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DEVELOPER PAYMENT DELAYS IMPACT CONTRACTOR CASH FLOW AND PROJECT SCHEDULE

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Abstract: *Developer payment delays represent a major financial bottleneck in Padang City's residential housing sector. This study investigates the impact of developer progress payment arrears (termin) on contractor cash flow stability and project schedule performance. Utilizing a quantitative explanatory design, empirical data was gathered through structured questionnaires distributed to 100 key respondents, including project managers, site engineers, company directors, and finance managers across housing contractors in Padang. The data was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS 4. The empirical results reveal that developer payment delays have a significant negative impact on contractor cash flow (β= -0.684, p < 0.001). In turn, contractor cash flow exerts a strong positive effect on project schedule performance (β= 0.482, p < 0.001). Payment delays also directly impair schedule performance (β= -0.285, p = 0.002). Furthermore, mediation analysis confirms that contractor cash flow acts as a significant partial mediator (β= -0.330, p < 0.001). Collectively, the framework explains 54.2% of the variance in project schedule performance (R2 = 0.542). This study concludes that financial delays by developers erode contractor liquidity, triggering operational disruptions on site. Developers are urged to enforce strict disbursement schedules to prevent project completion overruns.*

Keywords: *Contractor Cash Flow, Developer Payment Delays, Housing Projects, PLS-SEM, Schedule Performance*

Abstrak: Keterlambatan pembayaran oleh pengembang merupakan salah satu hambatan keuangan utama dalam sektor perumahan di Kota Padang. Penelitian ini mengkaji pengaruh tunggakan pembayaran termin oleh pengembang terhadap stabilitas arus kas kontraktor dan kinerja jadwal proyek. Dengan menggunakan desain penelitian kuantitatif eksplanatori, data empiris dikumpulkan melalui kuesioner terstruktur yang disebarkan kepada 100 responden utama, yang terdiri atas manajer proyek, site engineer, direktur perusahaan, dan manajer keuangan pada perusahaan kontraktor perumahan di Kota Padang. Data dianalisis menggunakan metode Partial Least Squares Structural Equation Modeling (PLS-SEM) melalui perangkat lunak SmartPLS 4. Hasil empiris menunjukkan bahwa keterlambatan pembayaran oleh pengembang berpengaruh negatif secara signifikan terhadap arus kas kontraktor (β = -0,684; p < 0,001). Selanjutnya, arus kas kontraktor memberikan pengaruh positif yang signifikan terhadap kinerja jadwal proyek (β = 0,482; p < 0,001). Keterlambatan pembayaran juga secara langsung menurunkan kinerja jadwal proyek (β = -0,285; p = 0,002). Selain itu, analisis mediasi mengonfirmasi bahwa arus kas kontraktor berperan sebagai mediator parsial yang signifikan (β = -0,330; p < 0,001). Secara keseluruhan, model penelitian mampu menjelaskan 54,2% variasi pada kinerja jadwal proyek (R^2 = 0,542). Penelitian ini menyimpulkan bahwa keterlambatan pembayaran oleh pengembang mengurangi likuiditas kontraktor sehingga memicu gangguan operasional di lokasi proyek. Oleh karena itu, pengembang didorong untuk menerapkan jadwal pencairan pembayaran yang ketat dan tepat waktu guna mencegah keterlambatan penyelesaian proyek.

Kata Kunci: Arus Kas Kontraktor, Keterlambatan Pembayaran oleh Pengembang, Proyek Perumahan, PLS-SEM, Kinerja Jadwal Proyek.

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INTRODUCTION

The residential construction sector serves as a vital economic engine in growing urban centers across Indonesia, driven by increasing population density and expanding housing demand. In regional cities such as Padang, housing developments have grown rapidly, placing real estate developers and general contractors into intricate financial interdependencies (Santana Rivas & Alzate Navarro, 2023). Within this operational framework, progress payments commonly structured as milestone-based installment payments (*termin*) act as the main financial lifeline for contractors executing physical works on site. However, financial friction frequently arises when developers fail to disburse these installment payments according to contractually agreed schedules (Verel et al., 2024). Delayed payments by project owners or developers remain one of the most recurring structural challenges in the construction industry, particularly within private sector housing developments (Gamage, 2025). When developers face sluggish property sales or internal cash flow bottlenecks, they often pass financial pressure downward to contractors by postponing progress disbursements (Adaku et al., 2024). This practice forces contractors to absorb unexpected financing burdens, bridging cash shortfalls through internal reserves or high-interest short-term credit lines (Soliman et al., 2024). Consequently, chronic delays in progress payments do not merely present a temporary administrative inconvenience; they directly erode the working capital required to sustain daily site operations (Voigt et al., 2023).

