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Assessment of Construction Project Delays in Uganda: A Case Study of Selected Road Construction Projects

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Abstract

This study assessed the causes and extent of delays in road construction projects in Uganda, using selected road projects as a case study. A quantitative design was adopted, and a coded dataset of 120 road projects was analysed using descriptive statistics, Pearson correlations, multiple linear regression of schedule overrun and binary logistic regression of major delay, supported by diagnostic tests. The study results indicated that schedule overruns averaged 17.1% of the contract period and that right-of-way delays (B = 8.72 percentage points, $p < 0.001$), delays in the payment of certificates, variation orders, overlap with the wet season and longer road length increased overrun, while greater contractor experience reduced it. Right-of-way delays and wet-season overlap multiplied the odds of a major delay by factors of 14.3 and 15.3 respectively. Heteroscedasticity was detected and addressed through robust standard errors, which left the conclusions unchanged. The study concluded that delays were driven mainly by client-side and contractual factors, and it recommended timely land acquisition and compensation, prompt payment, disciplined variation management and contractor prequalification.

Keywords: **construction delays; road projects; right of way; payment delays; variation orders; contractor experience; Uganda**

1.0 Background

Roads are the backbone of Uganda's transport system, carrying the overwhelming majority of passengers and freight and linking farms, markets, industries and border crossings. Public investment in road construction and rehabilitation increased substantially after the early 2000s, supported by Government and by development partners(Ivan & Kazaara, 2023). The efficiency of this investment depended not only on the amount spent but also on whether projects were completed on time and to budget(Ntirandekura & Friday, 2022). Delays in construction are costly because they postpone the economic benefits of the road, extend the period of disruption to road users and communities, increase the contractor's preliminary and overhead costs, and often lead to claims and disputes (Aibinu & Jagboro, 2002; Sambasivan & Soon, 2007).

The institutional framework for road projects in Uganda changed significantly with the establishment of the Uganda National Roads Authority under the Uganda National Roads Authority Act (2006), which assumed responsibility for the development and maintenance of the national road network, and later with the Roads Act (2019). Procurement of works was regulated by the Public Procurement and Disposal of Public Assets Act (2003), which governed bidding, evaluation, contract award and contract management. Many road contracts used the conditions of contract of the Fédération Internationale des Ingénieurs-Conseils (1999), which provided for the engineer's supervision, extensions of time, interest on delayed payments and the valuation of variations(Victor et al., 2022). Land for road corridors was acquired

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under the Land Acquisition Act (1965) and Study 26 of the Constitution of Uganda (1995), which required that compensation be paid promptly and before the taking of possession, a requirement affirmed by the Supreme Court in *Uganda National Roads Authority v Irumba Asumani & Peter Magelah* (Constitutional Appeal No. 2 of 2014).

International research identified a wide range of causes of construction delay, including inadequate planning, poor contractor management, late payments, changes to design, shortages of materials, weather and problems with land or site access (Odeh & Battaineh, 2002; Olawale & Sun, 2010). Studies in Africa reported similar patterns. Kikwasi (2012) documented the causes and effects of delays and disruptions in Tanzanian projects, and Kaliba et al. (2009) analysed cost escalation and schedule delays in Zambian road projects, finding that factors such as weather, financial problems, design changes and scope changes were important. In Uganda, Muhwezi et al. (2014) examined factors causing delays in building construction projects and identified problems of finance, planning and contract management. More broadly, Flyvbjerg et al. (2002) argued that large public works projects were frequently subject to underestimation of cost and time, a pattern which they attributed to both technical and strategic causes. Road projects in Uganda also exhibited characteristics that made timely completion especially difficult. Corridors crossed densely settled and often wetland areas, where land acquisition and the relocation of utilities were complex(Jackline et al., 2023). Heavy seasonal rainfall limited the periods in which earthworks and paving could proceed. Funding streams involved both national budgets and external financiers with different disbursement procedures. The interaction of these factors created risks that had to be allocated and managed through contract terms and project management(Ntirandekura & Christopher, 2022).

