Control Analysis of the Griya Jenggala Development Project using the Earned Value Method at PT Sarana Loka Almika in Kebayoran

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Abstract

Project control is a structured effort to establish standards in accordance with the plan, design information systems, compare implementation with established standards, analyze potential deviations, and take corrective actions necessary to ensure the effective and efficient use of resources in line with the set targets. Each project has its own specific plan and schedule, determining the start and end time of the project, implementation methods, and resource allocation. Operational challenges often arise in project planning, such as resource shortages, improper allocation, delays, and other issues that may hinder the achievement of project goals as planned. This research utilizes a descriptive quantitative approach, which is a research method that describes the specific conditions of the project through the analysis of available data. This article will discuss the cost variance (CV) and schedule variance (SV) in the development of Griya Jenggala at PT. Sarana Loka Almika, evaluate the cost performance index (CPI) and schedule performance index (SPI) in the development of Griya Jenggala to assess its effectiveness, estimate the cost at completion (EAC) and estimated duration at completion (EAS) required to complete the Griya Jenggala project, as well as provide an estimation of potential profits or losses that may arise in the Griya Jenggala development project.

Keywords: development of Griya Jenggala, PT Sarana Loka Almika, project control

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Introduction

Projects are a series of activities that process project resources including a certain result involving several related parties that are distinguished by functional and working relationships, only once implemented (unique) and generally short-term (Hasiyah, 2018). A project is a process with a clear starting and ending point and goes through a specificlife cycle. It involves the use of resources to produce specific results. Projects are temporary activities with a limited time frame and specific resource allocation. The purpose of a project is to complete a defined task and have clear objectives. Budget allocation, time, and quality areconstraints that must be faced in achieving project goals. These three aspects are important measures in project implementation and affect each other. Projects involve many related parties and are distinguished by functional relationships and work performed. Projects are unique implementations and generally have a short duration (Sinaga, 2014).The cornerstone of the entire project is planning, which is built on specific objectives. The correct resources can be accessed at the right time with careful preparation. Each step of the process is given sufficient time, and the various components of the activity are started at the right time.

Control is defined as a systematic effort to determine standards in accordance with planning goals and objectives, design information systems, compare implementation with standards, analyze possible deviations, then take the necessary corrective actions so that resources can be used effectively and efficiently in order to achieve goals and objectives in order to achieve goals and objectives (Monica, 2013). Project management is the process of planning, organizing, leading, and controlling company resources to achieve predetermined short-term goals (Rani, 2016). Project management is the discipline of planning, organizing, managing and controlling to achieve project goals control to achieve project objectives (Ruslan, 2019). Project management grew out of the drive to find a management approach that suits the demands and nature of project activities, an activity that is dynamic and different from routine operations. The main goal is to achieve all the project'send goals within the set deadline and budget. Each project has its own implementation plan and schedule, which determines when the project starts, when it should be completed, how to implement the project, and how to allocate resources. In project planning, operational challenges often arise such as resource shortages, improper allocation, delays, and other issuesthat can hinder the completion of the project as planned. Based on this definition, it can be concluded that several meanings of project management.

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Controlling is one of the tasks in project management that aims to to ensure work is completed on time and with accuracy. Controlling project is a systematic effort to set standards in accordance with the plan, design information systems, compare implementation with the standards that have been set, analyze potential deviations, and take corrective action as needed so that resources can be used effectively. This is necessary so that resources can be used effectively and efficiently in accordance with the set targets. Therefore, control requires the use of standards as comparisons, work measurement tools, and corrective steps that must be taken when there are deviations. Control activities may include monitoring, inspections, and corrective actions taken during the project implementation process. Control is defined as a systematic effort to set standards in accordance with planning goals and objectives, design information systems, compare performance with standards, analyze potential deviations, and then take corrective action so that resources can be used effectively and efficiently to achieve goals and objectives (Dewantoro, 2018).

The earned value concept is a concept for determining the cost that corresponds to the work that has been completed within the set budget (Meliasari & Indrayadi, 2011). This approach is used to make estimates or forecasts regarding the future status of the project with fundamental assumptions. The earned value method uses indicators such as BCWP (Budgeted Cost of Work Performed), BCWS (Budgeted Cost of Work Schedule), and ACWP (Actual Cost of Work Performed). These indicators help in monitoring and evaluating project performance. BCWP is the value of expenditure that should have been incurred for the completed work, comparing it to the allocated budget. BCWS is the budget set for the work package according to the implementation schedule, and includes factors such as cost variance, schedule variance, productivity index, and estimated project completion cost. ACWP Is the actual cost of the work This cost obtained from accounting or financial data of the project on the reporting date. So ACWP is the actual amount of expenditures or funds used to carry out work in a certain period of time.

