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The Lack of Risk and Logistics Management on Construction Projects: Governmental Schools as a Case Study

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ABSTRACT
Libyan government school construction projects suffer persistent delays and cost overruns stemming from weak administrative planning rather than technical failure. This study quantitatively examines how inadequate risk and logistics management affect project performance, using the Theory of Constraints as an interpretive framework. A structured questionnaire was administered to 48 project managers, supervisors, and site engineers working on government school construction in Tripoli. Multiple regression analysis revealed that logistics management is the dominant predictor of project underperformance ($\beta = -0.621$, $p < 0.01$), whereas risk management showed no independent statistical effect once logistics was controlled for. Together, both constructs explain 44.3% of variance in project delays and cost overruns. Findings suggest that stabilizing the physical supply chain — through centralized procurement and coordinated supplier management — yields more immediate gains than formal risk documentation alone. This study contributes evidence on logistics-risk comparisons in public construction within developing economies.

Keywords (Max: 5 key words):
Logistics Management, Risk Management, Project Performance, Theory of Constraints, Government Schools.

I. INTRODUCTION

1.1. Background and Problem Statement

The construction of governmental public facilities, particularly educational infrastructure, is a cornerstone of national development. In Libya, however, these critical projects operate within a highly volatile environment. Recent observations indicate that a significant number of government school projects suffer from chronic delays, severe cost overruns, and compromised quality. While technical execution is often blamed, the root of the problem lies deeper in the administrative and preparatory phases. Specifically, the lack of proactive risk management and fragmented logistic planning leaves these projects highly vulnerable to external economic shocks and internal supply chain disruptions.

1.2. Research Objectives

The primary aim of this study is to investigate how the absence of structured risk and logistic management impacts the performance of construction projects, using Libyan government schools as a focal case study. By examining these gaps, the research seeks to:

- Identify the predominant risk and logistical factors hindering timely project delivery.
- Evaluate the current awareness and application levels of management practices among field engineers and project managers.
- Determine which factor (risk or logistics) exerts a heavier constraint on project success, providing actionable insights to stabilize future public construction initiatives.

It is important to clarify the specific contribution of this study relative to the broader construction management literature. Neither the existence of a relationship between risk management and project outcomes, nor between logistics management and project outcomes, is new in itself; both have been documented separately across multiple developing-country contexts. What remains largely absent from the literature - and what this study contributes - is a direct, simultaneous comparison of these two managerial functions within a single statistical model, applied specifically to government-funded school construction in Libya, a national context that has received little empirical attention in the construction management literature to date. This comparative design, combined with the exploratory sector-based analysis reported in Section 4.3.2, allows the study to identify not merely that both factors matter, but which one dominates when both are considered together - a distinction with direct practical value for prioritizing limited managerial resources.

1.3. Research Hypotheses

Based on the literature review and the research objectives, the following hypotheses are proposed and tested:

H1: Risk Management practices have a statistically significant negative relationship with project performance deficiencies (i.e., delays and cost overruns).

H2: Logistics Management practices have a statistically significant negative relationship with project performance deficiencies (i.e., delays and cost overruns).

H3: Logistics Management has a stronger independent effect on project performance than Risk Management, when both are considered simultaneously in a single multivariate model.

These hypotheses operationalize the research questions and provide testable propositions that guide the statistical analysis and interpretation of findings in Section IV. The directional hypotheses (H1 and H2) expect negative relationships, reflecting the theoretical expectation that stronger management practices reduce the occurrence of delays and overruns; H3 reflects the Theory of Constraints proposition that the binding operational constraint (here, logistics) will dominate project outcomes relative to formal risk documentation.

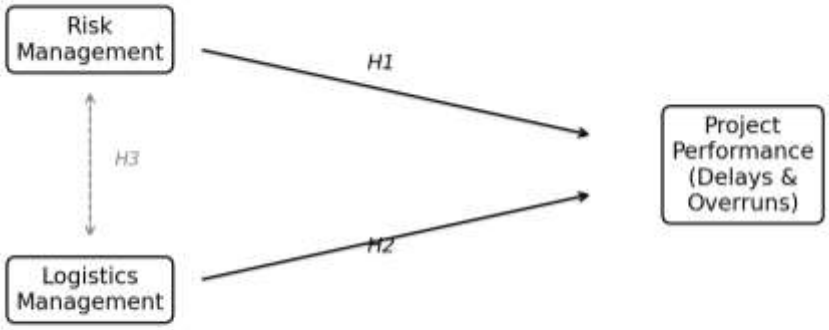


Fig. 1: Conceptual Framework of the Study (Risk Management and Logistics Management as predictors of Project Performance)