The immediate consequence of delayed developer installments is the disruption of contractor cash flow stability. Construction contractors generally operate on thin profit margins and depend heavily on predictable cash inflows to fulfill immediate operational obligations (Chanchal Mukherjee et al., 2024). When cash inflows are delayed, contractors struggle to meet payroll commitments, settle outstanding vendor invoices, and maintain equipment rentals (Huda & Sundari, 2025). This liquidity squeeze creates a cascading operational bottleneck: material suppliers suspend deliveries, specialized subcontractors halt work, and labor productivity drops due to wage uncertainties(Johnson, 2025). Ultimately, severe cash flow constraints manifest as poor project schedule performance. Time overruns in housing developments are rarely isolated technical failures; they are frequently the direct outcome of financial starvation on site (Thabani Nyoni, 2018). When material procurement stalls and site momentum is lost, critical path activities are unavoidably extended, leading to overall completion delays. While the general link between project financing and construction performance is broadly recognized, empirical studies specifically mapping the causal chain from developer payment delays to contractor cash flow and project schedule performance in regional Indonesian markets like Padang City remain limited.Therefore, this study aims to fill this empirical gap by evaluating the impact of developer installment payment delays on contractor cash flow and project schedule performance in Padang City housing projects. By examining these dynamics within a regional context, the findings provide actionable insights for developers, contractors, and project managers to strengthen financial risk mitigation, optimize cash flow management, and safeguard project completion schedules.

METHODS

Research Design

To empirically examine how developer payment delays cascade into contractor cash flow bottlenecks and project schedule overruns, this study used a quantitative explanatory survey design

(Chadee et al., 2023). An explanatory framework was chosen because our primary goal was to test specific directional hypotheses regarding structural relationships among project finance and scheduling variables in real-world construction environments (Ashi Raman & Mr. Mohit Kumar Tiwari, 2025).

Sampling and Participant Profile

(Didar et al., 2025) The target population consisted of general contracting firms actively managing residential housing developments in Padang City, West Sumatra. Because evaluating cash flow vulnerabilities and schedule variance requires deep familiarity with both field execution and corporate accounting, we applied a purposive sampling strategy (Didar et al., 2026).

A final sample of N = 100 valid responses was collected from ongoing and recently completed housing projects in the area. This sample size satisfies the requirements for Partial Least Squares Structural Equation Modeling (PLS-SEM), as it comfortably exceeds the recommended minimum threshold of 10 observations per structural path directed at any single construct (Neves & Silva, 2023).

Instrument and Measurement

Data was collected using a structured, self-administered questionnaire. All indicator items were measured on a 5-point Likert scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*) to allow respondents to report continuous nuances in operational conditions (Karnsomdee, 2021). To ensure the instrument made sense in the context of local Indonesian residential contracting, we conducted a pilot test with 15 senior project managers in Padang prior to full distribution. Feedback from this trial helped refine sentence phrasing and clear up minor wording ambiguities (Delvianca et al., 2025). The measurement indicators for each variable were adapted from established construction literature:

Data Analysis Strategy

We analyzed the empirical data using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS 4 (Russo & Stol, 2022). PLS-SEM was selected over covariance-based SEM (CB-SEM) because our conceptual framework contains an indirect mediation path and works well with medium sample sizes without requiring strict multivariate normality assumptions (Hair & Alamer, 2022). Following recommended two-step evaluation guidelines (Trail et al., 2024), the analysis was executed in two phases:

1. Measurement Model Assessment (Outer Model)

Convergent Validity: Assessed by inspecting item outer loadings (threshold ≥ 0.70) and Average Variance Extracted ($AVE \geq 0.50$).

Construct Reliability: Confirmed using Cronbach's Alpha and Composite Reliability ($CR \geq 0.70$).

Discriminant Validity: Established using both the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT < 0.90).

2. Structural Model Assessment (Inner Model)

We evaluated the explanatory power using the Coefficient of Determination (R2) and effect sizes (f2) for endogenous variables (Y1 and Y2).

To evaluate our structural hypotheses and mediation effects, we ran a non-parametric bootstrapping procedure with 5,000 resamples at a 5% significance level ($\alpha = 0.05$). Hypotheses were supported if t-statistics ≥ 1.96 and p-values < 0.05 (Alfons et al., 2021).