Effective project control is key to keeping projects on track, on time, and within budget. Some important steps in achieving effective project control include: (1) Developing a detailed project plan before starting the project; (2) Establishing relevant key performance indicators to regularly monitor project progress; (3) Implementing effective communication between the project team, stakeholders, and management; (4) Regularly monitoring project progress,

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including time, cost, and resource usage; (5) Identifying and managing risks that may a rise during the project; (6) Managing changes in the project by considering their impact on schedule, budget, and resources; and (7) Evaluating project performance after completion, identifying what went well and drawing lessons for future projects. These steps help ensure the project runs efficiently and provide valuable learning to improve the quality of future projects.

A literature review was conducted on the research of Christin Natalia Lumentah and Tisano Tj. Arsjad (2020) with the title "Cost and Time Control on Construction Projects Shophouse Construction Project in Kharisma Koka Minahasa Housing Area Using the Value Concept Method. Result". This study uses the notion of value obtained, namely BCWS, BCWP, ACWP, SV, SPI, CV, and CPI, to control project costs and schedules. The approach compares the value and results of work completed on a project. This study found that the costs incurred in the shophouse construction project in the Kharisma Koka Minahasa Housing Area was less than the budget allocated and the implementation of the project was delayed. Budget allocated and the implementation of the project was delayed or took longer than expected. The author of this study suggests that to improve the control of time and cost and prevent cost and time deviations from becoming severe cost and time deviations. Cost and time control should be reported regularly.

The word "construction" can be defined as the order or arrangement of the following elements of a building in which the position of each part is in accordance with its function. Talking about construction, then what is imagined is multi-storey buildings, bridges, dams, highways, irrigation buildings, airfields and others (Rani, 2016). A construction project is an endeavor that has time and resource constraints to achieve a specific goal. This means that construction projects aim to create buildings and infrastructure. The main tasks in this project include civil engineering, architecture, as well as other disciplines such as industrial engineering, mechanical engineering, and electrical engineering. Construction management is carried out in order to efficiently and effectively achieve project objectives in the construction of physical structures. Knowledge of the technical aspects of the implementation of construction management is very important in the implementation of the project. The objectives of this research are: (1) Understand the control of the Griya Jenggala construction project at PT Sarana Loka Almika; (2) Analyze the aspects involved in controlling the Griya Jenggala construction project at PT Sarana Loka Almika.

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Methods

The objects for doing research on are Griya Jenggala. Griya Jenggala Kebayoran is one of the housing projects being developed by PT Jenggala Graha Cipta in South Jakarta. This project offers a 700m2 house designed with a modern minimalist concept the location of Griya Jenggala in South Jakarta. This research applies a quantitative descriptive approach, which is a research method that describes specific project conditions through analysis of available data, namely monthly data obtained from PT Sarana Loka Almika regarding the Griya Jenggala construction project. Data analysis wasconducted using analytical and descriptive approaches. The analytical approach is used to process existing data with the aim of reaching a final conclusion. Meanwhile, the descriptive approach was used to identify and describe existing or visible problems. In this context, the concept of Earned Value Analysis is used to analyze the trend of schedule and cost variations over a certain period of time in the project. However, this study will only address cost and time variations.

Results and Discussions

Profile of PT Sarana Loka Almika

PT Sarana Loka Almika is a company engaged in construction in Indonesia which is located at Jl Ampera III 34, Jakarta, Indonesia 12560. PT Sarana Loka Almika is an Indonesia-based company that is primarily engaged in property development. PT Sarana Loka Almika is a construction company engaged in the construction of houses and other buildings. Our company has been operating for 10 years and has extensive experience in house construction, ranging from simple houses to luxury homes with complex designs. The advantages of PT Sarana Loka Almika are experience and ability to design and build houses that are in accordance with customer wishes. PT Sarana Loka Almika also uses high-quality materials and advanced technology to ensure quality and durable results. PT Sarana Loka Almika provides house building services from start to finish, including planning, design, construction, and finishing.