II. LITERATURE REVIEW

2.1. Government Projects and Educational Infrastructure

The vulnerability of government-funded projects in developing economies is a well-documented phenomenon. Damoah and Kumi (2018) showed, through interviews and a survey of practitioners in Ghana, that government construction failures rarely stem from a shortage of engineering knowledge; instead, they are rooted in administrative bottlenecks, weak leadership, and poor institutional oversight. Extending this argument, Akwei, Damoah, and Amankwah-Amoah (2020) demonstrated that partisan politics and clientelism interfere directly with the implementation of publicly funded programs, producing delays that originate outside the technical domain of the project team altogether. Damoah, Akwei, and Mouzughi (2019) further found that a large share of abandoned public infrastructure, including schools, results from unstable funding streams and inadequate initial planning rather than construction-phase failures. Within the specific context of educational facilities, the evidence is strikingly consistent across different institutional settings. Langat (2020) found that the completion of public secondary schools in Kenya depends heavily on continuous coordination between the ministry, contractors, and the community. Malipula (2024), and resourcing was a decisive factor separating completed schools from stalled ones — a finding that, by contrast, highlights what tends to be missing when such participation and coordination are absent. Basil and Waruguru (2024) added a financial dimension, showing that in the absence of strict cost-tracking mechanisms, Ministry of Education-funded school projects in Kenya remain highly susceptible to inflation and material shortages.

Taken together, these studies converge on a common conclusion: government-funded construction projects in developing countries and school projects in particular are shaped by an interacting set of managerial, financial, institutional, and political constraints, rather than by purely technical limitations. Although the specific causes vary by country, weak planning, inefficient coordination, procurement delays, political interference, and limited managerial capacity consistently emerge as the principal drivers of poor project performance. These convergent findings justify examining the

management practices that most directly influence project delivery in a comparable institutional environment such as Libya.

2.2. The Gap in Risk Management Practices

Risk management is widely acknowledged as essential for project survival, yet its application remains largely informal across much of the developing world (Bahamid, Doh, & Al-Sharaf, 2019). In a review consolidating 111 risk factors from the construction risk literature, Bahamid et al. (2019) confirmed that developing-country contractors are disproportionately exposed to economic, political, and operational risks that are seldom addressed through formal management systems. Abd El-Karim, El Nawawy, and Abdel-Alim (2017) reinforced this picture empirically, identifying and ranking the risk factors most strongly associated with cost and schedule overruns, and concluding that the earlier such risks are identified and allocated, the smaller their eventual impact on project outcomes. Within the Libyan construction sector specifically, Algremazy, Ideris, Alferjany, and Akram (2023) found that risk management practices are applied only moderately, with contractors typically reacting to crises as they emerge rather than anticipating them.

Taroun (2014) traced this reactive tendency to a deeper methodological gap in the field, arguing that most conventional risk models still treat construction risk as an estimation variance rather than a manageable project attribute, which limits their diagnostic value on the ground. El-Sayegh (2008) added a contractual dimension, showing that improper risk allocation in public contracts places an unbearable burden on contractors and inevitably produces schedule deviations. Collectively, this body of research agrees that effective risk management improves construction project performance by enabling organizations to identify uncertainties, minimize disruptions, and respond proactively rather than reactively. However, the overwhelming majority of these studies stop at identifying or ranking risk factors; very few examine how the influence of risk management compares with that of other managerial functions (such as logistics) once both are placed within the same analytical model. This comparative gap is precisely what the present study is designed to address.

2.3. Logistical Constraints as the Primary Bottleneck

Alongside formal risk management, the physical flow of materials, equipment, and labor dictates the actual pace at which construction work proceeds. Donyavi and Flanagan (2009), studying small and medium-sized construction enterprises, demonstrated the materials can represent up to 70 percent of total project cost and that indaquate material control —rather than poor design or poor labor management— is often the single largest source of preventable waste and delay on site; their work confirms that material availability, more than any other site factor, determines whether a construction schedule holds. More recently, Ying, Tookey, and Roberti (2014) approached the same problem through the lens of vehicle and material movements, finding that inefficient transport coordination alone can account for substantial idle time on site, independent of any risk-related cause.