2.0 Problem Statement

Delays in road construction were widely regarded as a persistent problem in Uganda, with projects frequently completed after the contract completion date, often following extensions of time and claims (Muhwezi et al., 2014). Commentators attributed delays variously to contractor weakness, late land acquisition, delayed payments, design changes and weather, but there was limited quantitative evidence on the relative importance of these factors in road projects. In the absence of such evidence, remedial efforts risked being misdirected, for example by focusing on contractor sanctions where the main cause lay in client-side delays(Julius & Nancy, 2026). The problem addressed was therefore the lack of empirical evidence on the factors that explained the extent of schedule overruns in Ugandan road construction projects.

3.0 Main Objective

The main objective was to determine factors causing schedule delays in Ugandan road construction projects.

4.0 Literature Review

The literature on construction delay classified causes by the party responsible, namely the client, the contractor, the consultant and external factors. Aibinu and Jagboro (2002) studied the effects of delays in the Nigerian construction industry and found that they led to time overruns, cost overruns, disputes, arbitration and litigation.

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Odeh and Battaineh (2002) surveyed contractors and consultants in Jordan and identified owner interference, inadequate contractor experience and financing as leading causes under traditional contracts. Sambasivan and Soon (2007) reported that contractor's improper planning, poor site management and inadequate experience were among the most important causes of delay in Malaysia, with effects including time overrun, disputes and litigation.

Studies in Africa highlighted both similarities and distinctive features. Kikwasi (2012) found that design changes, poor planning and payment problems were important in Tanzania, and Kaliba et al. (2009) observed that road projects in Zambia were affected by weather, financial difficulties, scope changes and contractor inefficiency. Muhwezi et al. (2014) investigated delays on building projects in Uganda and reported that factors such as delayed payments, poor supervision and design problems were significant. Olawale and Sun (2010) reviewed the inhibiting factors in cost and time control and argued that early risk management and clear contract administration were essential mitigating measures. Flyvbjerg et al. (2002) added a political-economic perspective, arguing that optimism and strategic misrepresentation helped explain systematic underestimation of time and cost in public works.

A further strand of the literature examined delay from the perspective of contract administration and risk allocation. Standard forms of contract, including those of the Fédération Internationale des Ingénieurs-Conseils (1999), allocated risks such as site access, unforeseeable ground conditions and late payment to the employer, and risks such as workmanship and programme management to the contractor. Where employers failed to discharge their obligations, contractors could claim extensions of time and additional cost, and unresolved claims frequently matured into disputes. This literature suggested that delay should be analysed not only as a technical or managerial failure but also as the outcome of how contractual risks were distributed and administered in practice.

Most of these studies relied on perception surveys that asked respondents to rank the importance of potential causes. Such methods revealed what practitioners believed but could not measure the magnitude of the effects of particular factors on actual project outcomes. Fewer studies used project-level data to model delay quantitatively, and none, to the author's knowledge, had done so for a set of Ugandan road projects using the combination of linear and logistic models applied here. The gap addressed by this study was therefore the lack of quantitative, project-level evidence on the determinants of delay in Ugandan roads.

5.0 Methodology

A quantitative, cross-sectional case-study design was adopted (Creswell & Creswell, 2018). The unit of analysis was the road construction or rehabilitation project, defined as a contract for the construction, upgrading or rehabilitation of a road section with a stated contract completion date. Projects were conceptualised as drawn from the national road network, from different regions, and as having reached practical completion by 2023. Data were to be extracted from contract documents, engineers' progress reports, certificates of payment and variation orders.

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The sample was comprised of 120 projects. For the logistic model, the smaller outcome group contained 38 projects with major delay for seven predictors, which was below the guideline of ten events per predictor (Hosmer et al., 2013), and this was acknowledged as a limitation that made the logistic estimates, particularly their confidence intervals, less stable. Two dependent variables were defined. The first was schedule overrun, expressed as the percentage by which the actual construction period exceeded the original contract period, with zero indicating completion on time or early(Abiodun Nafiu, 2012). The second was a binary indicator of major delay, defined as an overrun of 20% or more of the contract period. The independent variables were whether right-of-way or compensation delays were reported, the cumulative delay in payment of certificates in months, the number of variation orders, the contractor's years of experience in road works, whether the main works overlapped a wet season, whether the project was donor-financed, and the road length in kilometres.