Analysis Earned Value Method BCWP (Budgeted Cost of Work Performed)

BCWP is the value of expenditure that should have been incurred to complete all the work accomplished up to the point of analysis (Meliasari & Indrayadi, 2011). BCWP is a metric that compares the value of outcomes in terms of weight or percentage of work completed against the budget allocated to perform the tasks.

BCWS (Budgeted Cost of Work Schedule)

BCWS (Budgeted Cost of Work Timetable) is the budget for work packages generated in relation to the schedule of execution (Meliasari & Indrayadi, 2011). Thus, in this scenario, there is a blend of cost, time, and scope of work, where each aspect of the work has been assigned a cost and schedule that will subsequently serve as a measure of implementation. Factors indicating project progress and execution, such as:

1. Cost Variance (CV), Schedule Variance (SV);
2. Monitoring changes in variances against standard figures;
3. Productivity and performance indices; and
4. Project completion cost estimation.

ACWP (Actual Cost of Work Performed)

ACWP is the actual cost value expended for the work performed (Meliasari & Indrayadi, 2011). This cost value is obtained from project accounting or financial data at the reporting date (for example, end of the month), particularly recording all actual costs from work packages or accounting codes, including the calculation of overhead costs and others. Thus, ACWP is the total actual expenditure or funds used to carry out tasks until the analysis is completed.

The results of the cost and time analysis of the Griya Jenggala project show that the expenses incurred are still in line with the planned budget. Furthermore, the time analysis indicates that the project is progressing faster without any delays in its execution.

ACWP represents the actual costs used to run a project. On the other hand, BCWS reflects the amount of costs that should have been incurred based on the planned work weight. Furthermore, BCWP reflects the amount of costs that should have been incurred based on the amount of work completed.

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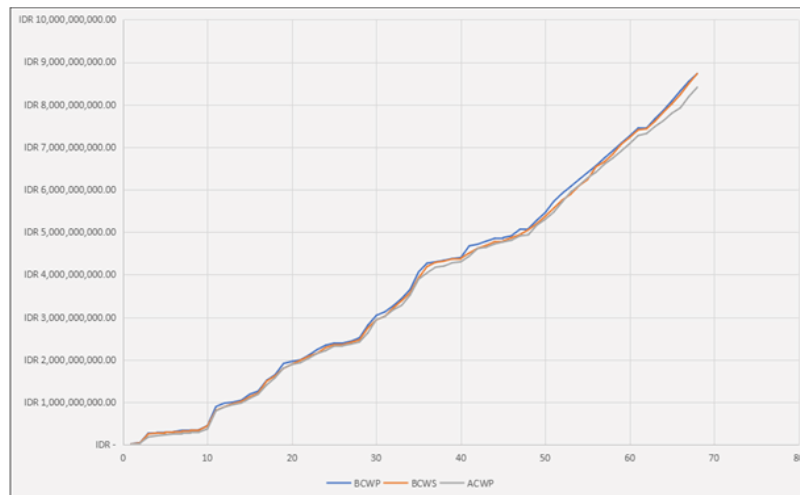at PT Sarana Loka Almika in Kebayoran | Nastiti et al.

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Fig. 1. Performance of ACWP, BCWS, and BCWP

In the Figure 1 graphical data comparison of BCWS (Budgeted Cost Schedule), BCWP (Budgeted Cost Performance), and ACWP (Actual Cost Performance) above, it can be observed that from week 1 to week 68, the values of BCWS, BCWP, and ACWP remain at a stable level with minor differences. This indicates that the initial plan established by the company in BCWS has remained relatively consistent, while BCWP and ACWP show averages below BCWP throughout the entire duration from the first week to the last.

Consequently, it can be concluded that the plan formulated by the company and the realization on the field do not exhibit significant differences. This suggests that the work carried out from week 1 to week 68 aligns with the plan and there is no acceleration or delay. Furthermore, the actual costs represented by ACWP are below the plan, signifying that the incurred costs remain within the project budget, and even below it, thereby resulting in additional profitability for the company.

