TIME DELAY ANALYSIS ON THE AYSHA CIBINONG ISLAMIC HOSPITAL PROJECT

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Abstract

Currently, the progress of infrastructure in Indonesia is very rapid, in its implementation the project must be in accordance with the planned time. Therefore there must be project control in terms of performance in terms of the amount of work time. The purpose of this study is to find out how long the delay is on the project and how long the work is completed with the conditions that occur in the field. In the construction project of the Aysha Cibinong Islamic Hospital, West Java, there was a delay from the plan that was supposed to be completed in mid-2021, but must be completed by the end of 2021. This was due to the previous contractor having problems, therefore the implementation of this project was in Take Over which resulted in project completion delay. The method used is the concept of Earned Value Analysis (EVA) to find out how much time the project delay is estimated to be. The budget plan is Rp.9,400,000,000 (nine billion four hundred million rupiah), the planning time is 90 calendar days, while the estimated time for completion of the project or Time Estimate which is influenced by the implementation of project work on the 8th week evaluation is 90 calendar days.

Keywords: Control, cost and time, Earned Value Analysis

Introduction

A construction project is a form of activity that takes place in a limited period, with certain resources, to achieve results in the form of buildings or infrastructure (Messah et al., 2013). Construction project performance depends on different project management dimensions, one of which is the time dimension (Demirkesen & Ozorhon, 2017). Meanwhile, problems can arise if there is a discrepancy between the plan and its implementation (Widhiawati, 2012). Building construction projects, especially hospital construction, require supervision and control in planning and implementation. Control is useful for ensuring the quality of project implementation, including ensuring whether it is following the plan (Batselier & Vanhoucke, 2015). Control also aims to determine whether or not there are problems that hinder implementation (Ervianto, 2005). Because projects that are late in implementation can affect the cost and quality of work (Gardezi et al., 2014). Another disadvantage due to delay is the emergence of stress on workers (Shubham, 2013). Of course, various ways are used to avoid problems that result in delays and losses (Wirabakti et al., 2017).

Building construction uses quite a lot of human resources (Winch, 2009). An example is the construction of health facilities in the form of hospitals. Various possible risks of work accidents in construction projects are things related to the unique characteristics of construction projects (Andarini & Hariyono, 2015). Therefore, performance evaluation in building construction must continue to be carried out. Evaluation is also considered an activity that helps construction sustainability (Ghorabaee et al., 2018).

Access to health facilities in many low- and middle-income countries remains low, and so is the importance of expanding the construction of health facilities such as hospitals across the country (Croke et al., 2020). In this study, what was reviewed was the Aysha Cibinong Islamic Hospital project

as the object of performance evaluation. Performance evaluation is a formal evaluation system of an organization that is used to assess the performance of individuals or teams within a certain period (Abdullah, 2014). The evaluation carried out in this study allowed the researcher to see the progress of the project to maintain progress and overcome delays in implementation (Dipohusodo, 1996).

When carrying out the construction project of the Aysha Cibinong Islamic Hospital, it is necessary to pay attention to cost and time performance, with the aim that project implementation is following the plan. Moreover, the construction of a hospital is very vital considering that this building is an important facility in the community (Goodley et al., 1994). Considering that construction time also coincides with the spread of the pandemic, the construction of hospitals is an effective way to help the community fight the pandemic (Wang et al., 2021).

A large amount of research has been done on project delays in the past; however, the continued existence of problems demands a relentless search for solutions (Mpofu et al., 2017). Construction projects can be delayed for some reasons (Kumaraswamy & Chan, 1998). Among them also occurred in various countries such as in Nigeria, where through a questionnaire it was found that project delays occurred due to the slow distribution of materials and equipment (Obodoh & Obodoh, 2016). The same thing also happened in Thailand, where the survey showed that the majority of project delays occurred due to poor management of contractors and managers (Toor & Ogunlana, 2008). This is no exception in developed countries such as Germany, where construction delays can occur due to the wrong method of installing construction elements (Kostka & Anzinger, 2016).

Whatever the cause of the delay in construction, effective time management must be pursued. Because effective time management for construction projects is

important in managing the risk of project completion delays (Chin & Hamid, 2015). The delay in the execution of the work will have an impact on cost losses and loss of competitive value (Hardiyanti & Musa, 2022).

Thus an evaluation is needed to determine the cost and time performance of the project using the *Earned Value Analysis method (Soeharto, 1997). Earn Value Analysis* is a project performance evaluation method that has been adapted in project management to estimating the final result through monitoring planned value, earned value, actual cost and actual time (Rizqie et al., 2022).

