Open Access

MARKETING INNOVATION JOURNAL
ISSN Print: XXXX-XXXX | ISSN Online: XXXX-XXXX
Homepage: https://ojs.polnes.ac.id/index.php/mij/index

Research Article

Volume: 01, (1), 2026
Page: 1-9

Delivery Reliability as Operational Value in Affordable Housing: A Critical Path Analysis of a Type 36 House Project in Samarinda

Rusliansyah[1]*, Shine Joynes Palapessy[2], Prapdopo[3], Delmiati[4], Daira E.M. Sangkilang[5]
[12345] Politeknik Negeri Samarinda, Indonesia
***Corresponding Author:** rusliansyah@polnes.ac.id

Article History

Received:
18th April 2026

Accepted:
27th April 2026

Published:
30th April 2026

Abstract

Affordable housing competes not only on price but also on dependable handover performance. However, many Critical Path Method (CPM) studies on small housing projects remain framed as technical scheduling exercises and do not clearly show the precedence logic needed for replication. This study examines a Type 36 house project in Samarinda as a case of project-based housing delivery. Using field observation, interviews with the project manager, and project schedule records, the study reconstructs a package-level CPM network with explicit predecessors, forward and backward pass results, slack values, and an accelerated scenario. The documented managerial schedule shows a normal completion horizon of 180 days. Under the accelerated scenario, the elapsed project time can be reduced to 123 days, generating a saving of 57 days or 31.7 percent. The revised CPM presentation shows that the critical structure is concentrated in preparatory work, earthworks, concrete work, wall work, the roof-ceiling sequence, sanitation coordination, and final electrical work, while floor work, frame installation, and locking activities carry limited float. The contribution of the study is threefold. First, it positions schedule control as a delivery-reliability issue in affordable housing operations. Second, it provides a more transparent CPM presentation than many local housing case studies. Third, it offers practical guidance for managers in prioritizing supervision and resource coordination. The study does not measure customer satisfaction directly; therefore, its claim is limited to time-efficiency analysis and delivery-reliability support.

Keywords: *Content Marketing, Social Media Marketing, Purchase Intention, Purchase Decision.*
JEL: *M31*

1. Introduction

Affordable housing delivery is increasingly pressured by urban growth, tighter buyer expectations, and the need to coordinate construction resources efficiently. In this context, project completion time is not merely a technical variable. It also shapes the dependability of the delivery promise made by a housing developer. For project-based housing services, late handover can weaken coordination, extend cash-cycle pressure, and reduce perceived operational credibility even when the physical unit is eventually completed.

Operations strategy literature treats speed and dependability as important performance objectives because they connect internal execution with externally perceived service value. In service and logistics settings, delivery reliability is also closely related to responsiveness and operational performance. This perspective is useful for affordable housing because the sector is highly sensitive to promised completion dates, financing timing, and coordination of labor and materials.

Previous housing-project studies using CPM in Indonesia have mainly focused on time optimization or time-cost comparison in technical project settings. That line of work is valuable, but it often stops at reporting activity durations and final project time. Two limitations remain. First, many studies do not explicitly connect schedule discipline with delivery reliability and project-based value delivery. Second, methodological transparency is often limited because immediate predecessors, network logic, slack values, and the derivation of accelerated schedules are not shown in sufficient detail.

The present study addresses those limitations through a revised analysis of a Type 36 house project in Samarinda. The case is relevant because Type 36 housing represents a practical form of affordable housing provision for young families and lower-middle-income consumers. The study does not argue that CPM itself is a new method. Instead, its contribution lies in a clearer business-oriented interpretation and a more transparent package-level CPM presentation. In other words, the paper asks how schedule control in a small housing project can support delivery reliability as an element of operational value.

The study makes three specific contributions. First, it reframes the housing project as a project-based service-delivery case rather than as a purely technical construction calculation. Second, it strengthens analytical transparency by providing activity predecessors, a network diagram, forward and backward pass results, and slack information at the work-package level. Third, it offers managerial implications for affordable housing providers regarding supervision priorities, coordination of critical activities, and the operational meaning of lead-time reduction.

On that basis, the objective of this study is to analyze the planning and control of a Type 36 house project in Samarinda using CPM and to interpret the result in terms of delivery reliability. The paper remains conservative in its claims. It demonstrates time-efficiency improvement and stronger schedule visibility, but it does not directly measure customer satisfaction, market response, or marketing performance.

