

## Effect of Procurement Risk Management Processes on Procurement Performance in Crude Oil Supply Projects: A Case of the Tanzania Petroleum Development Corporation

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**Abstract** — Crude oil supply projects are capital-intensive and exposed to supplier, logistical, regulatory, and market uncertainty, yet it is unclear how structured procurement risk management affects procurement outcomes in Tanzania's crude oil supply projects. This study examined the effect of four procurement risk management processes that include risk identification, assessment, mitigation, and monitoring on procurement performance in crude oil supply projects at the Tanzania Petroleum Development Corporation (TPDC). A quantitative, cross-sectional survey design informed by agency theory was adopted. Structured questionnaires were administered to a stratified random sample of 124 TPDC employees drawn from risk management, procurement, internal audit, legal, and upstream functions, yielding 101 usable responses (82%). Data were analyzed in IBM SPSS version 27 using descriptive statistics, Pearson correlation, and multiple linear regression. All four processes had positive and statistically significant effects on procurement performance, supporting the four hypotheses. Risk identification had the strongest effect, followed by risk assessment, risk mitigation, and risk monitoring. Together, the processes explained 84.8% of the variance in procurement performance. The results suggest that early, systematic identification and assessment of risk offer the greatest potential for improving procurement performance, while mitigation and monitoring play complementary roles. The study is limited by its single-organization setting and reliance on self-reported perceptions, and further research in other state-owned enterprises is recommended.

**Keywords** — Procurement risk management, risk identification, procurement performance, crude oil supply projects, agency theory

### I. INTRODUCTION

Procurement accounts for a large share of public expenditure in Tanzania and is a key means by which state-owned enterprises deliver their strategic mandates. Within the petroleum sector, the Tanzania Petroleum Development Corporation (TPDC) procures goods and services that support the exploration, development, transportation, and commercialization of petroleum resources. Procurement risk management, the structured identification, assessment, mitigation, and monitoring of risks that threaten procurement objectives, is meant to give reasonable assurance that organizational objectives will be met while limiting exposure to loss (Hillier, 2021). Evidence from several settings suggests that procurement is more likely to succeed when risks are properly managed (Otieno, 2013).

The consequences of weak risk management are well documented. Where risks are not systematically identified and assessed, organizations are more likely to face cost overruns, contract disputes, delayed delivery, and loss of value for money (Flyvbjerg, 2014), as well as weak supplier

performance, contractual non-compliance, and reputational damage (Kerzner, 2017). These consequences are likely to be especially serious in crude oil supply, a capital-intensive and technically complex sector in which procurement failures can disrupt national energy security and cause substantial financial loss (Banaitiene & Banaitis, 2012).

Prior research supports a link between risk management and performance. Large infrastructure and energy projects frequently suffer cost overruns and delays because of poor risk identification and optimistic bias during procurement planning (Flyvbjerg, 2014); effective risk management improves supplier reliability, cost control, and schedule adherence (Kerzner, 2017); and organizations with mature risk management frameworks experience higher procurement efficiency and fewer supply chain disruptions (Project Management Institute, 2021). Studies from developing-country contexts point the same way: risk mitigation and monitoring had significant positive effects on procurement cost efficiency and timely delivery in Ghana's oil and gas industry (Osei-Tutu et al., 2018), and risk management in the oil and gas industry has been reviewed systematically (Al-

Shboul et al., 2020). In Tanzania, inadequate risk planning and weak contract risk controls contributed to procurement delays and cost escalation in energy-related projects (Mlinga & Nguluma, 2019), and ineffective risk monitoring and poor supplier risk evaluation reduced procurement performance in large supply projects (Kavishe & Chalu, 2021).

Procurement risk remains a practical concern at TPDC despite government reforms aimed at strengthening risk management, improving planning accuracy, and controlling costs (Controller and Auditor General, 2022). Audit and oversight reports point to delays in contract execution, weak procurement planning, inadequate use of performance securities, limited use of comprehensive risk management frameworks, and insufficient monitoring of supplier performance (Controller and Auditor General, 2022; Public Procurement Regulatory Authority, 2024). One audit found delays of more than 82 days in signing two contracts worth TZS 6,238,603,988 (Controller and Auditor General, 2022), and audited public institutions averaged only 74% to 79% overall procurement compliance (Public Procurement Regulatory Authority, 2024). These findings suggest a gap between the intent of procurement policy and its implementation.

Most earlier studies were conducted in general project, construction, manufacturing, or public-sector settings rather than in crude oil supply projects, which have specialized and complex risk profiles. Oil and gas studies often examine operational continuity or logistics resilience rather than procurement performance (Al-Shboul et al., 2020), and Tanzanian public procurement studies did not account for the risk dynamics of crude oil supply (Kavishe & Chalu, 2021). Some studies do examine the full risk management process in Tanzanian public procurement and public-sector supply chains (Kavishe & Chalu, 2021; Nchindiuza, 2023), so the contribution of this study is narrower: it tests all four processes together in a specific sector (crude oil supply) and a specific organization (TPDC).

