JOURNAL OF WORLD SCIENCE
https://jws.rivierapublishing.id/index.php/jws
Volume 4 No. 2 February 2025
P-ISSN: 2828-8726
E-ISSN: 2828-9307

PROJECT MANAGEMENT EFFICIENCY STRATEGY FOR PUBLIC SAFETY CENTER (PSC) BUILDING IN PROBOLINGGO REGENCY

Lucky Hendra Saputra[1], Andi Patriadi[2], Sajiyo[3]
University of August 17, 1945 Surabaya, Indonesia

lucky.riluq@gmail.com, andipatriadi@untag-sby.ac.id, sajiyo@untag-sby.ac.id

ABSTRACT
This research examines the efficiency of managing the construction of the Public Safety Center (PSC) building in Probolinggo Regency. Effective management ensures the project meets its timeline, budget, and quality goals. We used a method called Earned Value Analysis to track progress and identify potential issues early on. Key indicators like the Cost Performance Index (CPI) and Schedule Performance Index (SPI) helped us understand how well the project was performing in terms of cost and schedule. The research revealed challenges such as material delays and labor shortages, which impacted the project's efficiency. By analyzing these issues, we propose solutions to improve project planning and execution, focusing on better resource allocation and scheduling. The findings offer valuable insights for future construction projects, helping to minimize delays and overspending. This research emphasizes the importance of identifying project performance issues promptly to ensure overall success. The recommendations can guide improvements in construction project management, ensuring projects are completed on time, within budget, and to the required quality standards.

Keywords: construction management, project efficiency, public safety center, project performance

INTRODUCTION

One of the government programs aligned with the fifth agenda of Nawa Cita aims to enhance the quality of life for the Indonesian people. To support this initiative, the Ministry of Health launched an integrated emergency management system (SPGDT), which includes the Public Safety Center (PSC) service (Harahap et al., 2021; Inne Yelisni et al., 2023; Nugroho, 2022). PSC 119 is designed as a rapid-response health emergency service that offers free access to medical emergencies for the public through code 119 (Nugroho, 2022; Nurulia Dwi, 2019; Prihanti et al., 2022; Sulistiadi et al., 2020; Sylvana, 2020).

The Public Safety Center (PSC) is a mandate from Presidential Instruction No. 4 of 2013, which requires every district or city in Indonesia to establish this service. In its implementation, the PSC is planned to cover all autonomous regions in stages. This aims to strengthen the coordination of emergency services in various regions of Indonesia, especially those with a high risk of health and non-health disasters. In the Probolinggo District, the PSC building was constructed to improve emergency response services to disasters such as fires, accidents, and other emergencies. The facility was built adjacent to the local hospital and Health Office to ensure a quick and effective response. The building is expected to provide direct benefits to the community in emergencies.

The government is changing the PSC service to version 1 because of the high number of emergency incidents. The 119 number provides quick access to the service center for

emergency medical assistance. This system, for example, directs an ambulance to the scene with organized coordination. Services like this help accident victims and handle other critical medical situations.

In construction projects, the development of Public Safety Communication (PSC) buildings presents significant challenges that extend beyond those encountered in conventional construction endeavors. These challenges encompass stringent regulatory compliance requirements, attributable to the critical nature of emergency services, as well as the necessity for specialized infrastructure to facilitate effective communication and emergency response systems. Additionally, there exists a pressing demand for expedited project completion to address immediate community needs. The complexity of these projects is further exacerbated by the requirement for seamless integration with existing healthcare facilities and emergency services, necessitating meticulous coordination and advanced planning. Furthermore, PSC projects frequently confront distinctive logistical challenges, including the acquisition of specialized equipment and the imperative to ensure the facility's resilience against potential disasters, thereby introducing additional layers of intricacy to project management.