2. Literature Review

Project management provides the structure needed to organize resources, coordinate work, and control progress in time-bound activities. Within that domain, CPM remains one of the most widely used tools for identifying critical activities, estimating project duration, and revealing where managerial attention should be concentrated. For applied housing projects, CPM is useful because even small delays in certain tasks can propagate across the entire schedule.

From an operations-strategy perspective, schedule control matters because speed and dependability are recognized as core performance objectives. Speed reduces elapsed completion time, while dependability strengthens the credibility of promised delivery. In service operations, the value of a process is not assessed only by output quality but also by how consistently the process supports reliable delivery. Arias-Aranda (2003) shows that service operations strategy is linked to performance, while Slack and Lewis (2017) argue that time-related performance objectives should be managed as competitive priorities rather than as isolated technical indicators.

Delivery reliability also has an external dimension. Jalili Marand et al. (2019) argue that delivery time and delivery reliability are both top-level measures of delivery performance and both influence perceived service value. In logistics and supply-chain research, AL-Shboul (2022) further shows that delivery reliability contributes to supply-chain responsiveness. These studies are not about housing construction specifically, but they provide a useful conceptual bridge: tighter schedule control can improve the operational conditions that support more dependable delivery.

This bridge is also relevant to process innovation. The present paper does not claim radical innovation or new product development. Its innovation angle is modest and process-oriented. Chen et al. (2009) define service delivery innovation as improvements in how value is delivered to customers. In that sense, a better-structured scheduling process can be treated as incremental operational innovation because it improves how the housing service is executed, monitored, and handed over.

Prior CPM studies on residential construction have demonstrated the practical importance of planning quality, time optimization, and acceleration scenarios. Local studies have consistently shown that schedule analysis can reveal substantial savings in housing projects. Yet many of those studies remain descriptive and tool-centered. They rarely explain how the critical structure supports project-based value delivery, and they often present activity durations without enough network detail for independent verification. Accordingly, the present study adds value by combining a transparent package-level CPM presentation with a broader operational interpretation grounded in delivery reliability.

3. Method

This study uses a descriptive case-study design. The empirical case is a Type 36 house project in Samarinda, Indonesia. The case was selected because it represents a practical affordable-housing project with a clearly defined scope, identifiable work packages, and accessible schedule information. The research focuses on time analysis rather than on cost, financing, or customer-satisfaction measurement.

The data are project-based primary data. They were obtained from direct field observation, interviews with the project manager, and project schedule records used in implementation planning. The project manager provided the normal-duration and accelerated-duration estimates for the main work packages. The owner had already secured the core building materials, which is relevant because material readiness affects the feasibility of acceleration.

To address the reviewer concern about replicability, the revised article expresses the case as a package-level CPM network. The original project records grouped activities into broad work packages and allowed partial overlap in site execution. Therefore, the duration values shown in the work-package table are managerial package durations and are not directly additive as simple finish-to-start chains. For transparency, the revised analysis reports the immediate predecessors, package-level network logic, elapsed-day schedule windows, forward and backward pass results, and slack values used to interpret the critical structure.

The accelerated scenario was derived from project-manager estimates under the assumption that the scope and quality target remained unchanged, material availability remained secured, and tighter coordination, earlier task hand-offs, and limited overtime were feasible. Thus, the accelerated scenario should be interpreted as a managerial compression scenario rather than as a formal crash-cost optimization model. The analytical steps were as follows:

identification of work packages, specification of package-level predecessors, construction of the CPM network, estimation of earliest and latest schedule windows, identification of slack, and comparison of the normal and accelerated elapsed-time schedules.

The study is subject to three boundaries. First, it is a single-case analysis, so the result is analytically informative rather than statistically generalizable. Second, the paper focuses on time efficiency and delivery reliability, not cost trade-offs. Third, the operational interpretation remains indirect because customer perceptions were not collected. These limits are acknowledged in order to keep the claims consistent with the available evidence.

4. Result And Discussion

4.1 Result

The project consisted of eleven major work packages, from preparatory work to electrical finishing. Table 1 reports the normal and accelerated package durations collected from the project manager. These values represent managerial package durations. Because some packages overlap in field execution, the total elapsed project duration is shorter than the simple arithmetic sum of all package durations. For that reason, the elapsed-day CPM schedule is presented separately in Tables 3 and 4.