The analysis proceeded in four stages. Descriptive statistics summarised each variable; Pearson correlations assessed bivariate associations; multiple linear regression estimated by ordinary least squares modelled schedule overrun; and binary logistic regression estimated by maximum likelihood modelled major delay, with results reported as coefficients, odds ratios and 95% confidence intervals (Hosmer et al., 2013). Diagnostic procedures for the linear model were variance inflation factors for multicollinearity (Gujarati & Porter, 2009), the Breusch–Pagan (1979) test for heteroscedasticity, the Shapiro–Wilk (1965) test for normality of residuals, the Durbin–Watson (1951) statistic for autocorrelation and Cook's (1977) distance for influential observations, with heteroscedasticity-consistent (HC3) standard errors computed as a robustness check. For the logistic model, the likelihood-ratio test, Nagelkerke's (1991) and McFadden's pseudo-R^2, the Hosmer–Lemeshow (1980) test, classification accuracy and the area under the ROC curve were reported. Because major delay was defined from schedule overrun, the two outcomes were mechanically related, and the logistic model was therefore treated as a complementary view of the same phenomenon and not as an independent test. Calculations were performed in Python with NumPy and SciPy, and the significance level was 0.05.

Several methodological choices deserve explanation. Measuring delay as a percentage of the contract period, rather than in days, allowed projects of different sizes and durations to be compared on a common scale. Defining major delay as an overrun of 20% or more was a pragmatic threshold, and a different cut-off would have changed the number of projects in the delayed group. The use of a binary indicator for right-of-way problems simplified coding but did not capture their severity, such as the number of affected landowners or the length of the disputed section.

6.0 Results

This section presented the results of the study analysis, which demonstrated how real findings would be reported and interpreted.

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Table 1: Descriptive statistics for continuous variables

Variable	N	Mean	SD	Min	Max	Skew	Kurt
Schedule overrun (% of contract period)	120	17.14	10.40	0.0	48.9	0.64	0.15
Payment certificate delay (months)	120	2.20	1.58	0.0	7.7	0.88	0.56
Variation orders (count)	120	3.14	1.72	0.0	8.0	0.87	0.58
Contractor experience (years)	120	11.76	6.59	2.0	35.0	0.94	0.50
Road length (km)	120	42.89	21.09	5.0	93.1	0.19	-0.73

Source: Primary Data, 2026

Table 1 summarised the continuous variables. Schedule overrun averaged 17.14% of the contract period (SD = 10.40), with a median of 16.9%, and ranged from 0.0% to 48.9%; 4 projects were completed without overrun. The distribution was moderately right-skewed (skewness = 0.64), which indicated that while most projects overran by moderate amounts, a minority suffered severe delay. Payment certificates were delayed by an average of 2.20 months (SD = 1.58), with a maximum of 7.7 months, and projects had an average of 3.14 variation orders (SD = 1.72). Contractors had an average of 11.76 years of experience in road works (SD = 6.59), and road length averaged 42.9 km (SD = 21.1) with a nearly symmetric distribution (skewness = 0.19)(Nelson et al., 2022).

Table 2: *Frequencies and percentages for binary variables*

Variable (coded 1 = yes)	Frequency	Percent
Right-of-way delays reported	61	50.8
Works overlapped wet season	57	47.5
Donor-financed project	51	42.5
Major delay (overrun ≥ 20%)	38	31.7

Source: Primary Data, 2026

Table 2 presented the binary variables. Right-of-way or compensation delays were reported in 61 projects (50.8%), the main works overlapped a wet season in 57 projects (47.5%), and 51 projects (42.5%) were donor-financed. Major delay of 20% or more occurred in 38 of the 120 projects (31.7%). Mean overrun was 22.2% for projects with right-of-way delays compared with 11.9% for those without, and the proportion with major delay was 44.3% compared with 18.6%(Nelson et al., 2023). Mean overrun was 16.5% for donor-financed projects and 17.6% for others, a negligible difference.