The definition of a successful construction project has evolved in the last two decades. In addition to considering time, cost, and quality constraints, project success is also measured by the ability of the project team to meet the expectations of the owner and end users. According to Salcedo Jimenez (2021), project success also involves customer satisfaction with the results. The Earned Value Analysis method is an important tool in evaluating the performance of this project. By using indicators such as ACWP (Actual Cost of Work Performed), BCWP (Budgeted Cost of Work Performed), and BCWS (Budgeted Cost of Work Scheduled), an evaluation can be made to identify cost and time deviations. This data then becomes the basis for decision-making for corrective measures (Arifin et al., 2023; Ayalew et al., 2023; Pramadha et al., 2024; A. P. Putra et al., 2022; H. R. Putra et al., 2024).

Applying this method allows project managers to anticipate problems that could arise during implementation. For example, delays in material delivery or lack of availability of skilled labor can be identified early. This helps in reducing the negative impact on the project schedule and budget (Roring, 2020; Salcedo Jimenez, 2021; Son et al., 2023).

In addition, good project scheduling is an important element in supporting project success. With careful planning, the project can run according to the target without sacrificing the quality of work. Using the Earned Value Analysis method also provides an overview of the efficiency of the costs incurred compared to the results of the work achieved.

While existing literature offers insights into construction project management, few studies specifically address the nuances of PSC construction in the Indonesian context. This research contributes uniquely by providing a detailed analysis of the Probolinggo Regency PSC project, offering practical recommendations tailored to the specific challenges encountered in such projects. By applying the Earned Value Analysis and identifying key

performance indicators, this study provides a framework for improving project efficiency, mitigating risks, and ensuring the successful delivery of critical emergency service infrastructure. This research provides strategic recommendations for managing the PSC building construction project in Probolinggo Regency. The results are expected to guide relevant parties in improving the efficiency and effectiveness of the project. Thus, this project can serve as a model for developing emergency services in other regions in Indonesia.

METHOD

This research employs a descriptive quantitative approach to analyze the efficiency of time and costs in the Health Office Building/PSC 119 construction project in Probolinggo Regency. The data utilized comprises both primary and secondary data. Primary data was gathered through direct field observations, interviews with relevant parties, and documentation of project conditions. Secondary data includes project documents such as the Cost Budget Plan (RAB), S-curve, project implementation schedule, weekly reports, and other contractual documents. The data collection phase begins with a literature review to grasp relevant project management theories and concepts, particularly the Earned Value method. Data from field observations were subsequently combined with project documents to provide a comprehensive view of project performance, including the causes of delays and cost overruns. This data collection is conducted systematically to ensure that the generated data is a solid foundation for analyzing project efficiency.

The data analysis phase used the Earned Value (EV) method to assess project performance. The computed values include Planned Value (PV), which reflects the anticipated value based on the percentage of project progress; Earned Value (EV), representing the actual value according to realized progress; and Actual Cost (AC), detailing the expenses incurred thus far. From these values, Schedule Variance (SV) and Schedule Performance Index (SPI) are derived to evaluate time efficiency, along with Cost Variance (CV) and Cost Performance Index (CPI) for assessing cost efficiency. Additionally, the project's estimated completion is determined using the Budget Estimate to Completion (BETC) and Budget Estimate at Completion (BEAC) metrics to forecast the funding necessary until project completion. The timeline for completion is estimated by calculating the Schedule Estimate to Completion (SETC) and Schedule Estimate at Completion (SEAC). The results of this analysis will offer a comprehensive overview of deviations in both time and cost, along with risk mitigation suggestions to ensure the project remains on track.

RESULT AND DISCUSSION

Performance Index Analysis

SPI Value

In the third-month review, the SPI (Schedule Performance Index) value from week 1 to week 8 is obtained from the Earned and Planned Value divisions.

$$SPI = EV/PV$$

CPI Value

In the third-month review, the CPI (Cost Performance Index) value for weeks 1 to 11 is obtained from the Earned Value and Actual Cost division.