This methodology integrates scope, cost and time, and requires regular cost and work measurements (Almeida et al., 2021).

From the background that occurs the author formulates the problems that have been described:
1. How is the project's performance in terms of the timing of its implementation?
2. What is the estimated duration of the project completion time required?

The objectives of this research are as follows:
1. To find out the time performance of the project.
2. To find out the estimated time for completion of the work.
3. Recommendations for control actions in carrying out the project

For this research to be more directed to the background and not widen from the problem, it is necessary to limit the research problem, as follows:
1. The method used is the concept of *Earned Value Analysis*
2. This research focuses on work time
3. This study analyzes the baseline week 8.

Research Methods

The measurement of budget performance and the time a project is implemented using the *Earned Value Analysis method (Mockler, 1972).* Earned Value is a

program management technique that uses the concept of "work in process" to indicate what will happen to work in the future (Bhosekar & Vyas, 2012). In addition, continuous interviews were held with the Site Manager, supervisors from the implementing contractors and logistics. To identify the causes that result in work progress or construction delays, and other data needed for calculations using the *Earned Value Analysis method (Fleming & Koppelman, 2016).*
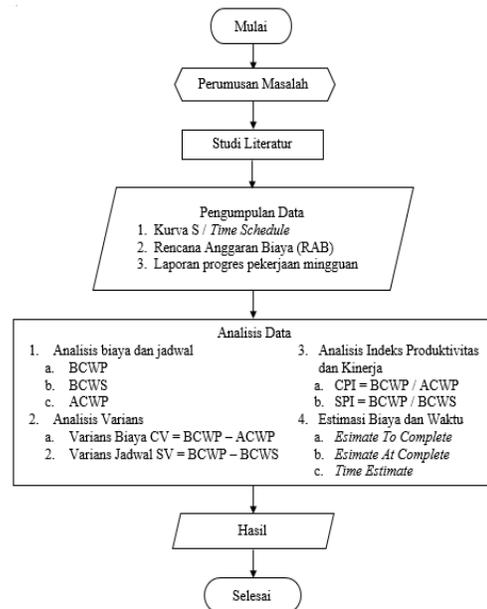
Figure 1. Research Flowchart

The data was collected in the form of an S curve, Budget Plan (RAB), and weekly work program reports. The S curve is defined as the method used in project planning and scheduling (Tamalika & Fuad, 2022).

Results and Discussions
The result and discussions of General Data on the Aysha Cibinong Islamic Hospital Development Project, West Java are as follows:
1. Occupation : Aysha Cibinong Islamic Hospital Construction Project, West Java
2. Contract Value: Rp. 9.400,000,000.00,-
3. Project Address: Housing Acropolis Karadenan Cibinong, West Java

4. Assignor   : PT. ASRI CAHYA MEDIKA
5. Supervisor and planner: PT. HR DESIGN
6. Contractor   : PT. SETIA HANDA
MANDIRI
7. Working Time : 13 Weeks
8. Building Size   : 1.8010 M2
9. Building Height: 29.4 M

The success of construction project performance and completion is highly dependent on adequate time scheduling of project activities (Valenko & Klanšek, 2017). So time schedule also needs to be considered in this study.

Time Schedule

Judging from *Time Schedule* from the 1st week to the 5th week period, it was carried out increasing from the planning curve data, but from the sixth week to the eighth week there was a significant decrease seen from the implementation curve which was under the planning curve.

Judging from the weight in the 6th week which is worth 0.32 which should be worth 10.45 when planning which has a difference of 10.13 it shows a delay in implementation, then in the 7th week the progress weight is worth 0.13 which should be worth 11.51 in planning when planning which has a difference of 11.38, and in week 8 the planned weight is 11.92 and the progress weight value is 0.23 then it has a difference of 11.69 which shows an increase in the value of the difference between planning and implementation.

Gantt charts are developed and used with little adaptation in various types of projects (Geraldi & Lechter, 2012). The following is the display of the Gantt Chart and Schedule in the following research.
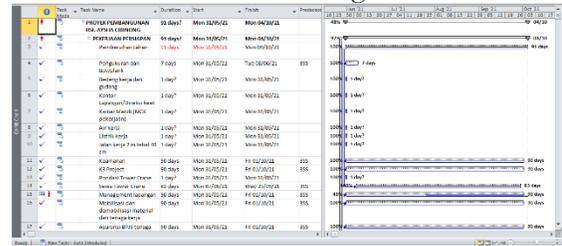
Figure 2. Comparison of BCWS and BCWP values.

