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Research Paper

Evaluating Supervisory Consultant Performance and Its Effect on Time Delays in Road Reconstruction Project in East Kalimantan, Indonesia

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ABSTRACT : *Road reconstruction is essential to regional connectivity in East Kalimantan, yet implementation frequently encounters schedule deviations under complex geographic, climatic, and logistical conditions. This study evaluates whether supervisory consultant performance influences time delays in provincial road reconstruction projects. A quantitative descriptive-verificative survey was conducted across projects implemented during 2023-2025, including the Sotek-Bongan, Muara Badak-Bontang, and Long Bagun-Long Boh corridors. The analysis used responses from 60 stakeholders representing supervising consultants, contractors, and the Provincial Public Works and Spatial Planning agency. Supervisory performance was measured through planning, monitoring and reporting, coordination and communication, corrective action, and compliance with schedules and standard operating procedures; project delay was assessed through schedule deviation, schedule revision frequency, planned-versus-actual progress, and supervision-related postponement. All nine indicators were valid ($r = 0.360$-0.664; $p < 0.01$). Overall reliability was modest (Cronbach's Alpha = 0.641) but acceptable for exploratory analysis. The data were normally distributed (Kolmogorov-Smirnov $p = 0.200$), free from autocorrelation (Durbin-Watson = 1.904), and the regression model was significant ($F = 7.802$; $p = 0.007$). Supervisory consultant performance had a significant negative relationship with project delay ($t = -2.793$; $p = 0.007$), indicating that stronger supervision is associated with lower delay. The model explains approximately 11.9% of delay variance, suggesting that supervision is important but must be integrated with contractor capability, resource readiness, weather management, and design governance. The findings support digital progress monitoring, formal escalation procedures, measurable supervision indicators, and faster corrective decision-making.*

KEYWORDS: *Construction management, project delay, road reconstruction, supervisory consultant, time control.*

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I. INTRODUCTION

East Kalimantan is undergoing intensive infrastructure development to strengthen regional connectivity and support the expansion of administrative, industrial, mining, plantation, and logistics activities. Provincial roads connect production centers and settlements and also support access to Indonesia's new capital region. Road infrastructure can reshape settlement and economic patterns by reducing travel costs and improving access to markets and public services [13]. Therefore, the reconstruction of deteriorated road corridors is not merely a maintenance activity but a strategic investment in regional mobility and economic integration.

Road reconstruction in East Kalimantan is technically challenging. High rainfall, heavy freight traffic, variable subgrade conditions, long material-hauling distances, and limited access to remote work fronts increase the probability of deviation from baseline schedules. Delayed completion extends traffic disruption, increases site overhead, postpones public benefits, and may trigger claims or accelerated work that threatens quality and safety. International studies consistently show that construction delay is produced by interacting responsibilities among owners, contractors, consultants, and external conditions rather than by a single isolated cause [3-6].

The supervisory consultant is the owner's principal technical representative during construction. Its responsibilities include verifying compliance with drawings and specifications, monitoring progress, reviewing work methods, coordinating inspections, documenting deviations, recommending corrective actions, and supporting contract administration. Effective supervision is therefore closely linked to schedule control: problems must be detected early, communicated clearly, assigned to responsible parties, and closed before they propagate to critical activities [1,2].

Weak supervision can increase delay through late technical decisions, incomplete progress verification, slow approval of corrective work, fragmented communication, and insufficient enforcement of contractual requirements. Conversely, stronger supervision should reduce delay by maintaining current information, identifying variance between planned and actual progress, and ensuring that corrective actions are implemented promptly. Evidence from developing-country construction markets also identifies poor coordination, delayed approvals, and inadequate consultant performance as recurring sources of time overrun [3-6].

Indonesian road-project studies have documented similar patterns. Managerial and operational variables significantly affect extensions of contract time, while design errors, owner changes, weak field supervision, material shortages, unsuitable methods, and incomplete surveys remain prominent delay drivers [14-16]. However, many studies combine consultant, contractor, owner, and resource factors within broad rankings. Fewer studies isolate supervisory consultant performance as a composite management variable and test its relationship with time delay in provincial road reconstruction projects under East Kalimantan conditions.