$$CPI = EV/AC$$

Table 1. SPI and CPI from Week 1 to 12

Week to	PV (a)	EV (b)	AC (c)	SPI (b/a)	CPI (b/c)
1	IDR 94,527.24	IDR 94,527.24	IDR 32,000,000.00	1	0
2	IDR 222,417.03	IDR 118,159.05	IDR 28,000,000.00	0.53	0
3	IDR 257,169.70	IDR 251,748.28	IDR 23,000,000.00	0.98	0.01
4	IDR 358,647.47	IDR 594,965.57	IDR 27,936,000.00	1.66	0.02
5	IDR 457,345.03	IDR 1,387,326.25	IDR 24,198,000.00	3.03	0.06
6	IDR 817,382.60	IDR 1,784,896.70	IDR 41,633,000.00	2.18	0.04
7	IDR 1,081,502.83	IDR 2,119,912.36	IDR 35,870,000.00	1.96	0.06
8	IDR 1,563,869.78	IDR 2,347,889.82	IDR 97,108,000.00	1.5	0.02
9	IDR 1,886,374.48	IDR 3,275,090.84	IDR 131,113,000.00	1.74	0.02
10	IDR 2,258,923.01	IDR 3,526,700.11	IDR 162,380,000.00	1.56	0.02
11	IDR 2,970,657.52	IDR 3,683,782.14	IDR 203,000,000.00	1.24	0.02
12	IDR 3,733,825.97	IDR 4,259,286.21	IDR 85,000,000.00	1.14	0.05
13	IDR 5,053,037.01	IDR 4,629,054.54	IDR 53,000,000.00	0.92	0.09
14	IDR 6,646,099.02	IDR 5,073,888.60	IDR 60,000,000.00	0.76	0.08
15	IDR 8,015,353.89	IDR 5,919,073.34	IDR 55,000,000.00	0.74	0.11

Source: Author's Processed Results

Project Cost and Completion Time Prediction

ETC (Estimate to Complete) Value

In the third month review, the ETC value for weeks 1 to 15 is obtained by subtracting the Budget and Earned Value.

$$ETC = Budget - EV$$

The value obtained below shows the cost that must be incurred to complete the project.

Table 2. ETC for Week 1 to 15

Week To	BAC (Budget)	EV	ETC (a-b)
1	1.390.106.467,03	13.901.064,67	1.376.205.402,36
2	1.390.106.467,03	27.802.129,34	1.362.304.337,69
3	1.390.106.467,03	41.703.194,01	1.348.403.273,02
4	1.390.106.467,03	55.604.258,68	1.334.502.208,35
5	1.390.106.467,03	69.505.323,35	1.320.601.143,68

6	1.390.106.467,03	83.406.388,02	1.306.700.079,01
7	1.390.106.467,03	97.307.452,69	1.292.799.014,34
8	1.390.106.467,03	111.208.517,36	1.278.897.949,66
9	1.390.106.467,03	125.109.582,03	1.264.996.884,99
10	1.390.106.467,03	139.010.646,70	1.251.095.820,32
11	1.390.106.467,03	152.911.711,37	1.237.194.755,65
12	1.390.106.467,03	166.812.776,04	1.223.293.690,98
13	1.390.106.467,03	180.713.840,71	1.209.392.626,31
14	1.390.106.467,03	194.614.905,38	1.195.491.561,64
15	1.390.106.467,03	208.515.970,05	1.181.590.496,97

Source: Author's Processed Results

EAC (Estimate At Complete) Value

In the Third month review, weeks 1 to 15 are obtained from the sum of Actual Cost, ETC.

$$EAC = AC + ETC$$

The value obtained below is the total estimated cost from the beginning until the project is completed.

Table 3. EAC in Week 1 to 15

Week To	AC (Rp)	ETC (Rp)	EAC (IDR)
1	32,000,000.00	1,376,205,402.36	1,408,205,402.36
2	28,000,000.00	1,362,304,337.69	1,390,304,337.69
3	23,000,000.00	1,348,403,273.02	1,371,403,273.02
4	27,936,000.00	1,334,502,208.35	1,362,438,208.35
5	24,198,000.00	1,320,601,143.68	1,344,799,143.68
6	41,633,000.00	1,306,700,079.01	1,348,333,079.01
7	35,870,000.00	1,292,799,014.34	1,328,669,014.34
8	97,108,000.00	1,278,897,949.66	1,376,005,949.66
9	131,113,000.00	1,264,996,884.99	1,396,109,884.99
10	162,380,000.00	1,251,095,820.32	1,413,475,820.32
11	203,000,000.00	1,237,194,755.65	1,440,194,755.65
12	85,000,000.00	1,223,293,690.98	1,308,293,690.98
13	53,000,000.00	1,209,392,626.31	1,262,392,626.31
14	60,000,000.00	1,195,491,561.64	1,255,491,561.64
15	55,000,000.00	1,181,590,496.97	1,236,590,496.97