Cost Variation (CV) and Time Variation (SV)

The value of cost variation (CV) is the difference between the Budgeted Cost of Work Performed (BCWP), which reflects the actual realized project cost, and the Budgeted Cost of Work Scheduled (BCWS), which reflects the planned cost (De Marco & Narbaev, 2013). To obtain the CV value, the following equation 1 can be used:

$$CV = BWCP - AWCP$$

Eq. 1. Cost Variance (CV)

The calculation for the work in week 40 is as follows:

BCWP Value = IDR 4,399,419,544.36

ACWP Value = IDR 4,301,038,400.00

CV Value   = IDR 4,399,419,544.36 - IDR 4,301,038,400.00

                       = IDR 98,381,144.36

Cost variance refers to the difference between the planned and actual cost of the work. Calculating the cost variance provides an overview of the project's status each week.If the cost variance value is zero, it indicates that the work has been performed as planned.On the other hand, a positive cost variance value indicates that the work is more cost-efficient than planned. However, if the cost variance value is negative, it indicates that thework exceeds the planned cost. The Figure 2 below illustrates the observed Cost Variance (CV) values.
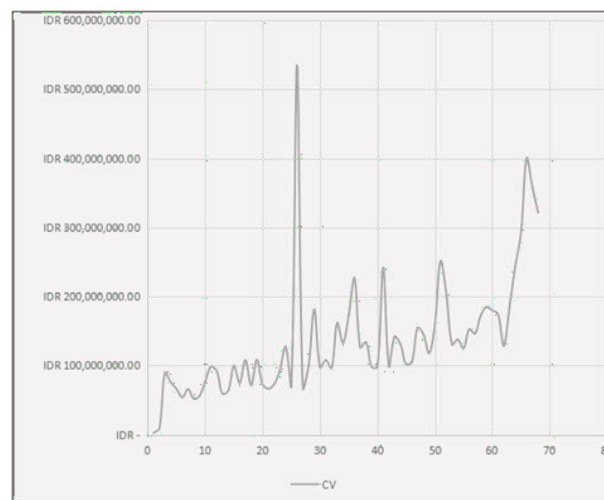

Fig. 2. Cost Variance (CV) variation

From the Figure 2 of the graphical data, it is observed that there is fluctuation in the CV(Cost Variance) values with both increases and decreases. However, it's important to notethat all Cost Variance (CV) values in the graph show positive values. Therefore, after conducting the analysis, the author concludes that from week 1 to week 68, the project implementation is running below the plan, indicating that the project has incurred lower costs than planned.

Schedule Variance (SV) is the difference between the actual project achievement value(BCWP) and the planned project value (BCWS) (De Marco & Narbaev, 2013). SV can be calculated using the following equation 2:

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$$SV = BWCP - BWCS$$

Eq. 2. Schedule Variation (SV)

The calculation for the work in the 40th week is as follows:

BCWP Value = IDR 4,399,419,544.36

BCWS Value = IDR 4,381,964,993.50

SV Value   = IDR 4,399,419,544.36 - IDR 4,381,964,993.50

                       = IDR 17,454,550.86

Schedule variance refers to the difference between the planned cost of work and the actual cost incurred. When calculating the schedule variance, it provides an overview of the project's status each week. When the schedule variance value is zero, it indicates that the work has been performed according to the planned schedule. If the schedule variance value is positive, it indicates that the work has been completed ahead of the set schedule. However, if the schedule variance value is negative, it indicates that the work has been delayed from the planned schedule. The Figure 3 below illustrates the schedule variance (SV) values that can be examined.
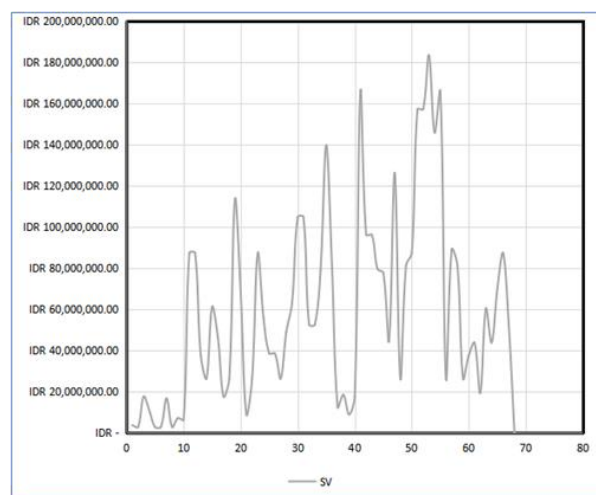

Fig. 3. Schedule Variations (SV)

From the analysis of the data above, it can be observed that in the schedule analysis or SV from week 1 to week 68, there is a fluctuating increase. Sometimes there are increments, but sometimes there are also decreases, as seen in week 20 and week 40 which experienced a decline. However, overall there are many increments, and the schedule variance results are always positive.