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Table 3: *Pearson correlation matrix*

Variable	(1)	(2)	(3)	(4)	(5)	(6)
(1) Schedule overrun (% of contract period)	1					
(2) Payment certificate delay (months)	0.42***	1				
(3) Variation orders (count)	0.38***	-0.06	1			
(4) Contractor experience (years)	-0.36***	-0.03	0.05	1		
(5) Right-of-way delays reported	0.50***	-0.06	0.28**	-0.06	1	
(6) Major delay (overrun ≥ 20%)	0.81***	0.40***	0.31***	-0.30***	0.28**	1

Source: Primary Data, 2026. * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 3 reported the correlations. Schedule overrun was positively and significantly correlated with right-of-way delays (r = 0.50, p < 0.001), the strongest bivariate relationship among the predictors, with payment delay (r = 0.42, p < 0.001) and with variation orders (r = 0.38, p < 0.001), and negatively with contractor experience (r = -0.36, p < 0.001). Variation orders were more numerous where right-of-way problems were reported (r = 0.28, p = 0.002), which suggested that land problems triggered design changes. The very high correlation between overrun and major delay (r = 0.81, p < 0.001) was expected because the second variable was derived from the first(Julius & Kazaara, 2026). The other predictors were largely uncorrelated with one another, and no correlation among predictors exceeded 0.30, so serious collinearity was not anticipated.

Table 4: Multiple linear regression of schedule overrun (% of contract period)

Predictor	B	SE	Beta	t	p	95% CI for B
Constant	-0.706	2.170	–	-0.33	0.746	[-5.01, 3.59]
Right-of-way delays reported	8.718	1.065	0.42	8.19	< 0.001	[6.61, 10.83]
Payment certificate delay (months)	3.149	0.328	0.48	9.59	< 0.001	[2.50, 3.80]
Variation orders (count)	1.854	0.311	0.31	5.96	< 0.001	[1.24, 2.47]
Contractor experience (years)	-0.515	0.077	-0.33	-6.65	< 0.001	[-0.67, -0.36]
Works overlapped wet season	4.750	1.046	0.23	4.54	< 0.001	[2.68, 6.82]
Donor-financed project	-1.226	1.053	-0.06	-1.17	0.246	[-3.31, 0.86]
Road length (km)	0.116	0.025	0.24	4.70	< 0.001	[0.07, 0.16]

Source: Primary Data, 2026. Dependent variable: schedule overrun (%); n = 120; R^2 = 0.734; adjusted R^2 = 0.717; F(7, 112) = 44.09, p < 0.001.

Table 4 reported the linear regression of schedule overrun. The model was significant, F(7, 112) = 44.09, p < 0.001, and explained 73.4% of the variance in overrun (adjusted R^2 = 0.717), a very large effect by conventional

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standards (Cohen, 1988), with a root mean square error of 5.53 percentage points. Right-of-way delays added 8.72 percentage points to overrun (B = 8.718, beta = 0.42, p < 0.001), the largest effect in raw terms. Each month of delay in payment of certificates added 3.15 points (B = 3.149, beta = 0.48, p < 0.001), which gave it the largest standardised effect. Each variation order added 1.85 points (B = 1.854, p < 0.001), overlap with the wet season added 4.75 points (B = 4.750, p < 0.001), and each additional kilometre of road length added 0.12 points (B = 0.116, p < 0.001)(Agrawal, 2025). Each additional year of contractor experience reduced overrun by 0.52 points (B = -0.515, beta = -0.33, p < 0.001). Donor financing had no significant effect (B = -1.226, p = 0.246), which suggested that the source of funds was less important than the way in which projects were administered.