Source: Author's Processed Results

TE Value (Time Estimate to Complete)

In the third-month review, the TE value for weeks 12 to 15 is obtained by dividing the remaining time by SPI.

$$TE = Remaining\ Time\ /\ SPI$$

The data below shows that the 15th week position shows the number 9.46, meaning that the project still takes 9.46 weeks to complete all the work. At the same time, the remaining time is only 7 weeks.

Table 4. TE in Week 1 to 15

Week To	Total Time	Week To	Remaining Time	SPI	TE
1	22	1	21	1	21
2	22	2	20	0.53	37.74
3	22	3	19	0.98	19.39
4	22	4	18	1.66	10.84
5	22	5	17	3.03	5.61
6	22	6	16	2.18	7.34
7	22	7	15	1.96	7.65
8	22	8	14	1.5	9.33
9	22	9	13	1.74	7.47
10	22	10	12	1.56	7.69
11	22	11	11	1.24	8.87
12	22	12	10	1.14	8.77
13	22	13	9	0.92	9.78
14	22	14	8	0.76	10.53
15	22	15	7	0.74	9.46
16	22	16	6	0.75	8.01
17	22	17	5	0.83	6.02
18	22	18	4	0.82	4.91

Source: Author's Processed Results

Calculation Result Chart

Earned Value Chart (EV, PV, and AC)

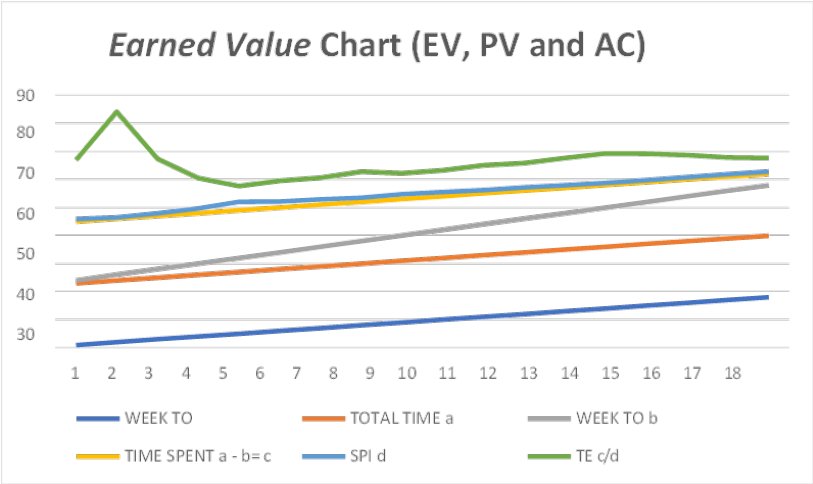

Figure 1.
Earned Value Comparison Chart

The Earned Value Chart in Figure 1 can be explained as below:

1. EV graph against PV, the position of the EV graph is below the PV graph after the implementation reaches week 18. It can be concluded that the Result Value is below the Plan; this indicates that the project at week 18 is delayed from the plan.
2. EV graph with AC: The EV graph is above the AC, so it can be concluded that in week 18, the project is still under budget.

