

Optimizing Project Delivery in Educational Infrastructure: The Impact of Fast-Track Methods in Indonesian School Construction

Arman Jayady^{1*}, Sahala Tua Rajagukguk²

¹ Universitas Persada Indonesia YAI, Jakarta, Indonesia

² Politeknik Katolik Saint Paul Sorong, Papua, Indonesia

*Email: armanjayady@upi-yai.ac.id

ARTICLE INFO	ABSTRACT
<p>Keywords: Fast-Track Construction, Project Management Efficiency, Educational Facility Development, Cost Reduction Strategies, Indonesian Infrastructure Projects.</p>	<p><i>Infrastructure development is essential for socio-economic growth, especially in the field of education, where facilities directly contribute to the development of human resources. In areas such as Sorong City, where the Indonesian government has invested a lot of funds, efficient project execution has become very important due to tight deadlines and budget constraints. This study examines the application of the fast-track method in managing the Model X School Construction Project in Sorong, focusing on its impact in reducing the duration and cost of the project. The fast-track method, characterized by overlapping and compression of activities, used in conjunction with Microsoft Project, represents a shift from the traditional, sequential project delivery model. The findings of this study show that the application of the fast-track method can reduce the project duration by 17 days and save indirect costs by 0.9%, or equivalent to IDR 13,073,000. These results confirm the effectiveness of this method in improving operational efficiency and reducing expenses in the context of projects that require quick and economical completion. This research contributes to the literature by providing insight into the practical benefits of fast-tracking methods in the construction industry, particularly educational infrastructure, and highlighting its potential for wider application to various types of construction projects.</i></p>

INTRODUCTION

The infrastructure supports a nation's socio-economic dynamics, providing a basic framework through various critical systems and facilities. It also serves as a pivotal support for sustainability and regional development (Chan et al., 2022); (Chatzimentor et al., 2020); (Liberalesso et al., 2020); (Pearsall et al., 2022). Infrastructure can be classified into two categories: physical and social (Ascher & Krupp, 2010); (Baskakova & Malafeev, 2017); (Indira & Chandrasekaran, 2023); (Momoh, 2018); (Willis, 2023). Physical infrastructure includes components such as roads, bridges, water channels, irrigation facilities, and water treatment and power generation installations designed to meet the community's physical needs. Meanwhile, social infrastructure comprises security facilities, telecommunications, education, and other elements that support social needs.

In the educational context, schools are a crucial part of social infrastructure and vital for regional human resource development (Ieiri et al., 2021); (Nekhorosheva et al., 2021); (Strashnova, 2022). Through its National Budget (APBN) and Regional Budgets (APBD), the Indonesian government has demonstrated significant commitment to facilitating the physical development of educational facilities (Sabilah et al., 2022); (Sulamsi et al., 2023), including in Sorong City, where substantial national investments are directed towards constructing educational facilities, particularly prioritizing secondary education.

However, the reality on the ground often reveals that implementing infrastructure projects only sometimes proceeds smoothly. Implementing contractors, such as in the Sorong Model School X Construction Project, frequently encounter challenges that impede progress, including delays in material delivery, resource wastage, and misallocation of labor. These incidents frequently result in deviations from the planned project schedule,

potentially causing significant delays and substantial fines from commitment-making officials representing the project owners.

In response to these challenges, this study focuses on implementing the fast-track method in project management to identify and apply effective acceleration strategies to optimize project rescheduling. Fast-tracking is often described as a method involving the overlapping and compressing of various activities during the conceptual design, procurement, and construction stages to complete projects quickly and economically (Amir et al., 2023); (Egbelakin et al., 2021); (Rasul et al., 2021); (Salhab et al., 2023). This method markedly differs from the typical project delivery models, which usually follow a sequential process where the completion of one phase triggers the start of the next. The fast-track method was chosen for further exploration in this context, given its limited adoption by construction practitioners in Sorong City, as indicated in preliminary pilot studies.

This study aims to plan the rescheduling of the Sorong Model School X Construction Project using the fast-track method, focusing on reducing work duration and potential cost savings. The results are expected to significantly contribute to construction practitioners and stakeholders in the industry, enhancing the efficiency of managing educational infrastructure projects in Indonesia. The implications of this study are substantial, as they provide a model for improving project timelines and cost efficiency, which can be applied to various construction projects beyond the educational sector, potentially influencing policy and practice in the broader construction industry.