The data above shows that there is a job description related to the schedule which next to it indicates that there is a schedule per job which is explained on a day-to-day basis and the percentage of activities.
Network Diagram
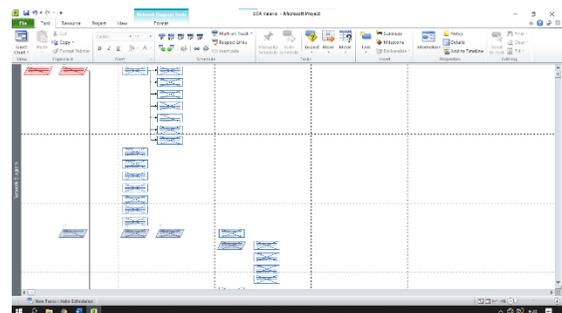
Figure 3. Network Diagram

The data above shows that there are job descriptions from initial work to final work, which are interrelated in their implementation. The red one indicates the critical path. And the blue colour shows the regular path.
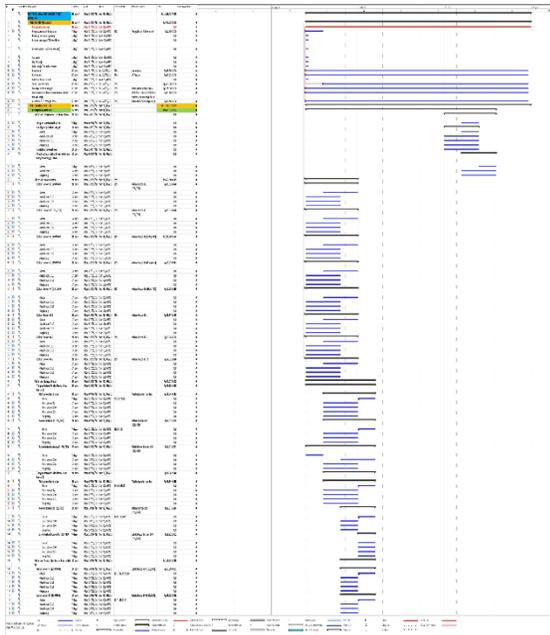
Figure 4. Final Results

The data above shows that there is a job description that is following the Time Schedule and details of the cost budget along with the start and finish time of work according to planning, linkages or *Predecessors,* job list (*Resources Name*), and costs *(cost)*. As well as the ACWP, BCWP, and BCWS values which are then calculated computationally in *Microsoft Excel* which produces the data below.

Budget Cost of Work Performed (BCWP)

Is the value obtained from completing a job during the available period? Also known as *Budget Cost of Work Performed* (BCWP) (Czemplik, 2014). This value is generated from the cumulative value of the details of activities that have been completed (Elbeltagi et al., 2011).
An example of the calculation form for a job in the 1st week period is below.
Total Budget = 9,400,000,000.00
Weight of BCWP = 0.23%
= 0.23% x 9,400,000,000.00
= Rp. 21,300,491

Table 1. BCWP

WEEKS	BCWP		CREDITS (%)	PROG. BCWP	
1	Rp	396.400.192	4,22	Rp	396.400.192
2	Rp	626.969.009	6,67	Rp	1.023.369.201
3	Rp	652.862.817	6,95	Rp	1.676.232.018
4	Rp	677.325.681	7,21	Rp	2.353.557.699
5	Rp	1.014.210.765	10,79	Rp	3.367.768.464
6	Rp	29.681.543	0,32	Rp	3.397.450.007
7	Rp	12.016.325	0,13	Rp	3.409.466.332
8	Rp	21.300.491	0,23	Rp	3.430.766.823

Budget Cost of Work Scheduled (BCWS)

This is the budget value for work that has been allocated based on a work plan that has been compiled for a certain period (Maromi, 2015). Also known as *Budget Cost of Work Scheduled* (BCWS). This value is obtained from the cumulative total details of the funds allocated within the available period (Ratih & Irnawan, 2020).
An example of the calculation form for work in week 8 is as follows.
Total Budget = 9,400,000,000.00
Weight of BCWS = 11.92%
= 11.92% x 9,400,000,000.00
= Rp. 1,120,075.625

Table 2. BCWS

WEEKS	BCWS		CREDITS (%)	PROG. BCWS	
1	Rp	280.069.405	2,98	Rp	280.069.405
2	Rp	381.108.805	4,05	Rp	661.178.210
3	Rp	401.889.965	4,28	Rp	1.063.068.175
4	Rp	423.489.809	4,51	Rp	1.486.557.984
5	Rp	778.184.256	8,28	Rp	2.264.742.240
6	Rp	981.921.385	10,45	Rp	3.246.663.625
7	Rp	1.081.949.388	11,51	Rp	4.328.613.014
8	Rp	1.120.075.625	11,92	Rp	5.448.688.639
9	Rp	883.783.432	9,40	Rp	6.332.472.071
10	Rp	1.006.179.319	10,70	Rp	7.338.651.390
11	Rp	832.522.430	8,86	Rp	8.171.173.820
12	Rp	968.146.281	10,30	Rp	9.139.320.101