The pattern in Table 1 shows that the largest nominal time reductions occur in concrete work, wall work, ceiling installation, and door-window installation. This suggests that schedule compression is not distributed evenly across all activities. Instead, acceleration depends on selected work packages where coordination, crew deployment, and earlier hand-offs are feasible.

Table 2 presents the immediate predecessor structure used in the revised package-level network. The logic is intentionally transparent and conservative. Concrete work branches into floor work and wall work. Wall work then becomes the main point from which frame installation, roof work, and sanitation coordination are organized. Final electrical work is positioned after the key completion packages are ready. Figure 1 visualizes this network and highlights the critical structure used in the revised analysis.

Table 1. Work-package durations used in the case analysis

Code	Work Package	Normal Duration (days)	Accelerated Duration (days)
A	Preparatory work	14	10
B	Earthworks, backfill, and foundations	41	30
C	Concrete work	62	40
D	Floor work	58	48
E	Wall work	48	37
F	Door and window frames and leaves	32	22
G	Locking work and accessories	13	10
H	Ceiling installation work	36	25
I	Roof work	17	14
J	Sanitation work	23	18
K	Electrical work	16	12

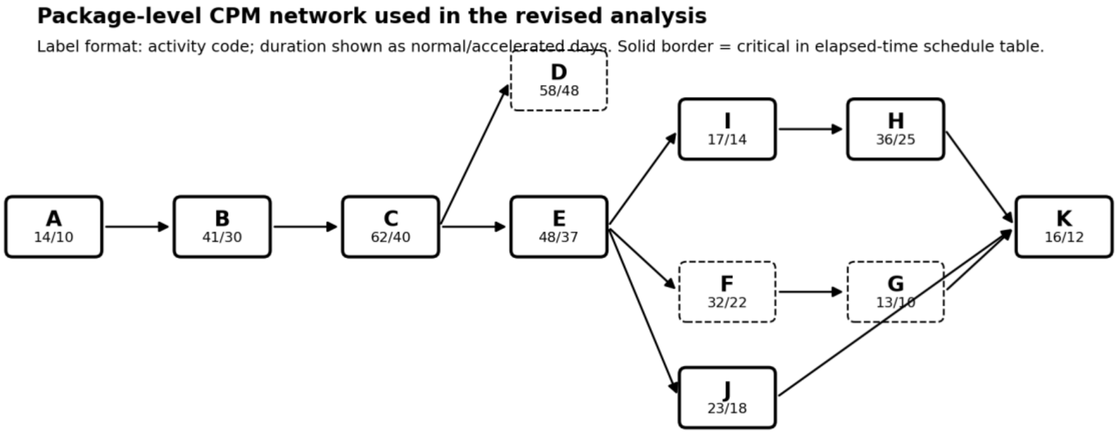
Note: The duration values are project-manager package estimates. They are not directly additive because several work packages partially overlap in field execution. The elapsed-day CPM schedules are therefore reported separately in Tables 3 and 4.

Table 2. Immediate predecessors used in the revised package-level CPM network

Code	Work Package	Immediate Predecessor(s)	Interpretive Logic
A	Preparatory work	-	Project start
B	Earthworks, backfill, and foundations	A	Starts after site preparation
C	Concrete work	B	Begins when the foundation stage is sufficiently ready
D	Floor work	C	Can proceed after concrete readiness
E	Wall work	C	Starts after the main structural concrete stage
F	Door and window frames and leaves	E	Installed after wall progress allows framing
G	Locking work and accessories	F	Follows frame installation
I	Roof work	E	Starts once wall progress allows roof installation
H	Ceiling installation work	I	Follows roof-readiness sequence
J	Sanitation work	E	Coordinated after wall progress and service access
K	Electrical work	G, H, J	Final electrical completion after key finishing packages

Note: The predecessor table represents the package-level network used for analytical transparency. It simplifies detailed daily site logs into a CPM structure that can be reproduced and discussed in a journal setting.

Figure 1. Revised package-level CPM network



The normal schedule results are shown in Table 3. The package-level CPM table indicates a project completion horizon of 180 days. The critical structure is concentrated in A-B-C-E-I-H-K, while the E-J-K branch also reaches the same project finish and therefore behaves as a parallel critical branch. By contrast, floor work (D), frame installation (F), and locking work (G) have positive float and can absorb limited delay without immediately extending the final completion date.