A parallel and complementary body of work situates these logistical failures within the broader construction supply chain. Adigun and Tah, reviewing the state of construction supply chain management, argued that the construction industry's supply chain tends to be structurally adversarial rather than collaborative, and that only an adaptive supply network — one built on clearly defined relationships, coordination roles, and shared information infrastructure — can

absorb the uncertainty inherent in construction logistics. This structural view helps explain why logistical failure is rarely an isolated event: it is often a symptom of fragmented coordination between suppliers, contractors, and project management, rather than a series of unrelated incidents. When such coordination breaks down, the resulting delays translate quickly into cost overruns, confirming that robust supply chain coordination is non-negotiable for project success (Doloi, Sawhney, Iyer, & Rentala, 2012).

Despite this growing recognition of construction logistics as a critical determinant of project outcomes, comparatively few empirical studies have examined its direct, measurable contribution to performance in government-funded school construction specifically, and fewer still have done so in a developing-country setting. Most existing work treats logistics either as a procurement issue or a supply chain issue in isolation, without weighing its influence against other managerial practices such as risk management. This study addresses that gap by examining risk management and logistics management together, within a single analytical framework, using Libyan government school projects as the empirical setting.

2.4. Conceptual Framework and Research Gap

The reviewed literature converges on three observations. First, government school projects in developing countries fail primarily for administrative, financial, and political reasons rather than purely technical ones. Second, formal risk management, while theoretically important, is applied inconsistently and is rarely tested against competing managerial variables. Third, logistics (the physical movement of materials, equipment, and labor) is repeatedly identified as a decisive, day-to-day constraint on project performance, yet it is almost never analyzed alongside risk management within the same model.

Framed through the Theory of Constraints (Goldratt, 1984), which holds that the performance of an entire system is governed by its single most binding constraint rather than by the average condition of all its parts, this suggests a testable proposition: in volatile public construction environments, logistics may function as the binding constraint that determines project outcomes, even where formal risk management practices are also weak. The present study tests this proposition empirically using data from Libyan government school construction projects. Fig. 1 illustrates the resulting conceptual framework, depicting Risk Management and Logistics Management as correlated predictors of Project Performance, with Hypotheses H1, H2, and H3 mapped onto their corresponding paths.

Applying the Theory of Constraints in this comparative role — to adjudicate between two competing managerial explanations rather than to describe a single process in isolation — distinguishes the present framework from prior applications of ToC in construction research, which have typically used the theory descriptively rather than as a basis for testing which of several candidate constraints is statistically dominant.

III. METHODS AND MATERIAL

3.1. Research Design and Data Collection

This research investigate risk and logistics management practices in Libyan government school projects through a quantitative, cross-sectional design. research design. A structured questionnaire

was developed based on established theoretical frameworks and tailored to the local construction context. The survey was distributed to a purposive sample of site engineers, supervisors, and project managers actively involved in public school construction. A total of 48 valid responses were collected and deemed suitable for statistical analysis.

The target population of active project managers, supervisors, and site engineers engaged specifically in Libyan government school construction is inherently small and difficult to enumerate precisely; the achieved sample of 48 respondents is comparable to sample sizes reported in similar developing-country construction management surveys (e.g., Bahamid et al., 2019; Algremazy et al., 2023). A post-hoc power analysis indicated that the overall regression model, given its large observed effect size (Cohen's $f^2 = 0.795$, $R^2 = 0.443$), achieved statistical power exceeding 0.99, and the test for Logistics Management achieved power of 0.93. However, the test for Risk Management was considerably underpowered (achieved power ≈ 0.06, reflecting its near-zero observed effect size), and the sample falls below Green's (1991) recommended minimum of 104 + k respondents for reliably detecting individual predictor effects in a two-predictor model. This is noted explicitly as a methodological limitation: the non-significant effect of Risk Management should be interpreted with caution, as it may reflect either a genuinely negligible independent effect (consistent with the substantive explanation offered in Section 4.4) or insufficient power to detect a smaller true effect, rather than conclusive evidence of no relationship.

3.2. Measurement and Variables

Responses were recorded on a five-point agreement scale (1 = Strongly Disagree; 5 = Strongly Agree) across three constructs: Risk Management, covering planning and response mechanisms; Logistics Management encompassing material procurement, transport, and supplier coordination; and Project Performance, capturing the frequency of schedule delays and budget overruns. For the third construct, higher scores denote worse rather than better outcomes—a directionality maintained consistently throughout all subsequent analyses.