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Based on the results of this analysis, it can be concluded that in the Jenggala Houseproject, all schedule variation values are positive from week 1 to week 67. The positive values generated by these SVs indicate that the project's execution time is faster than planned by the company. This demonstrates that the tasks are completed earlier than the established planned schedule.

Cost Performance Index (CPI) and Schedule Performance Index (SPI)

The project performance index (CPI) for each period is a comparison between theachieved value of planned work (BCWP) and the actual cost incurred (ACWP) (Kerzner, 2019). CPI can be calculated using the following equation:

$$CPI = BCWP/ACWP$$

Eq. 3. Cost Performance Index (CPI)

The calculation for the work in the 40th week is as follows:

BCWP Value = IDR 4,399,419,544.36

ACWP Value = IDR 4,301,038,400.00

CPI Value   = IDR 4,399,419,544.36 / IDR 4,301,038,400.00

                 = 1.02/102.3%

Cost Performance Index (CPI) is a method used to evaluate the effectiveness of cost utilization in completed work, whether it aligns with the planned budget or not. If the CPI value is less than one, it indicates schedule delays, while a CPI value greater than budget. When the CPI value is equal to one, it indicates that cost performance aligns with the established project budget. For the following result in the Figure 4 bellow.

Based on the CPI analysis or productivity analysis presented above, it can be concluded that from the first week to week 68, all CPI values are above 1 or more than 100%. This indicates that the project has achieved cost savings in the execution of work compared to the project budget. Therefore, it can be stated that the productivity of this project is running well and efficiently.

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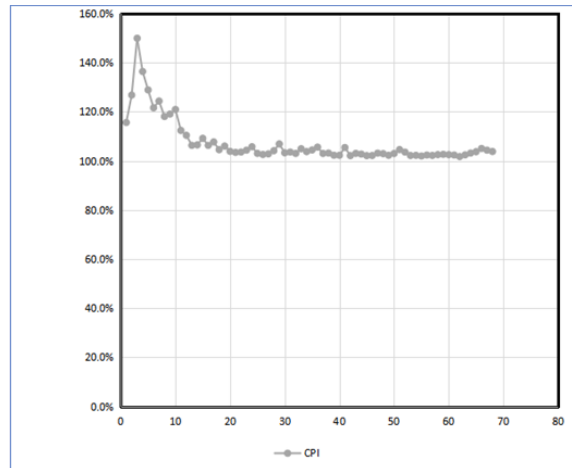at PT Sarana Loka Almika in Kebayoran | Nastiti et al.

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Fig. 4. Cost Productivity Index (CPI)

Schedule Performance Index (SPI) for each period is the ratio between the actual project accomplishment value (BCWP) and the planned project value (BCWS) (Kerzner, 2019). SPI can be calculated using the following equation:

$$SPI = BCWP/BCWS$$

Eq. 4. Schedule Performance Index (CPI)

The calculation for the work in the 40th week is as follows:

BCWP Value = IDR 4,399,419,544.36

BCWS Value = IDR 4,381,964,993.50

SPI Value: = IDR 4,399,419,544.36 / IDR 4,381,964,993.50

= 1.00,4/100.4%

In simpler terms, the "Schedule Performance Index (SPI)" is a tool used to determine whether a task has been performed according to the planned schedule. If the SPI value is less than one, it indicates that the task is delayed compared to the planned schedule. On the other hand, if the SPI value is greater than one, it indicates that the task has been completed faster than the planned schedule. If the SPI value is equal to one, it signifies that the task's performance is in line with the planned schedule.
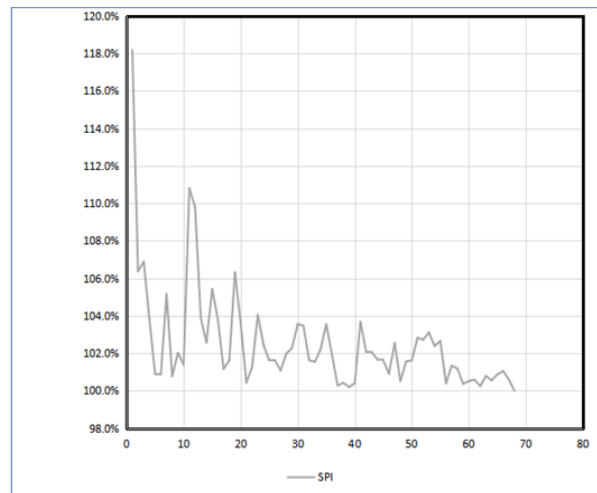
Fig. 5. Time Productivity Index (SPI)