METHOD

Generally, the fast-track method is often used in conjunction with Microsoft Project (Aulia et al., 2023); (Yusuf et al., n.d.). In this study, Microsoft Project also facilitated the implementation of fast-track. Its implementation has three main stages: planning a network diagram based on existing data and schedules, evaluating the existing diagram and implementing fast-track, and comparing time and cost before and after using the fast-track method.

In the first stage, a network diagram is created based on the schedule and existing data obtained from the contractor. This process is assisted by the Microsoft Project application, with steps including the input of the Budget Plan (RAB) into Microsoft Project, grouping of tasks into main work groups, entry of material quantities and labor into the resource sheet, calculation of duration for each task, and creation of a sequence of activities and logical relationships between tasks. The output obtained at this stage is a network diagram and a critical path based on existing data.

In the second stage, an evaluation and replanning of the network diagram and critical path are conducted using the fast-track method facilitated by Microsoft Project, resulting in a faster project schedule than the previous schedule. The steps taken using the fast-track method include creating a logical and realistic schedule, engineering several activities on the critical path with overlapping compression, and parallel approaches to reduce work time. The implementation of the fast-track method using Microsoft Project is detailed as follows:

- a. Project Introduction and Preparation: Project tasks, duration, and resources are entered to establish a basic schedule.
- b. Dependency Analysis and Critical Path Identification: The software determines critical tasks that dictate the project duration.
- c. Schedule Compression and Parallelization: Tasks are rearranged to occur simultaneously, reducing the overall timeline.
- d. Resource Allocation: Managed to optimize resource use and avoid bottlenecks.
- e. Monitoring and Adjustments: Involves using Tracking Gantt for real-time progress comparison and necessary schedule adjustments.
- f. Ongoing Analysis and Optimization: Assess fast-tracking effectiveness and refine strategies.
- g. Communication and Coordination: Ensures stakeholders are updated, utilizing Microsoft Project's features for effective communication and swift change implementation, crucial for maintaining project momentum and success.

In the third stage, the total time on the critical path and the overall cost of activities between the initial scheduling and after fast-tracking are compared, assessing the total duration reduced and the cost savings achieved using the fast-track method. Figure 1 below illustrates the methodology diagram.

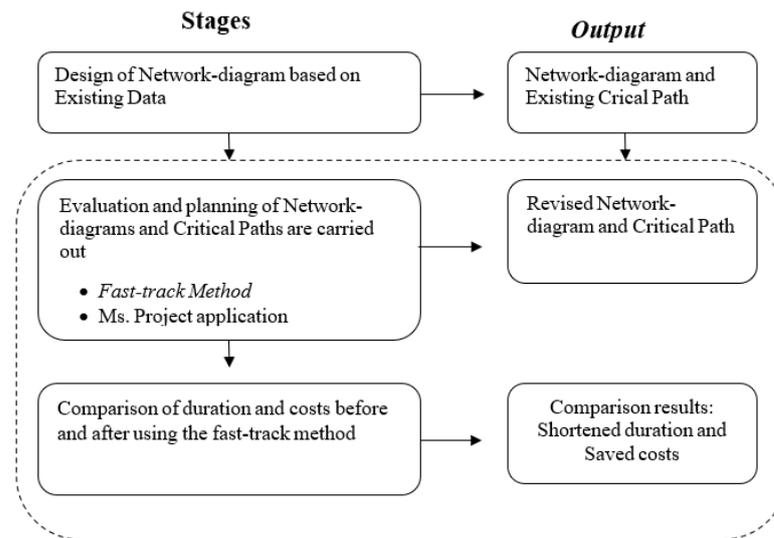


Figure 1. Flowchart of Research Methodology

RESULTS AND DISCUSSION

Based on the existing data and the previously described implementation of the methodology, Table 1 below has been compiled, listing the activities that constitute the existing critical path before applying the fast-track method.