13	Rp 260.679.899	2,77	Rp 9.400.000.000
	Rp 9.400.000.000	**100**	

Actual Cost Work Performed (ACWP)

This is a representation of all actual budgeted total expenditures to be able to complete a form of activity within a certain period. Can be known as the *Actual Cost of Work Performed* (ACWP) (Marfuah & Hiadayat, 2017). This value can be added to the performance period or the total cost for a specific time (Pertiwi, 2018).

Table 3. ACWP

WEEKS	ACWP	PROG. ACWP
1	Rp 396.400.192	Rp 396.400.192
2	Rp 626.969.009	Rp 1.023.369.201
3	Rp 652.862.817	Rp 1.676.232.018
4	Rp 677.325.681	Rp 2.353.557.699
5	Rp 1.014.210.765	Rp 3.367.768.464
6	Rp 32.900.000	Rp 3.400.668.464
7	Rp 20.680.000	Rp 3.421.348.464
8	Rp 23.500.000	Rp 3.444.848.464

The table above shows the value obtained from the actual budget amount associated with progress weights per week resulting in the appropriate total expenditure in the field during project implementation.

Comparison of BCWS and BCWP
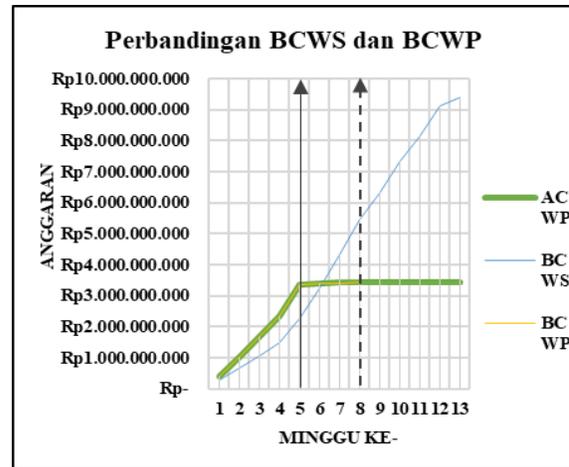
Figure 5. Comparison of BCWS and BCWP values

From the results of the comparative analysis, the BCWS and BCWP values from the 1st to the 5th week are above BCWS, whereas, seen from the 6-8th week of the period, shows that the BCWP value is right below the BCWS value which indicates that the project This has problems with delays both in terms of cost and time.

Cost Variance (CV)

CV in this project shows that the value of the cost variance from the 1st to the 5th week of the period is 0 (zero) whereas, seen from the 6th week of the 8th period week it is negative, then the event indicates that the cost of the activity does not match the planned cost.
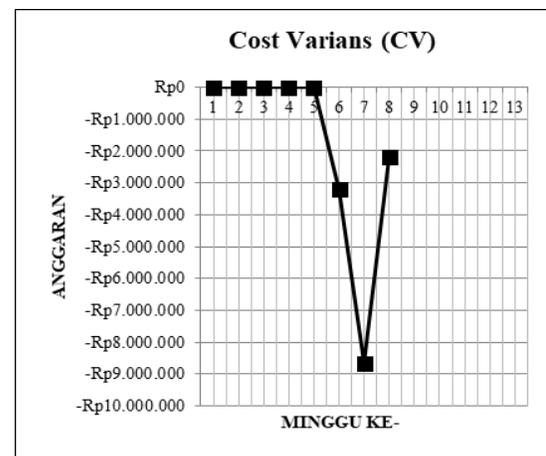
Figure 6. Cost Variance (CV)

Schedule Variance **(SV)**

SV in this project has a value with various conditions where the schedule variance from week 1 to week 5 is positive while, seen from week 6 to week 8 is negative, This shows that the work is delayed or not so according to the planned schedule.
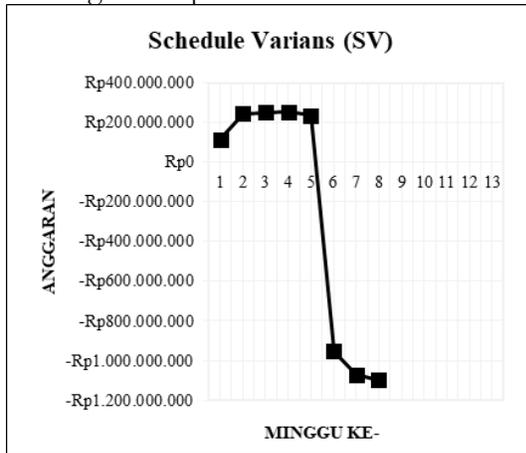
Figure 7. Schedule Variance (SV)