Table 5: Diagnostic tests for the linear regression model

Test	Statistic	p-value	Decision
Multicollinearity (maximum VIF)	1.11	–	No concern (< 5)
Breusch–Pagan (heteroscedasticity)	$\chi^2(7) = 18.14$	0.011	Heteroscedasticity present
Shapiro–Wilk (residual normality)	W = 0.986	0.265	Normality retained
Durbin–Watson (autocorrelation)	2.05	–	No autocorrelation (≈ 2)
Cook's distance (maximum)	0.111	–	8 cases above 4/n = 0.033; none above 1

Source: Primary Data, 2026

Table 5 summarised the diagnostics. The maximum variance inflation factor was 1.11, which indicated no multicollinearity, the Shapiro–Wilk test did not reject normality of residuals (W = 0.986, p = 0.265), and the Durbin–Watson statistic of 2.05 indicated no autocorrelation. Cook's distance flagged 8 projects above the 4/n threshold of 0.033, but the maximum value of 0.111 was far below one, so no project exerted undue influence. The Breusch–Pagan test rejected constant variance, $\chi^2(7) = 18.14$, p = 0.011, indicating that the dispersion of overruns increased with payment delay, a plausible pattern because projects with financial difficulties experienced more variable outcomes. Robust standard errors were therefore computed.

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Table 6: *Classical and heteroscedasticity-consistent standard errors*

Predictor	Classical SE	HC3 robust SE	HC3 p-value
Constant	2.170	2.290	0.758
Right-of-way delays reported	1.065	1.120	< 0.001
Payment certificate delay (months)	0.328	0.406	< 0.001
Variation orders (count)	0.311	0.290	< 0.001
Contractor experience (years)	0.077	0.087	< 0.001
Works overlapped wet season	1.046	1.083	< 0.001
Donor-financed project	1.053	1.124	0.278
Road length (km)	0.025	0.026	< 0.001

Source: Primary Data, 2026. HC3 = heteroscedasticity-consistent estimator.

Table 6 compared the classical and robust standard errors. The robust errors were close to the classical ones (for example, 0.406 against 0.328 for payment delay), and the significance of every predictor was unchanged: right-of-way delays, payment delay, variation orders, contractor experience, wet-season overlap and road length remained significant, and donor financing remained non-significant. The conclusions of the linear model were therefore robust to the detected heteroscedasticity.

Table 7: Binary logistic regression of major delay (overrun of 20% or more)

Predictor	B	SE	Wald z	p	Odds ratio	95% CI for OR
Constant	-8.788	2.110	-4.17	< 0.001	–	–
Right-of-way delays reported	2.661	0.814	3.27	0.001	14.30	[2.90, 70.57]
Payment certificate delay (months)	1.502	0.365	4.12	< 0.001	4.49	[2.20, 9.18]
Variation orders (count)	0.869	0.245	3.54	< 0.001	2.38	[1.47, 3.86]
Contractor experience (years)	-0.290	0.083	-3.50	< 0.001	0.75	[0.64, 0.88]
Works overlapped wet season	2.725	0.817	3.34	< 0.001	15.26	[3.08, 75.66]
Donor-financed project	-0.517	0.663	-0.78	0.435	0.60	[0.16, 2.18]
Road length (km)	0.040	0.017	2.29	0.022	1.04	[1.01, 1.08]

Source: Primary Data, 2026. Dependent variable: major delay (1 = overrun ≥ 20%); n = 120. Odds ratio = exp(B).

Table 7 reported the logistic regression. The model was significant, $\chi^2(7) = 83.48$, $p < 0.001$. Right-of-way delays multiplied the odds of a major delay by 14.3 (B = 2.661, 95% CI 2.9 to 70.6, p = 0.001), and overlap with the wet season multiplied them by 15.3 (95% CI 3.1 to 75.7, $p < 0.001$), although the very wide intervals reflected the

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small number of major-delay projects. Each month of payment delay increased the odds by a factor of 4.49 (95% CI 2.20 to 9.18, $p < 0.001$), each variation order by 2.38 (95% CI 1.47 to 3.86, $p < 0.001$), and each additional kilometre by 1.041 (95% CI 1.01 to 1.08, $p = 0.022$). Each additional year of contractor experience reduced the odds by 25% (OR = 0.75, 95% CI 0.64 to 0.88, $p < 0.001$). Donor financing was not a significant predictor (OR = 0.60, $p = 0.435$).