Table 3. Forward-backward schedule results for the normal scenario (elapsed days from project start)

Code	ES	EF	LS	LF	Slack	Critical?
A	0	14	0	14	0	Yes
B	14	55	14	55	0	Yes
C	35	97	35	97	0	Yes
D	85	143	97	155	12	No
E	97	145	97	145	0	Yes
F	118	150	132	164	14	No
G	150	163	151	164	1	No
I	111	128	111	128	0	Yes
H	128	164	128	164	0	Yes
J	141	164	141	164	0	Yes
K	164	180	164	180	0	Yes

Note: Day 0 marks the documented start of the project. The normal scenario yields an elapsed completion horizon of 180 days. Activities D, F, and G retain positive float, while the E-I-H-K and E-J-K branches both reach the final completion date and therefore form the critical structure at the package level.

The accelerated schedule results are shown in Table 4. Under the compressed scenario, the project duration decreases to 123 days. The same managerial logic is preserved, but earlier hand-offs and shorter package durations reduce the elapsed schedule significantly. The critical structure remains concentrated around the preparatory, structural, wall, roof-ceiling, sanitation, and electrical packages, while noncritical activities still retain limited float.

Table 4. Forward-backward schedule results for the accelerated scenario (elapsed days from project start)

Code	ES	EF	LS	LF	Slack	Critical?
A	0	10	0	10	0	Yes
B	10	40	10	40	0	Yes
C	20	60	20	60	0	Yes
D	52	100	55	103	3	No
E	60	97	60	97	0	Yes
F	75	97	79	101	4	No
G	99	109	101	111	2	No
I	72	86	72	86	0	Yes
H	86	111	86	111	0	Yes
J	93	111	93	111	0	Yes
K	111	123	111	123	0	Yes

Note: The accelerated scenario combines shorter package durations with tighter managerial coordination and earlier hand-offs under unchanged project scope. The elapsed completion horizon is reduced to 123 days.

Table 5 summarizes the difference between the two scenarios. The reduction from 180 days to 123 days yields a saving of 57 days, equivalent to 31.7 percent. For a small housing project, that saving is operationally meaningful because it improves schedule visibility, allows tighter supervision of high-risk packages, and can support more dependable handover performance.

Table 5. Comparison of the normal and accelerated schedules

Indicator	Normal Scenario	Accelerated Scenario	Change
Project completion horizon	180 days	123 days	57 days faster
Percentage reduction	-	-	31.7%
Dominant critical structure	A-B-C-E-I-H-K and E-J-K	A-B-C-E-I-H-K and E-J-K	Maintained
Activities with positive float	D, F, G	D, F, G	Still noncritical

4.2 Discussion

The first implication of the findings is that critical-path control matters specifically in affordable housing because this segment often operates with thin coordination margins. A delayed completion date can affect not only site efficiency but also installment timing, resource redeployment, and the credibility of promised handover dates. In that setting, CPM is useful not simply because it calculates time, but because it helps the manager distinguish between packages that must be protected continuously and packages that still have limited slack.

The second implication concerns internal coordination. Once the critical structure is visible, managerial decisions become more focused. Supervision can be concentrated on structurally important packages such as concrete work, wall work, roof-ceiling sequencing, sanitation coordination, and final electrical completion. Material arrival can be timed more carefully for critical packages, and crew allocation can be adjusted so that noncritical delays do not migrate into the critical structure. In small projects, that visibility is important because managerial attention is often spread too evenly across all tasks.

The third implication is conceptual. Existing housing CPM studies commonly present schedule results as technical outputs. The present study shows that the same evidence can also be interpreted through an operations lens. Better schedule control supports delivery reliability, and delivery reliability is relevant to operational value in project-based housing services. This is a more defensible contribution than claiming direct effects on customer satisfaction or market performance, because those variables were not measured in the present case.

The discussion also clarifies the novelty of the study. The novelty does not lie in inventing a new CPM model. Rather, it lies in making a standard CPM case more transparent and analytically useful for business and operations audiences. Compared with prior local housing papers that mainly report durations and final savings, this article explicitly presents package predecessors, network logic, forward and backward schedule windows, and float information. It also interprets those results in relation to delivery reliability and project-based value delivery.

At the same time, the implication of the paper should not be overstated. The study shows that CPM improves time-efficiency analysis and supports delivery reliability. It does not demonstrate customer satisfaction, service-quality perception, or marketing outcomes. Future research should extend the case by integrating cost acceleration, cash-flow consequences, and customer-facing measures such as perceived handover reliability or trust in the developer.