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

Table 5. SPI and CPI for Week 1 to 12

Week To	PV (Rp)	EV (Rp)	AC (Rp)	SPI	CPI
1	222,417.03	94,527.24	32,000,000.00	1	0
2	257,169.70	118,159.05	28,000,000.00	0.53	0
3	358,647.47	251,748.28	23,000,000.00	0.98	0.01
4	457,345.03	594,965.57	27,936,000.00	1.66	0.02
5	817,382.60	1,387,326.25	24,198,000.00	3.03	0.06
6	1,081,502.83	2,119,912.36	41,633,000.00	2.18	0.04
7	1,563,869.78	2,347,889.82	35,870,000.00	1.96	0.06
8	1,886,374.48	3,275,090.84	97,108,000.00	1.5	0.02
9	2,258,923.01	3,526,700.11	162,380,000.00	1.56	0.02
10	2,970,657.52	3,683,782.14	203,000,000.00	1.24	0.02
11	3,733,825.97	4,259,286.21	85,000,000.00	1.14	0.05
12	5,053,037.01	4,629,054.54	53,000,000.00	0.92	0.09
13	6,646,099.02	5,073,888.60	60,000,000.00	0.76	0.08

14	8,015,353.89	5,919,073.34	55,000,000.00	0.74	0.11
15	9,331,784.71	6,990,845.42	55,000,000.00	0.75	0.13
16	10,541,177.34	8,761,841.06	65,000,000.00	0.83	0.12
17	11,387,752.18	9,283,130.99	65,000,000.00	0.82	0.14
18	12,231,546.80	11,154,214.29	82,000,000.00	0	0.14
19	13,155,967.60	12,490,106.61	82,000,000.00	0	0.15
20	13,787,075.94	13,621,653.27	82,000,000.00	0	0.17
21	13,901,064.67	13,901,064.67	37,000,000.00	0	0.38

Explanation of the Performance Index Graph:

This graph is almost the same as the variant graph; the difference is that the Performance Index result is the variable division result, while the variant uses subtraction. A number above 1 means good performance, while a number below 1 means not good performance.

1. The Cost Performance Index (CPI) graph for weeks 1 and above already shows a number below one, indicating that cost performance did not improve until week 22.
2. The Schedule Performance Index (SPI) graph from week 4 to week 12 shows a value above 1 in the sense that the performance of Time from the Performance Index is a division result variable. However, from the Variant using subtraction, where the number above 1 means good performance, performance decreases from week 13 to week 22. In contrast, a number below 1 does not indicate good performance.

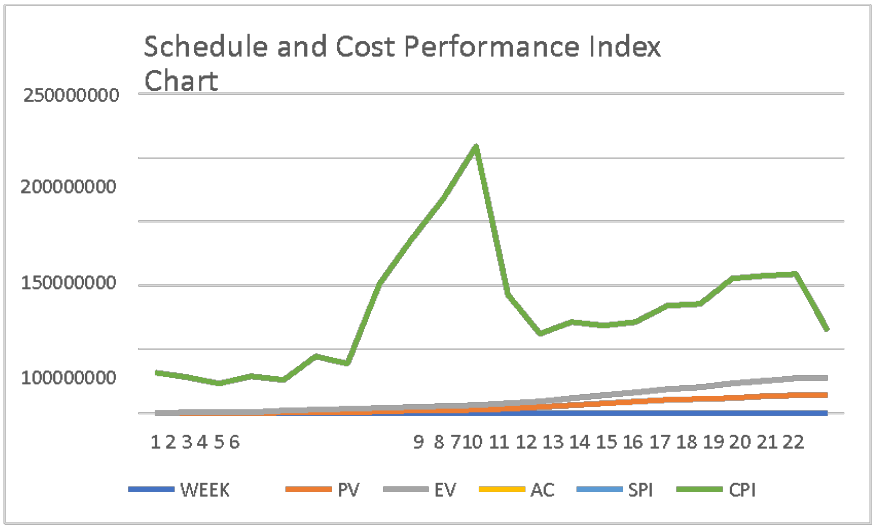

Figure 2.
Schedule and Cost Performance Index Graph

Discussion

Based on the analysis of the Cost Performance Index (CPI) and Schedule Performance Index (SPI) values, it can be concluded that the cost and time efficiency of the project

fluctuated during its implementation. In the initial weeks, the CPI was below 1, indicating that the actual cost incurred was higher than the value of the work completed. This suggested that the project was over budget at that point. However, cost control measures appeared effective in the subsequent weeks, with the CPI value gradually approaching 1, signaling improved cost efficiency.