This study addresses that gap by evaluating supervisory consultant performance on provincial road reconstruction projects implemented between 2023 and 2025. It examines five performance dimensions: supervision planning, monitoring and reporting, coordination and communication, corrective action for schedule deviation, and compliance with schedules and standard operating procedures. The objectives are to assess the measurement quality of these dimensions, test their aggregate effect on project delay, interpret the direction and explanatory strength of the relationship, and formulate practical improvements for owners and supervising consultants.

II. LITERATURE REVIEW

2.1. Supervisory Consultant Performance

Construction management integrates planning, organization, execution, and control so that project scope is delivered within time, cost, quality, and safety requirements [1,8,10]. Within this system, supervisory consultants focus on technical and administrative assurance during construction. They verify work quality, evaluate progress, coordinate information among the owner and contractor, and recommend acceptance, correction, or rejection of work. Their effectiveness depends on competence, independence, timely presence, documentation quality, communication capacity, and the authority available for escalation and decision support [8,9].

Performance in supervision should be evaluated as a process rather than only through end-of-project outcomes. Planning defines inspection points, reporting cycles, approval responsibilities, and risk priorities. Monitoring compares actual progress with the approved schedule. Coordination connects technical decisions with field execution. Corrective action converts identified deviations into recovery measures, while schedule and SOP compliance ensures that control activities are performed consistently. These dimensions form a coherent supervisory capability that influences how quickly emerging constraints are recognized and resolved.

2.2. Time Delay in Road Reconstruction

A project delay occurs when activities or final completion extend beyond the approved schedule. Delay can be excusable, non-excusable, or compensable depending on cause and contractual responsibility, but all categories require accurate records and timely assessment. Road reconstruction is particularly vulnerable because work occurs under traffic, across dispersed fronts, and on existing infrastructure whose actual condition may differ from design assumptions. Delays may therefore propagate through traffic management, excavation, drainage, pavement, testing, and finishing activities [2,11,12].

Project time control requires a reliable baseline, short-term look-ahead planning, current progress measurement, early-warning thresholds, and defined corrective procedures. When monitoring is delayed or progress is inaccurately verified, management loses the time needed to recover. The supervisory consultant can reduce this information lag by maintaining field records, checking productivity, reviewing schedule updates, and ensuring that proposed recovery measures are technically feasible and contractually documented [1,2,22].

2.3. Conceptual Relationship

The study assumes that higher supervisory consultant performance reduces the level of project time delay. The five dimensions are treated as indicators of a composite performance construct. The dependent variable represents perceived delay through schedule deviation, repeated schedule revisions, differences between planned and actual monthly progress, and postponement attributable to supervision. The expected relationship is negative because improved planning, monitoring, coordination, correction, and compliance should reduce unresolved constraints and waiting time.

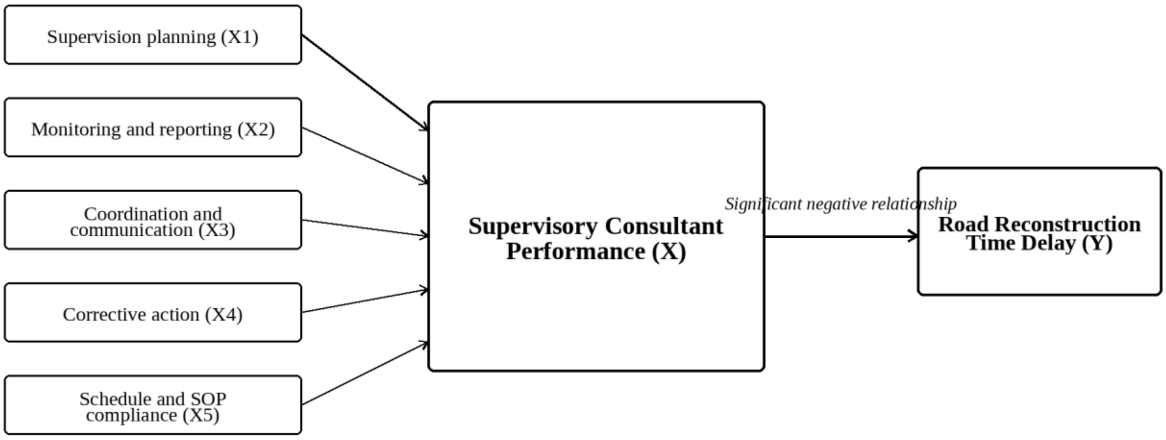

Figure 1. Conceptual framework of supervisory consultant performance and project delay