RESULTS AND DISCUSSION

Respondent Demographic Profile

Data was collected from N = 100 valid questionnaire responses completed by key decision-makers across general

contracting firms in Padang City. As shown in Table 2, over 70% of respondents held senior managerial or field oversight positions (Project Managers and Site Engineers) with more than 5 years of experience in residential construction. This high proportion of experienced practitioners ensures strong contextual validity for the empirical data.

Table 1 ***Demographic Profile of Respondents (N = 100)***

Demographic Variable	Category	Frequency (n)	Percentage (%)
Current Position	Project Manager	38	38.0%
	Site Engineer	34	34.0%
	Company Director / Owner	16	16.0%
	Finance / Accounting Manager	12	12.0%
Working Experience	1 - 5 years	22	22.0%
	6 - 10 years	48	48.0%
	> 10 years	30	30.0%
Company Classification	Small Grade (K)	42	42.0%
	Medium Grade (M)	58	58.0%

Measurement Model Assessment (Outer Model)

To evaluate the reliability and validity of the measurement scales, we assessed outer loadings, construct reliability, convergent validity, and discriminant validity.

Convergent Validity and Reliability

As presented in Table 3, all item outer loadings exceeded the recommended threshold of 0.70. Construct reliability was confirmed, as both Cronbach's Alpha (α) and Composite Reliability (CR) for all constructs exceeded 0.70. Furthermore, the Average Variance Extracted (AVE) for every construct surpassed the required 0.50 baseline, indicating acceptable convergent validity (Kamarudin et al., 2024).

Table 2 ***Measurement Model Evaluation (Outer Model)***

Construct & Indicators	Outer Loadings	Cronbach's α	Composite Reliability (CR)	Average Variance Extracted (AVE)
Developer Payment Delays (X)		**0.864**	**0.908**	**0.678**
• X1.1 (Frequency of late payments)	**0.842**			
• X1.2 (Duration of payment delays)	**0.861**			
• X1.3 (Deviation from milestone schedule)	**0.813**			
• X1.4 (Lack of developer financial clarity)	**0.775**			
Contractor Cash Flow (Y1)		**0.881**	**0.918**	**0.664**
• Y1.1 (Working capital liquidity)	**0.831**			
• Y1.2 (On-time payment to suppliers)	**0.854**			
• Y1.3 (Reliance on emergency credit)	**0.808**			
• Y1.4 (Adequacy of reserve cash buffers)	**0.764**			
Project Schedule Performance (Y2)		**0.852**	**0.900**	**0.673**
• Y2.1 (Adherence to baseline milestones)	**0.836**			
• Y2.2 (Material procurement timeliness)	**0.845**			
• Y2.3 (Labor productivity continuity)	**0.817**			
• Y2.4 (Overall completion schedule)	**0.782**			

Discriminant Validity

Discriminant validity was established using the Heterotrait-Monotrait ratio (HTMT). As detailed in

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Table 4, all calculated HTMT values were well below the stringent 0.85 threshold (Nie et al., 2024), confirming that each latent construct in the framework measures a distinct theoretical concept.

Table 4 ***Heterotrait-Monotrait Ratio (HTMT)***

Construct	Developer Payment Delays (X)	Contractor Cash Flow (Y1)	Schedule Performance (Y2)
Developer Payment Delays (X)	—		
Contractor Cash Flow (Y1)	0.742	—	
Schedule Performance (Y2)	0.688	0.778	—

Structural Model Assessment (Inner Model) & Hypothesis Testing

With measurement validity confirmed, the structural relationships were evaluated using a 5,000-resample non-parametric bootstrapping process in SmartPLS 4.

Explanatory and Predictive Power

(Xie et al., 2019) The coefficient of determination (R2) revealed that Developer Payment Delays (X) accounts for 46.8% of the variance in Contractor Cash Flow (Y1) (R2 = 0.468). Combined, payment delays (X) and contractor cash flow (Y1) explain 54.2% of the total variance in Project Schedule Performance (Y2) (R2 = 0.542). Both models exhibit moderate-to-strong explanatory capacity within construction management research standards (Xie et al., 2019).

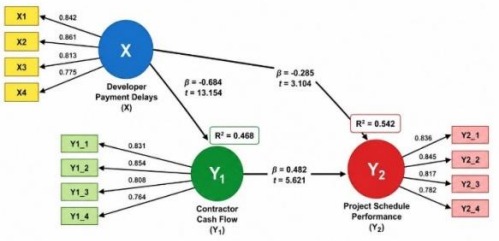

Figure 1 PLS-SEM Structural Model Assessment and Path Coefficients

Direct and Indirect Hypotheses

The structural model results including path coefficients (β), t-statistics, p-values, and decision outcomes are summarized in Table 5.