For the SPI, the project faced delays from the outset, with SPI values consistently falling below 1, especially between week 8 and week 15. This indicates that the work completed was not aligned with the project's predetermined time plan. While the delay was apparent in the earlier stages, from week 4 to week 12, there was an indication of improved time efficiency. However, this improvement was not consistent throughout the entire project period. These findings suggest that, although delays were addressed in part, significant time inefficiencies persisted for a prolonged period.

The estimated cost to complete the project (ETC) showed a gradual decrease as the work progressed. The high ETC value during the initial weeks reflected the remaining work. As the project moved forward, the ETC decreased, indicating that more of the project had been completed, which reduced the projected additional costs. In contrast, the Estimate at Completion (EAC) value demonstrated that the total project cost was expected to stay under control despite some fluctuations during implementation, suggesting that the project team was managing the budget reasonably well.

An analysis of the Earned Value (EV), Planned Value (PV), and Actual Cost (AC) graphs showed that the position of EV below PV indicated delays in completing the work up to week 18. This further confirmed the lack of progress in meeting the original schedule. However, the fact that EV was above AC indicated that the project was still running under the planned budget despite the time inefficiencies.

These findings underline the importance of tighter control over cost and time management to ensure the project can be completed within the set budget and schedule. The delays and initial over-expenditure underscore the need for more proactive measures. Several recommendations can be made to improve project performance based on these results. These include optimizing resource allocation, performing regular evaluations of the project schedule to identify potential delays early, and implementing more effective risk mitigation strategies to address any unforeseen challenges. It is also recommended that the project team consider using modern project management tools, such as software for real-time tracking of performance metrics, to enhance monitoring and decision-making further. Regular communication and coordination among the team and stakeholders will also be critical in focusing on key deliverables, ensuring the project's ultimate success in meeting both time and budget goals.

CONCLUSION

Based on the Earned Value analysis at week 15, the project experienced significant delays and initial cost inefficiencies. The Schedule Performance Index (SPI) below 1 indicated

a slower-than-planned schedule, and the early Cost Performance Index (CPI) values below 1 signaled higher-than-earned actual costs. While the CPI improved in later weeks, indicating better cost management, the project completion was projected to take 9.46 weeks beyond the original 22-week schedule.

Actionable recommendations are crucial to enhance project performance and mitigate the risks of further delays and cost overruns. Implemented advanced scheduling techniques, such as the Critical Path Method (CPM) and resource leveling, to optimize task sequencing and resource allocation. Prioritize tasks on the critical path to minimize overall project duration. Develop a comprehensive risk management plan identifying potential risks (e.g., material delays, labor shortages) and outlining mitigation strategies. Regularly monitor and update the risk register to address emerging issues promptly.

Identify and address resource bottlenecks to optimize resource allocation. This includes cross-training team members, reallocating resources from less critical tasks, and potentially hiring additional skilled labor or subcontractors to expedite critical activities. Foster seamless communication and coordination among all project stakeholders by establishing regular progress meetings and using collaborative project management tools.

Implement a real-time project performance monitoring system to track key performance indicators (KPIs). Develop contingency plans for potential disruptions and adopt an Earned Value Management System (EVMS) for comprehensive tracking. By implementing these strategic recommendations, project managers can proactively address challenges, improve project efficiency, and increase the likelihood of completing future projects on time, within budget, and to the required quality standards.

REFERENCES

Arifin, M. F. A., Sarifatuzzuhriyah, M., & Liu, S. S. (2023). Cost and Time Control Analysis with Earned Value Method in the MRT-Hub Building Construction. *Jurnal Teknik Sipil Dan Perencanaan*, *25*(1). https://doi.org/10.15294/jtsp.v25i1.43043

Ayalew, G. M., Meharie, M. G., & Ayalew, G. G. (2023). Regression Modeling for Prediction of Earned Value Indexes in Public Building Construction Projects: The case of Ethiopia. *Cogent Engineering*, *10*(1). https://doi.org/10.1080/23311916.2023.2220497