Table 1a summarizes the demographic profile of respondents. Supervisors (35.4%) and project managers (33.3%) formed the majority of the sample, complemented by site engineers (16.7%), government officials (6.2%), and freelance practitioners (8.3%). Most respondents held a Bachelor's degree (39.6%) or higher, and 93.8% reported five or more years of professional experience, supporting the credibility of their assessments. Respondents were drawn from government-only projects (39.6%), private projects (25.0%), and practitioners working across both sectors (35.4%), providing a reasonably balanced perspective on public-sector practices specifically.

Table 1a: Demographic Profile of Respondents

Characteristic (N = 48)	**n (%)**
Job Title	
Site Engineer	8 (16.7%)
Supervisor	17 (35.4%)
Project Manager	16 (33.3%)
Government Official	3 (6.2%)
Freelancer	4 (8.3%)
Education Level	
Intermediate Diploma	6 (12.5%)
Bachelor's Degree	19 (39.6%)
Master's Degree	12 (25.0%)
PhD	11 (22.9%)
Years of Experience	
Less than 5 years	3 (6.2%)
5-10 years	26 (54.2%)
More than 10 years	19 (39.6%)
Project Type Involved In	
Government	19 (39.6%)
Private	12 (25.0%)
Both	17 (35.4%)

3.3. Data Screening and Preparation

Prior to hypothesis testing, the dataset was screened following standard quantitative research guidelines. Missing data analysis showed no missing values across any of the 48 responses on any of the 18 questionnaire items or the 5 demographic items (0% missingness), indicating a fully complete dataset suitable for analysis without imputation. A range check confirmed that all Likert-scale responses fell within the valid 1–5 range, with no coding errors detected.

Reverse coding was applied to four negatively worded items (Q8, Q10, and Q12 regarding logistical failures, and Q18 regarding quality commitment) prior to constructing the study variables, ensuring that higher scores consistently reflected the same underlying direction within each construct.

Multivariate outlier detection was conducted using Mahalanobis distance (D^2) across the three study constructs. One case exceeded the critical threshold ($D^2 = 16.95$ against a critical value of 16.27 at $p < .001$, $df = 3$), while no case exceeded the threshold on any single variable using univariate z-scores (all $|z| < 3.29$). Given the borderline nature of this single multivariate flag and the absence of any implausible or out-of-range values for that case, it was retained in the main analysis rather than removed. A sensitivity check re-estimating the regression model without this case showed that the substantive conclusions were unchanged and, if anything, strengthened (R^2 increased from 0.443 to 0.570, and the standardized effect of Logistics Management increased from -0.621 to -0.739), confirming that the reported findings are not an artifact of this single observation.

3.4. Reliability Analysis

To verify internal consistency, Cronbach's Alpha tests were conducted for each construct. As shown in Table 1, all three constructs achieved acceptable to excellent reliability coefficients (above the conventional 0.70 threshold), indicating that the survey instrument is sufficiently reliable for the analyses that follow.

Table 1: Reliability Analysis of the Study Constructs

Construct	Number of Items	Cronbach's Alpha
Risk Management	6	0.928
Logistics Management	6	0.736
Project Performance	6	0.769

IV. RESULTS AND DISCUSSION

4.1. Descriptive Analysis

Table 2 summarizes the descriptive statistics for each construct. Risk Management averaged 2.53 (SD = 1.29). Similarly, Logistics Management exhibited an even lower mean score (Mean = 2.10, SD = 0.83). Conversely, the indicators for Project Performance construct—which, as noted above, primarily measured the occurrence of delays and budget overruns— scored exceptionally high (Mean = 4.00, SD = 0.82). Read together, these descriptive findings confirm the practical reality of the problem: government school projects in Libya suffer from a severe lack of proactive planning, with a high incidence of project underperformance.

Table 2: Descriptive Statistics of the Study Constructs

Construct	N	Mean	Std. Deviation
Risk Management	48	2.53	1.29
Logistics Management	48	2.10	0.83
Project Performance	48	4.00	0.82

(Note: Based on a 5-point Likert scale)