III. RESEARCH METHOD

3.1. Research Design and Study Setting

The research used a quantitative descriptive and verificative design supported by field survey data. The descriptive component assessed the condition of supervisory performance, while the verificative component tested whether aggregate supervisory performance significantly affected time delay. Data were collected from stakeholders directly involved in provincial road reconstruction, including supervising consultants, contractors, and personnel of the East Kalimantan Public Works and Spatial Planning agency.

The study covered projects implemented during 2023-2025. The selected corridors included Sotek-Bongan in Paser Regency, Muara Badak-Bontang in Kutai Kartanegara Regency, and Long Bagun-Long Boh in Mahakam Ulu Regency. Projects were selected purposively because supervisory consultants were actively involved and schedule deviations were documented. The analytical dataset contained 60 responses, as reflected in the statistical test output.

3.2. Variables and Instrument

The questionnaire used a five-point Likert scale, where higher supervisory scores represented stronger performance and higher delay scores represented greater schedule problems. Supervisory consultant performance (X) consisted of five indicators, while time delay (Y) consisted of four indicators. Primary data were complemented by field observations, structured interviews with key personnel, weekly and monthly progress reports, contracts, baseline schedules, and official project records.

Table 1. Measurement structure used in the study

Code	Construct	Indicators	Measurement Focus
X	Supervisory consultant performance	X1-X5	Planning; monitoring and reporting; coordination; corrective action; schedule and SOP compliance
Y	Project time delay	Y1-Y4	Schedule deviation; revision frequency; planned-versus-actual progress; supervision-related postponement

3.3. Data Analysis

Analysis was conducted using statistical software. Item validity was evaluated through item-total correlations; items were considered acceptable when correlations were positive and statistically significant. Internal consistency was assessed with Cronbach's Alpha. Because the study was exploratory and the instrument contained a small number of heterogeneous operational indicators, an overall Alpha slightly above 0.60 was interpreted cautiously as minimally acceptable rather than strong reliability [17-19,21].

Classical assumptions were assessed using the Kolmogorov-Smirnov normality test, tolerance and variance inflation factor values, and the Durbin-Watson statistic. A simple linear regression model was then estimated using the average supervisory performance score as the predictor and the average project-delay score as the response. Model significance was assessed with the F-test, and the direction and significance of the predictor were assessed with the t-test at alpha = 0.05. Because the thesis reported the F-statistic but not R-squared, approximate explanatory power was derived from F, the sample size, and one predictor using R-squared = F/ (F + df_error) [20].