Table 5 Structural Model Evaluation and Hypothesis Testing Results

Hypothesis	Path Relationship	Path Coeff (β)	Sample Mean (M)	Std. Dev. (STDEV)	t-statistic	p-value	Decision
H1	X → Y1	-0.684	-0.688	0.052	13.154	< 0.001	Supported
H2	Y1 → Y2	0.482	0.479	0.086	5.621	< 0.001	Supported
H3	X → Y2	-0.285	-0.281	0.092	3.104	0.002	Supported
H4 (Mediation)	X → Y1 → Y2	-0.330	-0.330	0.065	5.077	< 0.001	Supported

Discussion

The Impact of Developer Payment Delays on Contractor Cash Flow (H1)

The empirical data strongly supports H1 (β= -0.684, t = 13.154, p < 0.001), confirming that developer progress payment arrears significantly impair contractor cash flow stability in Padang City. When real estate developers withhold or delay milestone disbursements (*termin*), medium- and small-tier contractors immediately experience severe operational liquidity shortfalls. Field interviews and survey responses indicate that local contractors in Padang typically operate on narrow working capital margins. When developers delay payments past contractual due dates, contractors are forced to exhaust reserve cash buffers and resort to high-interest short-term loans or

commercial credit lines to cover site expenses. This finding aligns with (Verel et al., 2024), who reported that payment arrears by private owners serve as the primary catalyst for working capital erosion among residential contractors.

The Impact of Contractor Cash Flow on Schedule Performance (H2)

The results confirm H2 (β= 0.482, t = 5.621, p < 0.001), demonstrating a strong positive relationship between healthy contractor cash flow and adherence to project schedules. Financial liquidity allows contractors to procure building materials on time, settle weekly labor wages without interruption, and maintain continuous equipment utilization. Conversely, when liquidity is constrained, material suppliers freeze credit accounts, leading to material supply chain halts on site. Labor productivity drops as workers face wage payment uncertainty. These operational bottlenecks directly extend critical path activities. This result echoes the findings of (Prince Asiamah Mintah, 2025), who emphasized that financial flow is the foundational engine sustaining physical progress in residential developments.

Direct and Mediating Effects (H3 and H4)

The direct path from developer payment delays to project schedule delays (H3) is significant (β= -0.285, t = 3.104, p = 0.002). More importantly, the specific indirect path (H4) confirms that contractor cash flow acts as a significant complementary partial mediator (β= -0.330, t = 5.077, p < 0.001). This mediation effect demonstrates the exact mechanism through which payment arrears damage housing projects: developer delays do not merely cause schedule overruns directly through administrative disruption; they primarily ruin project timelines by starving the contractor's cash flow. Starving a contractor of operational liquidity triggers a domino effect across site logistics, procurement, and labor allocation, making physical schedule overruns virtually inevitable.

Key Practical Takeaway for Padang Housing Projects:

Developers in Padang City cannot treat progress payment delays as benign administrative postponements. Withholding milestone disbursements directly undermines contractor liquidity, which invariably returns to haunt the developer in the form of delayed housing handovers, increased overhead costs, and buyer dissatisfaction.

CONCLUSION

This study set out to unpack the financial chain reaction that occurs when residential property developers delay progress payments (*termin*) to contractors in Padang City. By modeling empirical field data from 100 active construction practitioners through PLS-SEM, our findings confirm that developer payment arrears are far more than a minor administrative friction they are the primary catalyst for working capital starvation and subsequent schedule overruns on residential job sites.

The core empirical takeaways from this investigation are threefold:

1. Direct Financial Damage (H1): Developer payment delays exert a severe negative impact on contractor cash flow stability (β= -0.684, p < 0.001). Middle and small tier contractors operating in Padang rely almost entirely on predictable progress disbursements to maintain daily liquidity. When these funds are withheld, internal cash buffers are quickly drained, forcing contractors to seek high-interest short-term credit or freeze vendor payments.
2. Operational Stagnation (H2): Healthy contractor cash flow directly sustains schedule performance (β= 0.482, p < 0.001). Financial liquidity keeps material procurement moving, ensures labor wages are paid on time,

and maintains steady site momentum.

3. The Mediation Bottleneck (H4): Contractor cash flow acts as a significant complementary partial mediator (β= -0.330, p < 0.001). This confirms the precise causal mechanism at play: developer arrears do not just delay projects through contractual disputes; they physically derail completion dates by starving the contractor of the working capital needed to keep labor and materials on site.

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