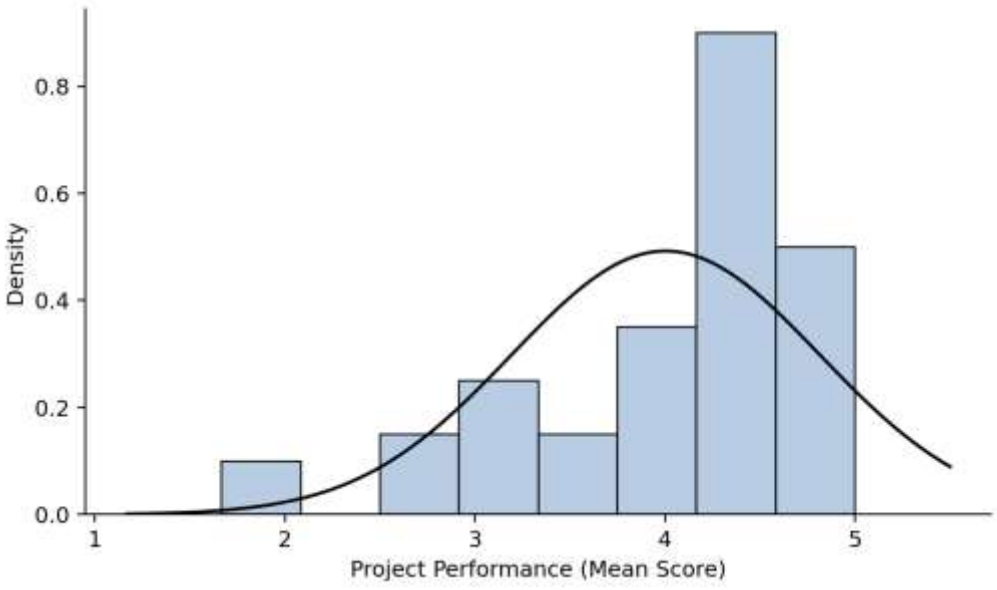


Fig. 2: Distribution of Project Performance Scores with Normal Curve Overlay

4.2. Correlation Analysis

Bivariate Pearson correlations were computed for all three constructs. Risk Management and Logistics Management showed a strong co-variation ($r = 0.774$, $p < 0.01$), confirming that the stronger logistics practices and stronger risk practices co-occur systematically. More importantly, both Risk Management and Logistics Management showed significant negative correlations with the Project Performance (delay/overrun) construct ($r = -0.537$ and $r = -0.664$, respectively, $p < 0.01$). This statistically confirms that as the application of risk and logistics planning decreases, higher rates of project delays and cost overruns consistently observed. Fig. 3 visualizes this relationship for the stronger of the two predictors, plotting Logistics Management against Project Performance together with the fitted regression line.

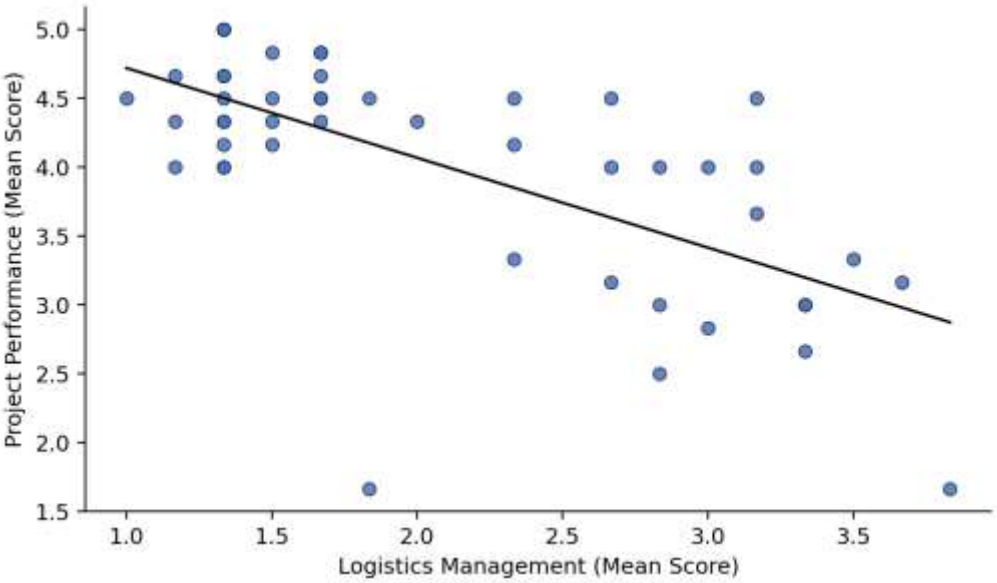


Fig. 3: Scatterplot of Logistics Management and Project Performance with Fitted Regression Line

4.3. Multiple Regression Analysis

To isolate the relative contribution of each predictor, a multiple linear regression was estimated with Project Performance as the outcome. The model was statistically significant ($F = 17.862$, $p < 0.001$) and explained 44.3% of the variance ($R^2 = 0.443$) in project performance.