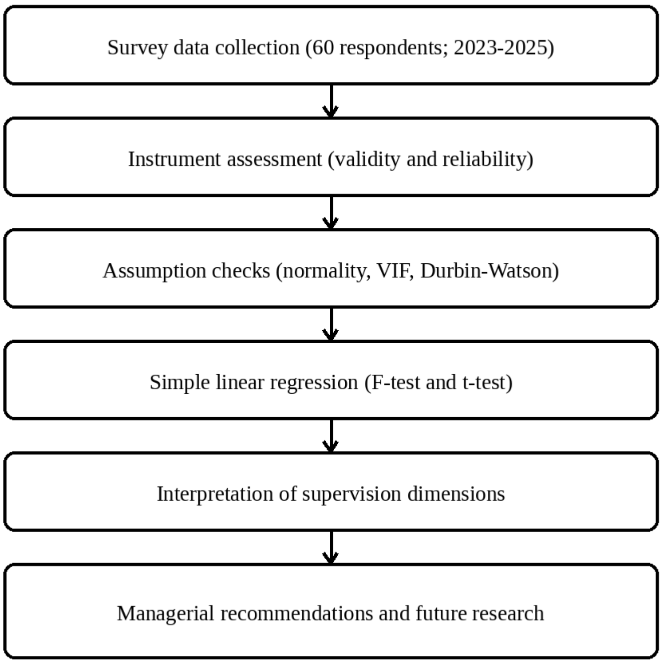

Figure 2. Research analysis procedure

IV. RESULT AND DISCUSSION

4.1. Instrument Quality

All nine questionnaire items were statistically valid. Item-total correlations ranged from 0.360 to 0.664, with p-values from 0.005 to less than 0.001. The strongest association occurred for monitoring and reporting (X2), while the lowest valid association occurred for supervision-related postponement (Y4). These results indicate that each item contributed meaningful information to its intended composite score.

The overall Cronbach's Alpha was 0.641. Item-deletion values ranged from 0.566 to 0.644. This level is lower than the conventional 0.70 benchmark and should not be described as high reliability. Nevertheless, it provides limited support for exploratory analysis where the construct contains several operational dimensions and the instrument is at an early development stage. The result also highlights the need for future refinement, particularly of the monitoring item whose deletion diagnostic was below 0.60.

Table 2. Summary of validity and reliability results

Assessment	Statistic	Result	Interpretation
Item validity	Correlation range	0.360-0.664; all p < 0.01	All items valid
Performance indicators	X1-X5	0.478-0.664	Moderate positive item-total association
Delay indicators	Y1-Y4	0.360-0.532	Low-to-moderate positive association
Overall reliability	Cronbach's Alpha	0.641	Modest; acceptable only for exploratory use
Item-deletion reliability	Alpha range	0.566-0.644	Instrument refinement recommended

4.2. Regression Assumption and Model Tests

The Kolmogorov-Smirnov statistic was 0.093 with p = 0.200, indicating no evidence against normality. With a single predictor, tolerance and VIF were both 1.000, so multicollinearity was structurally absent. The Durbin-Watson value of 1.904 fell within the reported acceptance interval of 1.6162-2.3838, supporting residual independence. The overall regression was significant, F = 7.802 and p = 0.007.

Table 3. Summary of statistical assumption and model tests

Test	Statistical Result	Decision
Normality	Kolmogorov-Smirnov = 0.093; df = 60; p = 0.200	Satisfied
Multicollinearity	Tolerance = 1.000; VIF = 1.000	Not present
Autocorrelation	Durbin-Watson = 1.904	Not present
Overall model	F = 7.802; p = 0.007	Statistically significant

4.3. Effect of Supervisory Consultant Performance on Delay

The regression coefficient for supervisory consultant performance was negative and statistically significant, with $t = -2.793$ and $p = 0.007$. Thus, higher performance scores were associated with lower delay scores. The direction is substantively consistent with project-control theory: supervision improves the speed and quality of information, reduces unresolved deviations, and strengthens implementation of schedule recovery actions [1,2,22]. The result should not be interpreted as supervisory activity causing delay; rather, stronger performance reduces the measured level of time delay.

For a simple regression with one predictor and 60 observations, the reported F-statistic corresponds to an approximate R-squared of 0.119 and adjusted R-squared of 0.103. Supervisory consultant performance therefore explains about 11.9% of the observed variation in delay. This is a meaningful but limited contribution. Most delay variation remains associated with factors outside the model, such as contractor productivity, material and equipment availability, weather, access, design changes, payment conditions, and owner decision time. The result supports treating supervision as an important control mechanism within a broader delay-management system rather than as the sole determinant.

Table 4. Simple linear regression results

Model Element	Value	p-value	Decision / Interpretation
Constant t-statistic	9.105	< 0.001	Constant statistically significant
Supervisory performance t-statistic	-2.793	0.007	Significant negative effect
F-statistic	7.802	0.007	Overall model significant
Approximate R-squared	0.119	-	About 11.9% of delay variance explained
Approximate adjusted R-squared	0.103	-	Modest explanatory power

4.4. Interpretation of the Supervisory Performance Dimensions

Supervision planning establishes how control will be performed before field activities begin. Inspection and test plans, reporting calendars, approval routes, schedule-review requirements, and risk-based priorities reduce ambiguity and prevent reactive supervision. For road reconstruction, planning must also account for dispersed work fronts, traffic arrangements, weather exposure, laboratory testing, and the need to maintain public access.