After analyzing the data using the Time Productivity Index (SPI), it was found that from the first week to the 68th week, the SPI values indicated figures above 100% or above 1. Based on the previous explanation, this can be interpreted to mean that the project is progressing faster than the initial plan set by the company.

Cost Estimate at Completion (EAC) and Estimate of Time at Completion (EAS)

The estimate of project completion cost (EAC) is the result of adding the actualcosts incurred to date (ACWP) to the estimated cost required to complete the unfinishedwork (ETC) (Agatha & Dani, 2018). EAC can be calculated using the following equation:

$$EAC = ACWP + ETC$$

Eq. 5. Cost Estimate at Completion (EAC)

The calculation for the work in the 40th week is as follows:

ACWP Value = IDR 4,301,038,400.00

ETC Value   = IDR 4,310,685,261.41

EAC Value   = IDR 4,301,038,400.00 + IDR 4,310,685,261.41

                    = IDR 8,611,723,661.41

Through the analysis of the EAC value against the remaining job costs, there isa difference in the total cost required to complete the project. If the EAC value is below the planned budget, it indicates that the required cost is lower than the previous estimate.
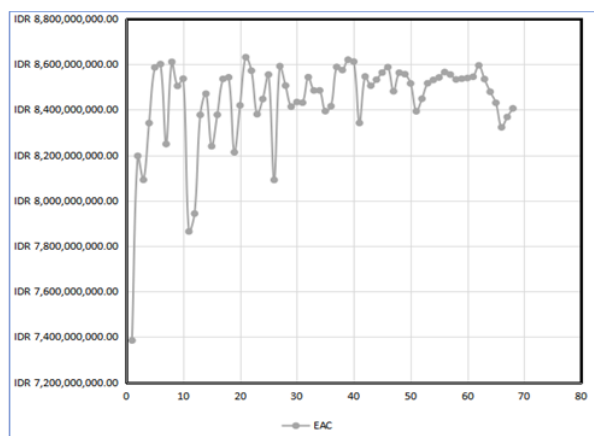
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Fig. 6. Top 5 Estimated Cost (EAC)

Based on the data analysis presented in the above Figure 6, it can be observed thatin the Jenggala House project, the EAC value or Total Projected Cost from week -1 toweek 68 is below the Budgeted Cost Plan (RAB). With an average EAC level below the Estimated Total Cost (ETC), it can be concluded that there is cost efficiency and profit improvement due to the company's successful implementation of effective controls.

Estimated Completion Time (EAS) is a projection of when a project will be finished by combining the current reporting time with the time required to complete the unfinished tasks. EAS can be calculated using the provided equality.

$$EAS = Current\ Reporting + ETS$$

Eq. 6. Estimate Completion Time (EAS)

The calculation for the work in the 40th week is as follows:

Reporting Time	= 40 weeks
Estimated Time of Completion (ETC)	= 27.98 weeks
Estimated Actual Time (EAT)	= 40 weeks + 27.98 weeks
	= 67.98 weeks

Based on the data analysis conducted on the Estimated Time of Completion (ETC) values in the project schedule, there appears to be variation in the projected time required to complete the work each week. Ideally, the effective ETC value should align with the point where the work is realized according to the predetermined remaining project schedule. If there is a deviation from this, it can be concluded that the work execution is not effective. The result for ETS in Figure 7 bellow:

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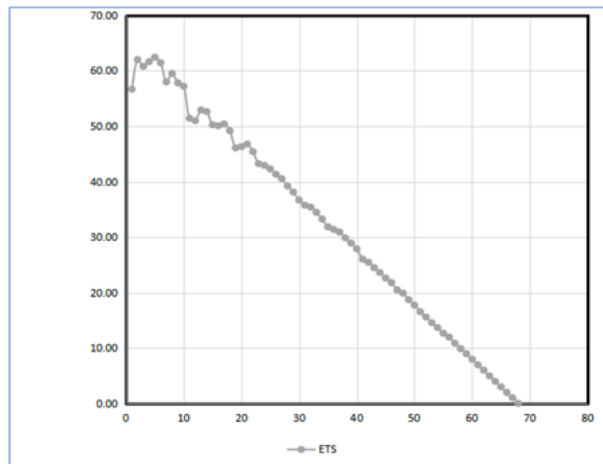at PT Sarana Loka Almika in Kebayoran | Nastiti et al.