Table 3: Multiple Regression Results

Variable	B	Beta	95% CI for B	t	Sig.	Cohen's f²
(Constant)	5.373	–	[4.877, 5.869]	21.800	0.000	–
Risk Management	-0.035	-0.056	[-0.260, 0.189]	-0.318	0.752	0.002
Logistics Management	-0.609	-0.621	[-0.957, -0.261]	-3.529	0.001	0.277

(Note: Dependent Variable = Project Performance; N = 48. Model $R^2 = 0.443$, Adjusted $R^2 = 0.418$. Cohen's f^2 values are interpreted as small (≥0.02), medium (≥0.15), or large (≥0.35); Logistics Management shows a medium-to-large practical effect, while Risk Management shows a negligible independent effect once Logistics Management is controlled for)

4.3.1. Regression Diagnostic Tests

Prior to interpreting the regression results, four diagnostic tests were performed to verify that the model satisfies the key assumptions of multiple linear regression. Multicollinearity was assessed using the Variance Inflation Factor (VIF); both predictors returned VIF = 2.50, well below the conventional threshold of 5, indicating that the strong correlation between Risk Management and Logistics Management ($r = 0.774$) does not distort the regression estimates. Homoscedasticity was tested using the Breusch-Pagan test, which was non-significant ($\chi^2 = 0.68$, $p = 0.712$), confirming that the variance of the residuals is stable across the range of predicted values; this is also visually supported by Figure 4, which shows standardized residuals scattered evenly around zero without a discernible funnel pattern. Independence of residuals was verified with the Durbin-Watson statistic ($d = 2.07$), which falls within the acceptable range of 1.5–2.5, indicating no meaningful autocorrelation among observations.

The normality of residuals was assessed using the Shapiro-Wilk test, which returned a statistically significant result ($W = 0.898$, $p = 0.001$), indicating some departure from a normal distribution. This is a common occurrence in small-sample survey research using bounded five-point Likert scales, where response clustering at scale extremes can produce mild non-normality even when the underlying relationships are genuine. Given that ordinary least squares regression is generally robust to moderate violations of normality when the sample size exceeds 30 (as is the case here, $N = 48$) and that the remaining three assumptions were fully satisfied, the regression estimates are considered acceptably reliable; however, this departure from normality is noted here as a methodological limitation, and results should be interpreted with appropriate caution regarding the precision of the reported p-values.

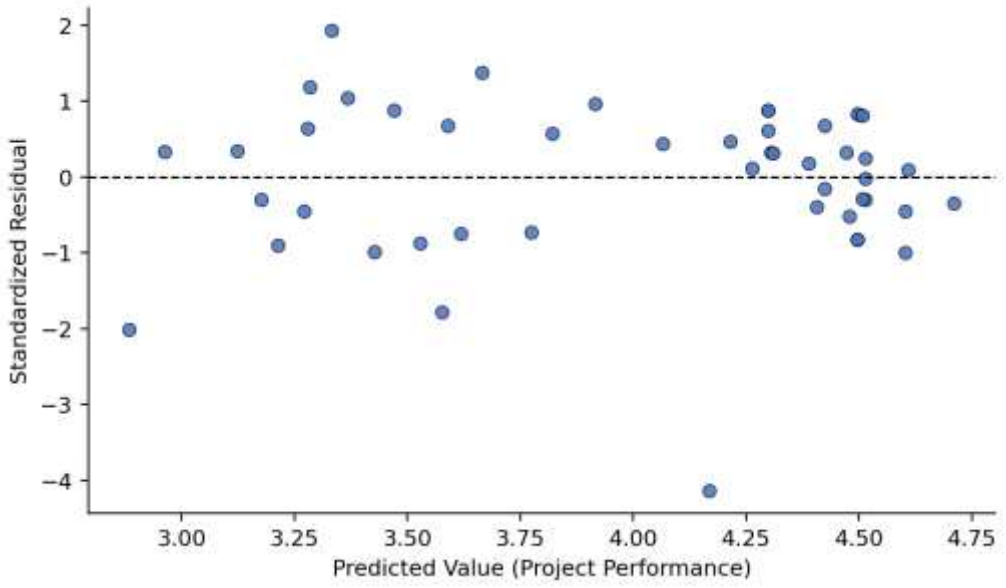


Fig. 4: Standardized Residuals versus Predicted Values (Homoscedasticity Check)

4.3.2. Exploratory Moderation Analysis by Project Sector

To address the reviewer's suggestion that the study's contribution could be strengthened through the integration of additional variables, an exploratory analysis examined whether the relationship between Logistics Management and Project Performance varies by project sector (government-only, private-only, or mixed involvement in both), using the demographic data collected alongside the main constructs. This analysis is exploratory given the resulting subgroup sizes (n = 12–19) and should be interpreted as indicative rather than confirmatory.