Harahap, N. C., Handayani, P. W., & Hidayanto, A. N. (2021). Barriers in health information systems and technologies to support maternal and neonatal referrals at primary health centers. *Healthcare Informatics Research*, *27*(2). https://doi.org/10.4258/HIR.2021.27.2.153

Inne Yelisni, Ayu Dekawaty, & Meriyatul Rahmi. (2023). Implementation of the Implementation of Hallucination Implementation Strategies Related to the Readiness of Nursing Centers for the Integrated Emergency Management System (SPGDT) at the Palembang Homeless and Displaced Persons' Home. *Jurnal Inspirasi Kesehatan*, *1*(2). https://doi.org/10.52523/jika.v1i2.53

Nugroho, D. (2022). Perancangan Desain User Interface Mobile Apps Pada Sistem Penanggulangan Gawat Darurat Terpadu D.I.Y. *Journal of Information Systems for Public Health*, *7*(2). https://doi.org/10.22146/jisph.71321

Nurulia Dwi, D. S. (2019). Analisis Sistem Informasi Inovasi PSC (Public Safety Center) 119 dengan Metode Pieces di Dinas Kesehatan Kabupaten Boyolali. *Prosiding - Semnas & Call for Papers*, *01*(2).

Pramadha, I. Y., Tjendani, H. T., & Witjaksana, B. (2024). Cost and Time Analysis Using Earned Value Method on the Construction of the National Kediri Airport Access Road Phase 1 Kediri - Nganjuk. *International Journal on Advanced Technology, Engineering, and Information System (IJATEIS)*, *3*(1). https://doi.org/10.55047/ijateis.v3i1.1023

Prihanti, R., Widjanarko, B., & Budiyono, B. (2022). Faktor- Faktor Yang Mempengaruhi Implementasi Public Safety Center (PSC) 119 Di Indonesia : Literatur Review. *Media Kesehatan Politeknik Kesehatan Makassar*, *17*(2). https://doi.org/10.32382/medkes.v17i2.3049

Putra, A. P., Cahya, E. N., & Fidari, J. S. (2022). Studi Manajemen Proyek Rehabilitasi Daerah Irigasi Domas Kabupaten Pasuruan Menggunakan Metode Crashing dan Fasttrack. *Jurnal Teknologi Dan Rekayasa Sumber Daya Air*, *2*(2). https://doi.org/10.21776/ub.jtresda.2022.002.02.19

Putra, H. R., Koespiadi, K., & Oetomo, W. (2024). Cost And Time Analysis Using Methods Earned Value. *Asian Journal of Engineering, Social and Health*, *3*(1). https://doi.org/10.46799/ajesh.v3i1.204

Roring, H. S. D. (2020). Earn Value Analysis Pada Proyek Rehabilitasi Gedung Asrama Balai Diklat Keuangan Manado. *Jurnal Ilmiah Realtech*, *16*(1). https://doi.org/10.52159/realtech.v16i1.126

Salcedo Jimenez, L. C. (2021). Aplicación de la Gestión del Valor Ganado “Earned Value Management EVM”, como Herramienta para Garantizar el Seguimiento y Control en Proyectos de Consultoría. *Paper Knowledge. Toward a Media History of Documents*, *3*(2).

Son, J., Khwaja, N., Milligan, D. S., & Honey, B. D. (2023). Simplified Earned Value Analysis Method for Highway Construction Projects. *Transportation Research Record*, *2677*(10). https://doi.org/10.1177/03611981231161354

Sulistiadi, W., Nurhidayah, S., & Al Asyary. (2020). Evaluating the management information system of integrated medical emergency care in batang regency, Indonesia. *International Journal of Online and Biomedical Engineering*, *16*(7). https://doi.org/10.3991/ijoe.v16i07.14725

Sylvana, B. (2020). Tanggung Jawab Pemerintah Daerah Dalam Penyelenggaraan Kedaruratan Pra-Hospital Melalui Public Safety Center (Psc) 119 Untuk Peningkatan Layanan Kesehatan Di Indonesia. *Aktualita (Jurnal Hukum)*. https://doi.org/10.29313/aktualita.v0i0.6513