Monitoring and reporting are central because schedule control depends on timely and credible progress data. Daily observations, verified quantities, photographs, equipment status, material readiness, and short-term forecasts should be converted into early-warning information rather than merely archived. A digital dashboard can compare baseline, current schedule, actual progress, critical constraints, and responsible parties. This approach shortens the interval between the emergence of a problem and management response.

Coordination and communication determine whether technical information is converted into action. Weekly meetings should focus on unresolved constraints, not only percentage progress. Each issue should identify the decision required, responsible person, due date, schedule impact, and escalation path. Where owner approval is needed, the supervisory consultant should provide complete technical recommendations so that decisions are not delayed by repeated clarification.

Corrective action is the operational bridge between monitoring and recovery. When deviation occurs, the consultant should assess the affected activities, validate contractor recovery proposals, examine resource and quality implications, and monitor implementation. Recovery measures may include resequencing, additional resources, adjusted work shifts, alternative access, or revised inspection arrangements, but acceleration must not compromise specifications or safety.

Compliance with schedules and SOPs ensures consistency. Schedule updates should reflect approved work methods and actual productivity, while reports should use a common cut-off date and verified data. Stronger compliance supports accountability and provides defensible records for evaluating extension-of-time requests. In geographically complex projects, this discipline is essential because informal decisions and delayed documentation can magnify the effect of field constraints.

4.5. Managerial Improvement Strategy

The regression evidence and dimensional interpretation indicate that owners should strengthen supervision through measurable performance requirements and integrated information systems. Consultant contracts should define minimum field presence, reporting timeliness, response times, schedule-review frequency, closure of nonconformities, and escalation procedures. Performance evaluation should be linked to documented outcomes rather than only the submission of routine reports.

Table 5. Priority actions for improving supervision and reducing delay

Priority Area	Recommended Action	Performance Indicator
Planning	Prepare risk-based supervision plans, inspection points, approval routes, and reporting calendars before mobilization.	Approved plan available before work starts
Digital monitoring	Use shared progress dashboards with baseline, actual progress, constraints, photographs, and decision status.	Updated at agreed daily/weekly frequency
Coordination	Assign each constraint an owner, deadline, schedule impact, and escalation route.	Percentage of constraints closed on time
Corrective action	Validate recovery plans and track implementation without compromising quality and safety.	Time from deviation detection to approved action
Competence and evaluation	Train personnel in scheduling, risk, contract administration, and field documentation; apply measurable consultant KPIs.	Improved KPI score and reduced schedule variance

V. CONCLUSION

This study evaluated the effect of supervisory consultant performance on time delay in road reconstruction projects in East Kalimantan. The performance construct comprised supervision planning, monitoring and reporting, coordination and communication, corrective action, and compliance with schedules and SOPs. Project delay was represented by schedule deviation, schedule revisions, planned-versus-actual progress, and supervision-related postponement.

All indicators were valid, while the overall reliability coefficient of 0.641 indicated modest internal consistency. The classical tests supported use of the simple regression model. Supervisory consultant performance had a statistically significant negative relationship with project delay ($t = -2.793$; $p = 0.007$), confirming that stronger supervision is associated with lower time delay. The model explained approximately 11.9% of delay variation, so supervision is important but does not replace control of contractor, resource, weather, design, financial, and owner-related risks.

For practice, the East Kalimantan Public Works and Spatial Planning agency and project teams should prioritize risk-based supervision planning, real-time progress monitoring, constraint-focused coordination, rapid corrective action, consistent schedule governance, and measurable consultant performance indicators. Digital reporting should connect field evidence with schedule impact and decision status so that deviations are resolved before they affect the critical path.

The study is limited by its cross-sectional perception data, modest instrument reliability, single-predictor model, and concentration on selected road projects in one province. Future research should refine the questionnaire, report full regression coefficients, combine perceptions with objective project records, and incorporate contractor capability, materials, equipment, weather, design changes, payment, and owner decision time. Multiple regression or structural-equation modeling could then distinguish direct, indirect, and interacting causes of project delay.

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