A one-way ANOVA found no significant difference in mean Project Performance scores across the three sector groups ($F(2,45) = 0.298$, $p = 0.744$), indicating that the overall severity of delays and overruns is comparable regardless of sector. However, when the Logistics–Performance correlation was examined separately within each sector, the relationship held across all three groups and was, if anything, strongest among private-sector respondents, as shown in Table 4.

Table 4: Logistics Management – Project Performance Correlation by Project Sector (Exploratory Subgroup Analysis)

Project Sector	**n**	**r (Logistics-Performance)**	**Sig. (p)**
Government-only	19	-0.656	0.002
Private-only	12	-0.853	<0.001
Both sectors	17	-0.554	0.021

This subgroup pattern strengthens the paper's central contribution in two ways. First, it demonstrates that the logistics–performance relationship identified in the full sample is not an artifact specific to government projects, but generalizes across sectors — addressing, in part, the concern that the study's contribution rests on a narrow institutional context. Second, the notably strong correlation within the private-sector subgroup ($r = -0.853$) suggests that logistical coordination may be an even more decisive constraint where administrative bureaucracy is lower, an avenue that future research with a larger, sector-stratified sample could investigate more

rigorously, potentially through a formal moderation model with a Sector × Logistics interaction term.

4.4. Discussion of Findings

The regression results in Table 3 presents a critical academic finding: Logistics Management is a strong, independent predictor of project performance deficiencies ($\beta = -0.621$, $p = 0.001$), while Risk Management ($\beta = -0.056$, $p = 0.752$) does not show an independent significant effect when combined with Logistics Management in the same model. It is important to be precise about what this means. The correlation analysis in Section 4.2 shows that Risk Management and Logistics Management are each significantly related to poor project performance when considered separately ($r = -0.537$ and $r = -0.664$, respectively), and the two constructs are themselves strongly correlated with one another ($r = 0.774$). This pattern — significant simple correlations alongside one variable losing significance in the combined model — indicates that risk management and logistics management are not competing, unrelated causes of poor performance; rather, their effects substantially overlap, and logistics is the variable that captures most of the shared variance once both are considered together.

This is consistent with, rather than contradictory to, the broader construction management literature. Bahamid et al. (2019) and Algremazy et al. (2023) both describe risk management in developing-country contexts as largely reactive and informally applied; the present findings suggest a possible mechanism for why such reactive risk management fails to show an independent statistical effect here — much of what would otherwise be classified as a "risk" (a late shipment, a blocked delivery route, a supplier default) manifests operationally as a logistics failure long before it is ever documented as a risk. On Libyan government school sites, logistical disruption may therefore be the visible, day-to-day expression of underlying risk exposure, rather than a wholly separate phenomenon. This interpretation is consistent with Donyavi and Flanagan (2009), who showed that material availability governs whether a construction schedule holds more reliably than any single administrative process, and with Adigun and Tah's argument that construction supply chains remain structurally fragile unless deliberately coordinated as an adaptive network.

Viewed through the Theory of Constraints, this result is broadly consistent with what the theory would predict: system performance is bounded by its single most limiting constraint rather than by the average condition of all its parts (Goldratt, 1984). In the projects examined here, that binding constraint appears to be logistical — the coordination of suppliers, transport, and site delivery — rather than the formal documentation of risk. Strengthening risk registers or risk-awareness training without first stabilizing the physical supply chain is therefore unlikely, on its own, to meaningfully reduce delays and overruns; the constraint would simply reassert itself further downstream, in the form of a delayed shipment or a stalled delivery, regardless of how well the risk was anticipated on paper.