Cost Performance Index **(CPI)**

The Cost Performance Index (CPI) is the main indicator used to analyze cost and schedule performance (Christensen & Heise, 1993). The CPI value shows that the *Cost Performance Index* (CPI) value from the 1st week to the 5th period is worth 1 while, seen from the 6th week to the 8th week of the period <1, it indicates that the work is late or not at the planned time.
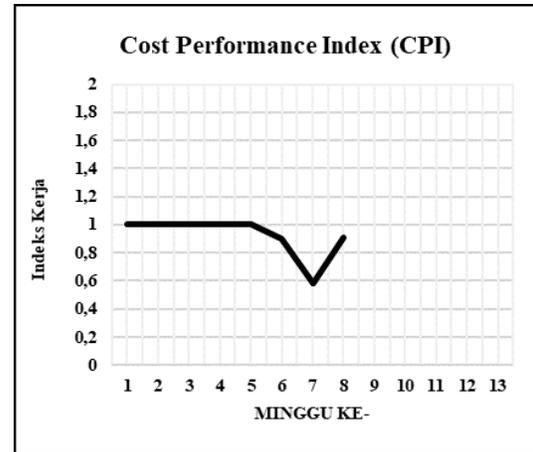
Figure 8. Cost Performance Index (CPI)

Schedule Performance Index (SPI)

The Schedule Performance Index *(SPI)* for this project has different values. SPI is the ratio between the obtained and planned values (De Koning & Vanhoucke, 2016). During the first week, the condition of the SPI value increased because the project started working earlier until the 4th-week SPI value was higher than one (>1) which means the temporary performance of this project is good, but from week 5 and the following week 8 can see that SPI value is not good. As evidenced by the SPI value of less than one (<1) means the performance of the schedule when work is less than optimal.
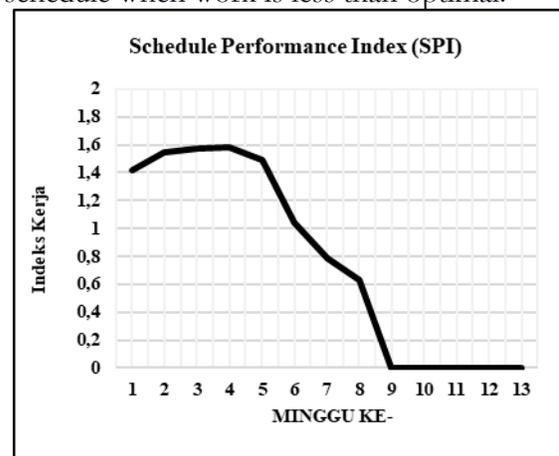
Figure 9. Schedule Performance Index (SPI)

Estimated Time

Based on the results of the analysis carried out on the Aysha Cibinong Hospital project, it was found that the Estimated Cost to complete the project was Rp. 10,347,152,772, - seen from the ETC calculation (Estimate to Complete). The estimated time to complete the project is 90 days seen from the calculation of TE (Time Estimate).

Causes of Delay

The causes of delays in this project are several factors including: Uncertain weather, Cash flow from the *owner* who is late / not on time, Number of workers who are not fixed (every day some workers don't come in).

Based on the results of field observations, data collection, and data analysis that have been carried out on the Aysha Cibinong Islamic Hospital Development project, West Java, it can be concluded as follows :

(SV) in this project has a value with various conditions in which some SV is positive and some SV is negative. This shows that this project has poor performance because there are more negative SVs in week 8 which means that the project implementation is slower than planned.

The schedule performance index (SPI) for this project has various values. In the condition of the first-week SPI value increased because the project started work earlier until the 4th week the SPI value was greater than one (> 1) which means that the time performance on this project was good, while in the 5th week to the 8th week it can be seen that the SPI value is not good, this is indicated by the SPI value smaller than one (<1) which means that the time performance of this project is not good.

The planned time for the construction project of the Aysha Cibinong Islamic Hospital in West Java is 90 calendar days, while the estimated time for completion of the project or *TE* is influenced by the implementation of project work. At evaluation week 8 is 90 calendar days.

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