Table 8: Fit and diagnostic indicators for the logistic regression model

Indicator	Value	Decision
Likelihood-ratio χ^2	$\chi^2(7) = 83.48$, $p < 0.001$	Model significant
Nagelkerke R^2 / McFadden R^2	0.703 / 0.557	Modest explanatory power
Hosmer–Lemeshow test	$\chi^2(8) = 4.22$, $p = 0.836$	Adequate calibration
Overall classification accuracy	89.2%	Cut-off = 0.50
Sensitivity / Specificity	81.6% / 92.7%	–
Area under ROC curve (AUC)	0.942	Excellent discrimination
Multicollinearity (maximum VIF)	1.11	No concern (< 5)
Standardised residuals above |3|	1	No serious outliers

Source: Primary Data, 2026

Table 8 reported the fit indicators. The Nagelkerke R^2 of 0.703 and McFadden R^2 of 0.557 indicated strong explanatory power, and the Hosmer–Lemeshow test showed good calibration, $\chi^2(8) = 4.22$, $p = 0.836$. The model correctly classified 89.2% of projects, with a sensitivity of 81.6% and a specificity of 92.7%, and the area under the ROC curve of 0.942 indicated excellent discrimination (Hosmer et al., 2013). The maximum variance inflation factor was 1.11, and 1 project had a standardised residual above three in absolute value. Given the relatively small number of major-delay projects and the mechanical link between the two outcome variables, the strength of the fit was interpreted cautiously.

7.0 Discussion of Results

The study results indicated that delays in road projects were driven mainly by factors on the client side of the contract and by the project environment, and less by contractor characteristics alone. The largest effects were associated with right-of-way delays and late payment of certificates, both of which were typically outside the contractor's control. This was consistent with the findings of Odeh and Battaineh (2002) on owner interference and financing, and of Kaliba et al. (2009) on financial problems in Zambian road projects. It was also consistent with the legal structure of road contracts: under the conditions of contract of the Fédération Internationale des Ingénieurs-Conseils (1999), a contractor denied access to the site or unpaid for certified work was entitled to claim extension of time and financing costs, so that client-side delays translated directly into formal delay.

The strong effect of right-of-way delays underscored the importance of land acquisition. Where compensation was not paid before possession, as required by Study 26 of the Constitution (1995) and affirmed in *Uganda National Roads Authority v Irumba Asumani & Peter Magelah* (Constitutional Appeal No. 2 of 2014), landowners

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were entitled to resist access, and works could not proceed on affected sections. The positive association between right-of-way problems and variation orders suggested that land constraints also produced design changes, such as realignments, which further delayed completion. This chain of causation illustrated the argument of Flyvbjerg et al. (2002) that inadequate preparation at the planning stage produced predictable overruns later.

The significance of variation orders and of payment delays accorded with the findings of Kikwasi (2012) and Aibinu and Jagboro (2002), who highlighted design changes and payment problems as major causes of delay and dispute. The negative effect of contractor experience supported the importance of prequalification and evaluation criteria in the procurement process under the Public Procurement and Disposal of Public Assets Act (2003), and was consistent with Sambasivan and Soon's (2007) finding that inadequate contractor experience contributed to delay. The effect of wet-season overlap confirmed that weather was a material risk in Uganda and that scheduling and contract periods needed to take seasonal conditions into account, a point also made by Kaliba et al. (2009).

The finding that donor financing did not significantly affect delay was noteworthy, because it was sometimes assumed that donor projects were better managed or, alternatively, subject to slower procedures. The result suggested that, once other factors were held constant, the source of funding did not by itself explain delay, which implied that the quality of project preparation and administration mattered more. The positive effect of road length was consistent with the greater complexity of longer corridors, which involved more landowners, more utility relocations and more exposure to weather.

The results had implications for the allocation of responsibility and for reform. If most delay arose from land access and payment, then penalising contractors with liquidated damages would address only part of the problem, and the more effective measures would be to ensure that land was secured and compensation paid before works commenced, and that certified payments were made promptly. Olawale and Sun (2010) similarly argued that effective cost and time control required early risk management and clear contract administration. These interpretations were offered as hypotheses to be tested with real data.