5. Conslusion

This study analyzed a Type 36 house project in Samarinda through a revised and more transparent CPM presentation. The package-level analysis shows that the normal schedule horizon of 180 days can be reduced to 123 days under an accelerated managerial scenario, producing a time saving of 57 days or 31.7 percent. The revised presentation also shows where the critical structure is concentrated and which activities retain limited float.

The practical contribution is that affordable-housing providers can use CPM not only to calculate project time but also to strengthen delivery reliability through better supervision and coordination of critical packages. The study therefore supports a conservative but useful claim: schedule discipline improves time-efficiency analysis, and better schedule control supports more reliable delivery in housing provision. Further research is needed to integrate crash-cost analysis and customer-facing outcomes so that the operational benefits of schedule reliability can be evaluated more comprehensively.

6. References

Aprillia, S. C., Wasono, & A'yun, Q. Q. (2023). Optimalisasi biaya dan waktu pelaksanaan pembangunan rumah tinggal di Kecamatan Rantau Pulung Kutai Timur menggunakan Critical Path Method (CPM) dan Program Evaluation and Review Technique (PERT). Basis: Jurnal Ilmiah Matematika, 2(1). https://doi.org/10.30872/basis.v2i1.1000

Asrul, M. R., Tindaon, M. C. A., Azzahra, D. N., Wulandari, R., & Ismayanti, R. (2025). Project scheduling for swallow nest construction using the critical path method. Enrichment: Journal of Management, 15(2), 121–128. https://doi.org/10.35335/enrichment.v15i2.2273

Badan Pusat Statistik Kota Samarinda. (2025). Kota Samarinda dalam angka 2025.

Basriati, S., & Melda, A. (2017). Analisis biaya pembangunan proyek perumahan menggunakan metode PERT dan EVM (Studi kasus: Perumahan D'Lion Cluster). Seminar Nasional Teknologi Informasi, Komunikasi dan Industri, 642–647.

Bhatt, R., Thakker, R., Sukhadia, O., Kunadia, S., Kumar, A., & Kiran, M. B. (2022). Challenges in the implementation of the critical path method: A review. Proceedings of the 1st International Conference on Industrial Engineering and Operations Management, Sydney.

Mazlum, M., & Güneri, A. F. (2015). CPM, PERT and project management with fuzzy logic technique and implementation on a business. Procedia - Social and Behavioral Sciences, 210, 348–357. https://doi.org/10.1016/j.sbspro.2015.11.378

Perdana, M. A., & Sari, R. P. (2022). Optimalisasi waktu pelaksanaan proyek konstruksi rumah tinggal menggunakan metode CPM (Critical Path Method) dan PERT (Program Evaluation and Review Technique). Jurnal Media Teknik dan Sistem Industri, 6(2), 116–123. https://doi.org/10.35194/jmtsi.v6i2.1944

Project Management Institute. (2017). A guide to the project management body of knowledge (PMBOK guide) (6th ed.). Project Management Institute.

Rabbani, R. M., Muhazir, A., & Widyantoro, M. (2024). Penerapan manajemen proyek dengan metode CPM dan PERT pada proyek pembangunan perumahan Permata Nusa Indah. Prosiding Semnastek FT-UBJ, 1(1).

Senior, B. A. (2009). Critical path method implementation drawbacks: A discussion using action theory. Colorado State University / ASC Proceedings.

Surahman, S., Kusumah, A., Tiara, T., Tomby, R. S., & Nurmaulida, N. (2024). Project management planning of the small house construction in Samarinda using the critical path method (CPM). Enrichment: Journal of Management, 14(3), 476–487. https://doi.org/10.35335/enrichment.v14i3.1939

Syaifuddin, D. T. (2011). Riset operasi (Aplikasi quantitative analysis for management). CV Citra Malang.

Trihudiyatmanto, M. (2018). Riset operasional (Operations research) dan penyelesaian menggunakan software WinQSB. Penerbit NEM.

Wardani, N. M. E., Musdalifah, S., & Lusiyanti, D. (2018). Optimalisasi biaya dan waktu pelaksanaan proyek pembangunan perumahan Citraland Palu menggunakan metode Program Evaluation and Review Technique (PERT)–Critical Path Method (CPM). Jurnal Ilmiah Matematika dan Terapan, 15(2), 197–208. https://doi.org/10.22487/2540766X.2018.V15.I2.11353