Table 1. Critical Path Activities (Existing)

ID	Activities	Duration (Days)	Volume	Unit
2	Site Clearance	2	72	Sq M
3	Construction of Equipment Warehouse	2	1	Lump Sum
8	Material Transport Services	2	1	Lump Sum
9	Demolition of Old Building	4	1	Lump Sum
4	Measurement and Installation of Bowplank	1	36	Meters
12	Foundation Excavation	2	52.08	Cubic M
21	Installation of Wooden Dolken Piles	4	150	Points
17	Installation of Working Floor Footprint	3	2.94	Cubic M
18	Installation of Footprint Foundation	17	15.27	Cubic M
19	Installation of Column for Footprint Foundation (35/35)	3	3.675	Cubic M
13	Soil Backfilling	2	17.360	Cubic M
24	Installation of Sloof (20/30)	17	9.71	Cubic M
26	Installation of 1st Floor Column (20/40)	7	7.06	Cubic M
27	Installation of 1st Floor Terrace Column	7	2.268	Cubic M
34	Installation of Beam (30/50)	18	13.920	Cubic M
36	Concrete Slab Installation T=10 cm	16	25.2	Cubic M
30	Installation of 2nd Floor Column (30/30)	6	4.158	Cubic M
31	Installation of 2nd Floor Column (20/20)	6	1.088	Cubic M
35	Installation of Ring Beam (15/20)	10	3.066	Cubic M
51	Installation of Ironwood Truss (5/10)	6	2.53	Cubic M
52	Installation of Truss Consul of Wood	6	0.15	Cubic M
53	Installation of Ironwood Purlins (5/10)	6	2.22	Cubic M
54	Installation of Corrugated Zinc Roof BJLS 30	4	154	Sq M
55	Installation of Spandek BJLS 30 Roof Ridge	3	30	Meters
59	Installation of Ceiling Frame	6	250	Sq M
60	Installation of 3mm Plywood Ceiling	6	250	Sq M
61	Installation of Wooden Profile Molding	6	50	Meters
97	Installation of XL 24 Watt Lamps	1	17	Pieces
101	Cable Installation	3	29	Points
120	Cleaning & Tidying	3	1	Lump Sum

Table 2 below presents the sequence of activities, durations, volumes, and units that constitute the critical path following the implementation of the fast-track method.

Table 2. Critical Path Activities Post Fast-Track Implementation

ID	Work Items	predecessor	Accelerate	Cumulative Accelerate
2	Site Clearance	-	-	-
3	Equipment Warehouse Creation	-	-	-
8	Material Transportation Service	-	-	-
9	Demolition of Old Buildings	-	-	-
4	Bowplank Measurement and Installation	-	-	-
12	Excavation of Foundation Soil	-	-	-
21	Fitting. Dolken Wood Stake	-	-	-
17	Fit. Palm Work Floor	-	-	-
18	Fitting. Footing Foundation	-	-	-
19	Fitting. Footing Column (35/35)	-	-	-
13	Backfill	-	-	-
24	Fitting. Sloof (20/30)	-	-	-
26	Fitting. 1st Floor Column (20/40)	-	-	-
27	Fitting. Column Lt.1 Terrace Pole	-	-	-
34	Fit. Beam (30/50)	-	-	-
36	Fitting. Concrete Plate T=10 cm	-	-	-
30	Fitting. 2nd floor column (30/30)	-	-	-
31	Fitting. 2nd floor column (20/20)	-	-	-
35	Fit. Ring Beam (15/20)	30,31SS+3days	3	3
51	Fitting. Ironwood Horse (5/10)	35SS+8days	2	5
52	Fit. Horse Consul - Wooden Horse	51SS+4days	2	7
53	Fitting. Ironwood Cording (5/10)	52SS+4days	2	9
54	Fitting. Zinc Roof BJLS 30	53SS+2days	2	11
55	Fitting. Spandek Roof Nok BJLS 30	54SS+2days	1	12
59	Fitting. Ceiling Frame	-	-	-
60	Fitting. 3mm Triplex Ceiling	59SS+4days	2	14
61	Fitting. Wood Profile List	60SS+4days	2	16
97	24 Watt XL Lamp	-	-	-
101	Cable Installation	-	-	-
120	Cleaning & Fireplace	101SS+3days	1	17

In this study, an evaluation was also conducted on the impact of implementing the fast-track method on the New Classroom Building Project at Model School X, particularly regarding cost savings. This method was applied without adding labor, with costs and materials remaining by the contractor's agreement. The fast-track implementation involved overlapping activities on the critical path, resulting in a 17-day reduction in project duration.

Cost analysis indicated savings on indirect costs, which include daily operational expenses. From an initial indirect cost of IDR 118,500,000, the acceleration saved IDR 13,073,000, reducing the total to IDR 105,427,000. Overall, the cost savings amounted to 0.9% of the total project cost, which decreased from IDR 1,436,950,000 to IDR 1,423,877,000.

In addition to cost savings, the fast-track method accelerated project completion by 11.2% from the existing schedule. In conclusion, the fast-track method optimizes cost and time, making it relevant for projects with strict time and budget constraints.