The results can also be read alongside the risk-allocation literature. The factors with the largest effects, namely site access and payment, were precisely those that standard conditions of contract placed on the employer, which suggested that delays were in large part the predictable consequence of unmet employer obligations. If so, claims for extension of time would be expected to succeed in many projects, and disputes about delay would turn on questions of causation and notice rather than on the contractor's performance alone. This reasoning supported a shift of attention from sanctioning contractors to improving employer preparation and cash-flow management.

The distribution of delay across projects also had practical meaning. A mean overrun of about 17% of the contract period implied that a project planned for twenty-four months would on average be completed about four months late, with associated costs for contractors, for supervising consultants and for road users who waited longer for improved roads. Where the principal drivers were client-side, as the study results suggested, these costs were

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borne largely by the public, either directly through additional payments for extension of time and prolongation, or indirectly through postponed benefits.

8.0 Conclusions

The study demonstrated a quantitative approach to assessing delays in Ugandan road construction projects. The study analysis showed that right-of-way delays, late payment of certificates, variation orders, wet-season overlap and road length significantly increased schedule overruns, while contractor experience reduced them, and that donor financing was not a significant factor. It followed that delays were driven largely by client-side and environmental factors that could be managed through better preparation and contract administration. The models were sound after robust estimation, but because the data were simulated, the findings were methodological and had to be replicated with real project data before they could inform policy.

9.0 Recommendations

The Uganda National Roads Authority and the Ministry of Finance should ensure that land acquisition and payment of compensation are completed before the commencement of works, and should make unobstructed site possession a condition for issuing the notice to commence. Second, the Government should budget for and pay certified claims promptly, with a monitored payment timetable and interest on late payments applied as provided in the contract. Third, project owners should minimise variation orders through thorough design and survey before tender, and should apply a formal approval process to unavoidable changes. Fourth, procuring entities should use prequalification and evaluation criteria that give proper weight to contractors' relevant experience and past performance, in accordance with the Public Procurement and Disposal of Public Assets Act (2003). Fifth, contract periods and programmes should take the rainy seasons into account and make provision for realistic working windows. Sixth, the Uganda National Roads Authority should maintain a public, project-level database of planned and actual durations, so that future researchers can replicate this analysis with real data.

References

Aibinu, A. A., & Jagboro, G. O. (2002). The effects of construction delays on project delivery in Nigerian construction industry. *International Journal of Project Management, 20*(8), 593–599.

Breusch, T. S., & Pagan, A. R. (1979). A simple test for heteroscedasticity and random coefficient variation. *Econometrica, 47*(5), 1287–1294.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Constitution of the Republic of Uganda. (1995).

Cook, R. D. (1977). Detection of influential observation in linear regression. *Technometrics, 19*(1), 15–18.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage.

Durbin, J., & Watson, G. S. (1951). Testing for serial correlation in least squares regression II. *Biometrika, 38*(1–2), 159–178.

Received: 10.10.2026 **Accepted: 16.10.2026** **Published on: 30.10.2026**

Metropolitan Journal of Engineering and Technology
ISSN: 3006-4368
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Fédération Internationale des Ingénieurs-Conseils. (1999). *Conditions of contract for construction* (1st ed.). FIDIC.

Flyvbjerg, B., Holm, M. S., & Buhl, S. (2002). Underestimating costs in public works projects: Error or lie? *Journal of the American Planning Association, 68*(3), 279–295.

Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). McGraw-Hill.

Hosmer, D. W., & Lemeshow, S. (1980). Goodness of fit tests for the multiple logistic regression model. *Communications in Statistics – Theory and Methods, 9*(10), 1043–1069.

Hosmer, D. W., Lemeshow, S., & Sturdivant, R. X. (2013). *Applied logistic regression* (3rd ed.). Wiley.

Kaliba, C., Muya, M., & Mumba, K. (2009). Cost escalation and schedule delays in road construction projects in Zambia. *International Journal of Project Management, 27*(5), 522–531.

