993.197,28.

$$ETC = \frac{Contract\ Value - BCWP_{24}}{CPI}$$

$$= \frac{IDR 14.586.238.231,72 - 11.775.061.709,2280}{1,208}$$

$$= IDR 4.841.426.269,65$$

5 CONCLUSION AND SUGGESTION

5.1 Conclusion

- Time performance of Lecture Building Development Project of Nutrition Development at East Kalimantan Health Polytechnic has a delay. It can be seen in the condition of the 24th week of the *Schedule Performance Index* (SPI) which is of = 0,858 < 1, the value of *Schedule variance* (SV) = -1.953.203.330,25. The completion time of the rest project is 5 weeks, so that the total time is 31 weeks from the initial schedule of 26 weeks.
- In general, cost performance of Lecture Building Development Project of Nutrition Development at East Kalimantan Health Polytechnic until the 24th week is included into medium category because even though the value of ACWP = IDR 9.744.811.962,07, which is smaller than the value of BCWS = IDR 13.728.265.040,05 and the value of BCWP = IDR 11.775.061.709,80 and the value of *Cost Performance Index* (CPI) = 1,208 > 1, the value of *Cost Variance* (CV) = IDR 2.030.249.747,73 has a positive value, but there is a work experiencing delay of 13,391%.
- The remaining cost needed to complete the work (ETC) after the 24th week is IDR 4.841.426.269,65 or the cost needed to complete 100% of the work (EAC) of the Lecture Building Development Project of Nutrition

Department at Health Polytechnic of East Kalimantan is IDR 11.361.245.034,44.

5.2 Suggestion

The suggestions that can be addressed to this research are:

- a) To the relevant departments or institutions, *earned value* method can be utilized to make an evaluation because this method is effective to be implemented by as a means of monitoring and controlling the project since it can give an idea about the condition of project performance.
- b) To the next researcher, it is recommended to make improvements to this research by examining the effect of time and cost performance on the achievement of quality.

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