The analysis of implementing the fast-track method on the New Classroom Building Project at Model School X reveals several significant findings. Based on existing tables and those generated after applying the fast-track method, there is a clear indication that this method significantly shortens the project duration from the set schedule. By overlapping critical activities, fast-tracking reduced the project duration by 17 days.

Cost savings are a key aspect of this analysis. Calculations show that applying fast-track reduced indirect costs of IDR 13,073,000, or 0.9% of the total project cost. This is a significant saving, considering that indirect costs include equipment rental, project management salaries, and ongoing utility expenses during the project. These results, demonstrating both time reduction and cost savings, also confirm previous research on different cases (Aulia et al., 2023); (Rahayu et al., 2018); (Stefanus et al., 2017); (Yusuf et al., n.d.).

This acceleration also indicates potential reductions in direct costs, although, in this case, the direct costs remained unchanged based on the initial agreement with the contractor (Andryansyah & Jayady, 2023); (Jayady, 2018); (Jayady et al., 2017); (Jayady et al., 2021); (Maulinda & Jayady, 2023); (Purnomo & Jayady, 2023); (Sudjatmiko & Jayady, 2023). This suggests that the primary benefit of fast-tracking lies in time efficiency, which

directly impacts the reduction of indirect costs. From a project management perspective, the time efficiency produced by the fast-track method not only reduces costs but also offers greater operational flexibility and the ability to respond quickly to changes or challenges that arise during the project execution phase. Moreover, accelerating project completion allows contractors to move on to the next project sooner, increasing project turnover within the same period. However, it should also be noted that implementing fast-tracking requires meticulous planning and effective coordination among all involved parties. Risks such as construction errors due to increased work pace and potential conflicts among teams due to overlapping activities need to be carefully managed.

CONCLUSION

The results of this study indicate that the fast-track method effectively reduces project duration by 17 days, resulting in 0.9% savings in indirect costs. These savings stem from reducing unnecessary operational expenditures due to the faster completion of the project. However, the success of fast-track implementation depends on meticulous planning and effective coordination among all parties involved. Recommendations for future research include a deeper examination of the impact of fast-tracking on the quality of construction outcomes and identifying factors that can optimize the use of this method across various types of construction projects to enhance efficiency more broadly.

REFERENCES

- Amir, A., Khodeir, L., & Khaled, A. (2023). Identification of key Risks in Fast-Track Construction projects: A Literature Review. *MSA Engineering Journal*, 2(2), 173–192.
- Andryansyah, M., & Jayady, A. (2023). Urbanization Challenges In Cipinang Besar Utara: A Study On Slum Conditions And Mitigation. *Enrichment: Journal of Multidisciplinary Research and Development*, 1(9), 569–576.
- Ascher, W., & Krupp, C. (2010). Rethinking physical infrastructure development. In *Physical infrastructure development: Balancing the growth, equity, and environmental imperatives* (pp. 1–33). Springer.
- Aulia, H., Widiyanti, I., & Lenggogeni, L. (2023). Penerapan Metode Fast Track pada Proyek Pembangunan Instalasi Gawat Darurat. *Jurnal Pendidikan Tambusai*, 7(3), 26435–26439.
- Baskakova, I. V., & Malafeev, N. S. (2017). The concept of infrastructure: Definition, classification and methodology for empirical evaluation. *Известия Уральского Государственного Экономического Университета*, 3, 29–41.
- Chan, M., Jin, H., van Kan, D., & Vrcelj, Z. (2022). Developing an innovative assessment framework for sustainable infrastructure development. *Journal of Cleaner Production*, 368, 133185.
- Chatzimentor, A., Apostolopoulou, E., & Mazaris, A. D. (2020). A review of green infrastructure research in Europe: Challenges and opportunities. *Landscape and Urban Planning*, 198, 103775.
- Egbelakin, T., Ogunmakindae, O. E., Teshich, B., & Omotayo, T. (2021). Managing fast-track construction project in Qatar: Challenges and opportunities. *Buildings*, 11(12), 640.
- Ieiri, M. C. A., Kosaka, S., Tomitsuka, E., & Umezaki, M. (2021). Factors affecting undernutrition among school children in Cebu, Philippines. *Ecology of Food and Nutrition*, 60(2), 182–197.
- Indira, A., & Chandrasekaran, N. (2023). Infrastructure development in India: a systematic review. *Letters in Spatial and Resource Sciences*, 16(1), 35.
- Jayady, A. (2018). Teknologi Konstruksi: Sebuah Analisis. *Karkasa*, 4(1).
- Jayady, A., Pribadi, K. S., Abduh, M., & Bahagia, S. N. (2017). Success Indicators of Knowledge Transfer for the Transferee on the Construction Joint Venture in Indonesia. *SIBE 2017, The Third International Conference on Sustainable Infrastructure and Built Environment*.
- Jayady, A., Subekti, P., Smyshlyaev, A. V., Protasova, O. N., & Artha, R. (2021). Salary scale and the diversity of wage systems. *Linguistics and Culture Review*, 5(S1), 293–302.
- Liberalesso, T., Cruz, C. O., Silva, C. M., & Manso, M. (2020). Green infrastructure and public policies: An international review of green roofs and green walls incentives. *Land Use Policy*, 96, 104693.
- Maulinda, N. S., & Jayady, A. (2023). Kekumuhan Pada Kelurahan Tanah Tinggi Kota Jakarta Pusat: Penilaian dan Strategi Penanganan. *IKRA-ITH Teknologi Jurnal Sains Dan Teknologi*, 7(2), 13–21.
- Momoh, M. A. (2018). Infrastructure Classification Revisited. *Journal Of Social Science Research*, 12, 1.
- Nekhorosheva, E., Alekseycheva, E., & Kravchenko, A. (2021). Quality of life and everyday mobility of schoolchildren: what choice do Moscow parents make? *SHS Web of Conferences*, 98, 2002.
- Pearsall, H., Heck, S., Tablas, M., Pierce, J., Hinrichs, C., Roman, L. A., & Shabazz, J. (2022). Building knowledge infrastructure for diverse stakeholders to scale up co-production equitably. *Current Opinion in Environmental Sustainability*, 54, 101156.
- Purnomo, C., & Jayady, A. (2023). The North Line Jakarta Lrt: Operating System And Risk Analysis. *Enrichment:*