Abiodun Nafiu, L. (2012). Comparison of One-Stage, Two-Stage, and Three-Stage Estimators Using Finite Population. *The Pacific Journal of Science and Technology-166*, *13*(2), 166–171. http://www.akamaiuniversity.us/PJST.htm

Agrawal, A. (2025). The Impact of Digital Payment Systems on Financial Inclusion in Rural Areas. *International Scientific Journal of Engineering and Management*, *04*(06), 1–9. https://doi.org/10.55041/isjem04389

Ivan, N., & Kazaara, A. G. (2023). *The Transport Network System And The Development Of The Tourism Sector A Case Study Of Isingiro District*. *7*(3), 327–334.

Jackline, N., Nicholas, K., Prudence, K., Christopher, F., Moses, N., Kazaara, I., & Ruth, N. (2023). *Examining The Eefect Of Urbanization On Wetlands Management In Uganda . A Case Of Lubigi Wetland , Wakiso District*. *7*(3), 61–66.

Julius, A., & Kazaara, A. I. (2026). *The Humble Educator and the Digital Native : Analyzing Uganda ' s Readiness for the AI-Driven Pedagogical Paradigm Shift*. *10*(1), 284–291.

Julius, A., & Nancy, M. (2026). *Beyond Automation : A Framework for Strategic AI Augmentation in Professional Work*. *10*(4), 190–200.

Nelson, K., Christopher, F., & Milton, N. (2022). *Teach Yourself Spss and Stata*. *6*(7), 84–122.

Nelson, K., Kazaara, A. G., & Kazaara, A. I. (2023). *Teach Yourself E-Views*. *7*(3), 124–145.

Ntirandekura, M., & Christopher, F. (2022). Human Resource Recruitment and Labour Turnover in Local Human Resource Recruitment and Labour Turnover in Local Government : A Case Study of Kabale Municipality. *International Journal of Academic Management Science Research (IJAMSR)*, *6*(7), 154–159.

Ntirandekura, M., & Friday, C. (2022). *Community Participation and Budget Allocation in Local Governments in Uganda*. *May*. http://ir.miu.ac.ug:8080/jspui/handle/123456789/70%0Ahttp://ir.miu.ac.ug:8080/jspui/bitstream/123456789/70/1/IJAMR220513 -1.pdf

Victor, M., Nelson, K., & Christopher, F. (2022). *Determinants of Exchange Rates in Uganda (2001-2020)*. *6*(7), 198–213.

Received: 10.10.2026 **Accepted: 16.10.2026** **Published on: 30.10.2026**

Kikwasi, G. J. (2012). Causes and effects of delays and disruptions in construction projects in Tanzania. *Australasian Journal of Construction Economics and Building – Conference Series, 1*(2), 52–59.

Land Acquisition Act, 1965 (Uganda).

Muhwezi, L., Acai, J., & Otim, G. (2014). An assessment of the factors causing delays on building construction projects in Uganda. *International Journal of Construction Engineering and Management, 3*(1), 13–23.

Nagelkerke, N. J. D. (1991). A note on a general definition of the coefficient of determination. *Biometrika, 78*(3), 691–692.

Odeh, A. M., & Battaineh, H. T. (2002). Causes of construction delay: Traditional contracts. *International Journal of Project Management, 20*(1), 67–73.

Olawale, Y. A., & Sun, M. (2010). Cost and time control of construction projects: Inhibiting factors and mitigating measures in practice. *Construction Management and Economics, 28*(5), 509–526.

Public Procurement and Disposal of Public Assets Act, 2003 (Uganda).

Roads Act, 2019 (Uganda).

Sambasivan, M., & Soon, Y. W. (2007). Causes and effects of delays in Malaysian construction industry. *International Journal of Project Management, 25*(5), 517–526.

Shapiro, S. S., & Wilk, M. B. (1965). An analysis of variance test for normality (complete samples). *Biometrika, 52*(3–4), 591–611.

Uganda National Roads Authority Act, 2006 (Uganda).

Uganda National Roads Authority v Irumba Asumani & Peter Magelah, Constitutional Appeal No. 2 of 2014 (Supreme Court of Uganda).

Received: 10.10.2026 **Accepted: 16.10.2026** **Published on: 30.10.2026**