These findings should be read with two caveats. First, the sample is drawn from 48 respondents working on government school projects in a single city (Tripoli), which limits how far the specific magnitude of these effects can be generalized to other regions or project types, although the direction of the relationships is consistent with findings from comparable developing-country settings (Bahamid et al., 2019; Ying et al., 2014). Second, because Risk Management, Logistics Management, and Project Performance were all measured concurrently through a single self-reported questionnaire, the analysis establishes a strong statistical association rather than a strictly causal sequence; respondents who perceive logistics as poor may also be more inclined to rate performance as poor, independent of documented project records. Future research combining

project-level records — such as delivery logs or documented delay claims — with perceptual survey data would help triangulate these findings.

Practically, the results suggest that the sequencing of managerial reform matters. For agencies such as the Organization for Development of Administrative Centers (ODAC) and their contracted firms, the more immediate return is likely to come from stabilizing the physical supply chain — centralizing procurement, pre-qualifying suppliers, and building buffer stock for critical materials — rather than from administrative risk documentation alone. This does not diminish the long-term value of formal risk management; it suggests instead that, in the current Libyan public-school context, risk management is likely to translate into measurable performance gains only once it is embedded directly into logistics planning, rather than treated as a parallel, paperwork-based exercise.

The magnitude of the effect further reinforces this interpretation. Cohen's f^2 for Logistics Management ($f^2 = 0.277$) falls in the medium-to-large range, while the effect for Risk Management ($f^2 = 0.002$) is negligible once Logistics Management is held constant. This numerical gap is considerably wider than what comparable studies typically report when risk and logistics variables are examined separately rather than jointly — for instance, Ying et al. (2014) and Donyavi and Flanagan (2009) each documented strong standalone logistics effects, but neither study benchmarked logistics against a competing risk-management predictor within the same model. The present findings therefore extend this literature by showing not only that logistics matters, but that it matters substantially more than risk management once both are placed in direct statistical competition.

These results carry distinct implications for different categories of stakeholders. For the Organization for Development of Administrative Centers (ODAC) and similar public agencies, the priority implication is procedural: procurement cycles for critical materials should be decoupled from annual budget approval cycles, which are frequently cited informally by practitioners as a source of delay in Libyan public projects. For contracting firms, the findings suggest that investment in supplier pre-qualification and buffer-stock policies is likely to yield a more immediate return than expanding internal risk-management documentation alone. For the Ministry of Education specifically, the results imply that school-building delays are less a matter of unforeseen risk events and more a matter of predictable, manageable supply chain friction — a distinction with direct consequences for how future budgets and oversight mechanisms should be designed.

Beyond the two methodological caveats already noted (sample size and cross-sectional design), a further limitation concerns measurement scope: the Logistics Management construct in this study captures procurement, transport, and supplier coordination, but does not separately isolate customs clearance, currency access, or fuel availability — factors that are frequently mentioned anecdotally in the Libyan context and that may operate as sub-components of the broader logistics constraint identified here. Disaggregating these sub-factors in future research would help clarify which specific logistical bottleneck contributes most to project under performance, and would support more precisely targeted policy interventions than the aggregate construct used in the present study.

V. CONCLUSION

The execution of government school projects in Libya is severely constrained by systemic administrative and operational inefficiencies. This study quantitatively established that the chronic delays and cost overruns plaguing these educational facilities are deeply rooted in the neglect of proactive risk and logistics management. Notably, the empirical findings highlight that logistical

fragmentation acts as the primary operational bottleneck. While formal risk management remains theoretically essential, its practical impact on site performance is largely absorbed and overshadowed by daily supply chain disruptions, such as delayed material procurement, transportation failures, and poor supplier coordination.

The significance of these findings lies in shifting the traditional paradigm of public construction management in volatile environments. Rather than treating risk assessment and material logistics as isolated administrative tasks, project stakeholders must recognize them as intertwined operational lifelines.

The study strongly suggests that government agencies, such as the Organization for Development of Administrative Centers (ODAC), alongside local contractors, should transition from reactive crisis management toward agile logistical planning. Establishing centralized procurement strategies and embedding risk response mechanisms directly into the supply chain can meaningfully mitigate unforeseen disruptions.

These conclusions are drawn from a modest, single-city sample (N = 48) and cross-sectional, self-reported data, and should be interpreted as indicative rather than definitive; replication with larger, multi-city samples and objective project records would strengthen confidence in the specific magnitude of the effects reported here. Moving forward, future research should explore the implementation of digital supply chain tracking or localized risk modelling within the Libyan public sector. Expanding the scope to compare logistical resilience between public and private construction projects could also provide deeper insights. Ultimately, stabilizing the construction of educational facilities extends beyond mere engineering success; it is a fundamental national necessity for sustainable development.

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