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Fig. 7. Remaining Work Schedule Projection (ETS)

Based on the analysis of the conducted data, it was found that there was a decrease in the ETS (Estimated Time Remaining) values from Week 1 to Week 68, as shown in the above graph. The consistent decline in ETS indicates that the project is progressing according to the established plan with effective work implementation. Therefore, under these circumstances, the project has been successfully completed on time as per the planned schedule.

Fig. 8. Pillar
(Source: PT Sarana Loka Almika, 2023)

In Figure 8 at this stage of the construction, pillars support the floors above them, including the roof. Floors and roofs have significant weight, and pillars provide vertical support to prevent them from collapsing. Pillars can also be an aesthetic design element. The choice of pillar shape, material and style can affect the visual appearance of the house and give a special touch to the architectural design.

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Fig. 9. Ceiling

In Figure 9 above is the stage of making the ceiling, the ceiling is one that is very important as a Hiding Structure The ceiling hides the roof structure and utility systems (electrical cables, pipes, air ducts, etc.) that run on it. This gives a clean and neat look to the interior of the room.

Fig. 10. Formwork

In Figure 10 namely formwork is an auxiliary construction for concrete molding of a building structure with the desired shape design. This mold is used to maintain the shape of the building, that way, the foundation will be able to form neatly and after passing a certain time, harden and be able to bear its own weight. Then it will be removed and reassembled in other parts.

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Fig. 11. Griya Jenggala

After all projects are carried out such as pillars, ceilings, formwork etc. the final results are obtained as shown in figure 11, namely Griya Jenggala. This project offers a 700 m² house designed with a modern minimalist concept. The project is equipped with various modern facilities.

Conclusion

Through the analysis of the Jenggala House project, the following results were obtained using several project performance metrics:

1. Cost Variance (CV) and Schedule Variance (SV):

   a. Cost Variance (CV): The smallest CV is IDR 3,067,000. This indicates that the Jenggala House project has resulted in lower expenditures than planned.

   b. Schedule Variance (SV): The smallest SV is 2,619,182.63. This shows that the Jenggala House project is progressing slightly faster than planned.

2. Cost Performance Index (CPI) and Schedule Performance Index (SPI):

   a. Cost Performance Index (CPI): The smallest CPI is 1.02. This indicates that the Jenggala House project has achieved good cost performance, as a CPI greater than 1 indicates that actual expenditures are lower than estimated.

   b. Schedule Performance Index (SPI): The smallest SPI is 1.01. This indicates that the Jenggala House project has achieved good schedule performance, as an SPI greater than 1 indicates that the project is progressing slightly faster than planned.

3. Estimated at Completion (EAC) and Estimated Time of Completion (ETC):

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a. Estimated at Completion (EAC): IDR 8,587,561,683.36. This represents the total estimated cost required to complete the Jenggala House project.

b. Estimated Time of Completion (ETC): 68 weeks. This represents the total estimated time required to complete the Jenggala House project.

With the positive results from these three analyses, it can be concluded that project control is proceeding well and in accordance with the plan. The analysis results of the Griya Jenggala project indicate that the company can leverage the benefits of positive variations in Cost Variance (CV) and Schedule Variance (SV) to enhance budget efficiency and identify best practices for expediting project completion. While the Cost Performance Index (CPI) and Schedule Performance Index (SPI) demonstrate favorable productivity performance, the company needs to continually enhance productivity by reducing costs and accelerating the schedule. Ongoing monitoring of the Estimated at Completion (EAC) and Estimated Time to Complete (ETC) is crucial, along with evaluating project management processes to drive learning and sustainable development within the project team. Effective collaboration and clear communication within the project team are also key factors in achieving project success.

Acknowledgements

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