Journal of Multidisciplinary Research and Development, 1(6), 250–256.

- Rahayu, A. P., Mulyani, E., & Arpan, B. (2018). Analisa Percepatan Waktu Dengan Metode Fast Track Pada Proyek Konstruksi. *JeLAST: Jurnal Teknik Kelautan, PWK, Sipil, Dan Tambang*, 5(3).
- Rasul, N., Malik, M. S. A., Bakhtawar, B., & Thaheem, M. J. (2021). Risk assessment of fast-track projects: a systems-based approach. *International Journal of Construction Management*, 21(11), 1099–1114.
- Sabilah, F., Suparto, S., & Salahudin, S. (2022). Public Policy Analysis On Education Budget Allocation: Case Studys in Regencies/Municipalities East Java, Indonesia. *Jurnal Studi Pemerintahan*, 59–85.
- Salhab, D., Lindhard, S. M., & Hamzeh, F. (2023). Schedule compression and emerging waste in construction: an assessment of overlapping activities. *Engineering, Construction and Architectural Management*.
- Stefanus, Y., Wijatmiko, I., & Suryo, E. A. (2017). Analisis percepatan waktu penyelesaian proyek menggunakan metode fast-track dan crash program. *J. Media Tek. Sipil*, 15(1), 76.
- Strashnova, Y. (2022). Social infrastructure importance for modern city and the ways of its urban development. *E3S Web of Conferences*, 363, 2045.
- Sudjatmiko, S., & Jayady, A. (2023). Metode Pelaksanaan Erection Steel Box Girder Pada Proyek Relokasi Jembatan Antelope Km 5+ 145 Bekasi-Jawa Barat. *IKRA-ITH Teknologi Jurnal Sains Dan Teknologi*, 7(2), 1–12.
- Sulasm, E., Prasetia, I., & Rahman, A. A. (2023). Government Policy Regarding Education Budget On The Posture Of The State Budget (APBN) In 2023. *Journal for Lesson and Learning Studies*, 6(1).
- Willis, K. (2023). Third Places: The Social Infrastructure of the Smart City. In *Gated Communities and the Digital Polis: Rethinking Subjectivity, Reality, Exclusion, and Cooperation in an Urban Future* (pp. 199–208). Springer.
- Yusuf, M. F., Arumsari, P., & Lie, J. L. (n.d.). *Analysis of Schedule Overrun Methods in Acceleration of Scheduling in the Ploso Bridge Construction Project*.