This study therefore evaluates the effect of procurement risk management processes on procurement performance in crude oil supply projects at TPDC. Its specific objectives are to determine the effect of risk identification, risk assessment, risk mitigation, and risk monitoring on procurement performance. Four research questions follow: to what extent do risk identification (RQ1), risk assessment (RQ2), risk mitigation (RQ3), and risk monitoring (RQ4) affect procurement performance in crude oil supply projects at TPDC? Hypotheses H1 to H4, derived from agency theory and the literature, are stated in the section on the research gap and conceptual framework. The study contributes organization- and sector-specific evidence from crude oil supply, and it informs TPDC management and regulators on where risk management effort is likely to yield the greatest return.

### A. Key Concepts

Procurement risk is the possibility of an event or condition that may affect project objectives positively or negatively, gauged by its likelihood and its impact on cost, time, quality, or project success (Al Hasani, 2019). Risk management is a planned, systematic process of identifying, assessing, prioritizing, and controlling such risks (Banaitiene & Banaitis, 2012; Urbański et al., 2019). Risk identification recognizes internal and external sources of risk, such as supplier failure, price fluctuation, and regulatory change (Shokouhi et al., 2024). Risk assessment evaluates the probability and impact of identified risks so that resources go to the most pressing ones (Flyvbjerg et al., 2003). Risk mitigation comprises actions that reduce the likelihood or impact of risks, such as alternative procurement plans and contract safeguards (Mbae & Ismail, 2022). Risk monitoring is the continuing tracking of risks and review of mitigation effectiveness across the project life cycle (Cheng'e, 2014). Procurement performance is the effectiveness and efficiency with which procurement achieves project objectives, indicated by cost control, timeliness, quality, supplier reliability, and adherence to contracts (Mchomvu, 2022). Crude oil supply projects involve the extraction, transportation, and delivery of crude oil to refineries or end users, and are capital-intensive and exposed to operational, financial, and market risks (Nchindiuza, 2023).

### B. Theoretical Perspective: Agency Theory

Agency theory (Jensen & Meckling, 1976) describes the relationship between a principal, who delegates work, and an agent, who carries it out, together with the tensions that delegation creates. Principals and agents often want different things and hold different views on risk (Eisenhardt, 1989). The theory predicts an objective clash, where their interests diverge, and information asymmetry, where the agent holds more or better information, and it points to a risk-sharing problem when the parties differ in how much risk they will bear (Eisenhardt, 1989). In procurement, buyers often find it hard to verify the skill and quality of contractors in complex purchases (Eisenhardt, 1989), and mega-project development depends on rules and processes that create accountability (Flyvbjerg, 2014). The theory is also criticized: its assumption of pure self-interest ignores fairness, trust, and personal motivation (Eisenhardt, 1989). It also tends to model a single principal and a single agent, whereas real organizations involve many principals, power struggles, and political pressures.

Here the four risk processes are treated as governance tools. The mapping that follows is a conceptual proposition drawn from agency theory (Eisenhardt, 1989), not a result tested in this study. Identification reduces information asymmetry by surfacing problems before a contract is signed. Assessment addresses risk sharing by estimating the likelihood and impact of each risk so that it can be allocated fairly. Mitigation,

through safeguards such as performance guarantees and contingency plans, limits losses that follow from divergent interests and moral hazard. Monitoring sustains accountability throughout the contract and also addresses moral hazard, by keeping the agent's behavior visible after signature (Eisenhardt, 1989). Three agency problems are therefore matched to four processes, with mitigation (ex ante safeguards) and monitoring (ex post oversight) both aimed at moral hazard. The processes complement, rather than replace, trust, fairness, and relationships.

### C. Related Studies

1) *Risk Identification*: A survey of 159 respondents in Kenyan oil marketing companies found that transportation, delivery, and geopolitical risks significantly influenced performance (Mbae & Ismail, 2022). Among 47 supply chain managers in Kenyan petroleum companies, procurement and transportation risk considerations positively influenced supply chain performance (Cheng'e, 2014). In Tanzania, clear specifications, bidder selection, and pre-contract negotiation improved project performance among 220 respondents at the Tanzania Building Agency, which indirectly suggests early identification of requirements (Mchomvu, 2022). A mixed-methods study of 191 employees of a public water agency reported a strong, significant effect of risk identification on supply chain performance (coefficient = 0.712) (Nchindiuza, 2023). None of these settings is a crude oil supply project.

2) *Risk Assessment*: Among 36 ranked risk factors in Iranian oil and gas construction, the planning process group had the largest role in managing contractor and delay risks (Sohrabi & Noorzai, 2021). A survey of 314 professionals in Yemen found that internal risks (weak project management, poor feasibility studies, material availability) and external risks (political and economic factors) affect project success (Kassem, 2022). Early assessment of material and procurement risks cut construction duration by about 35% in a piping case study (Jo et al., 2018). A Tanzanian study of force account construction projects (318 respondents) found that supply risk management, internal procurement controls, and contract administration significantly improved performance (Mwaiseje et al., 2024). Framework and alliance contracts combined with dual sourcing reduced risk exposure and improved cost efficiency in offshore petroleum engineering projects (Ackah & Boadu, 2025).

3) *Risk Mitigation*: Risk reduction and risk transfer strategies significantly improved supply chain resilience in Kenyan oil marketing companies (150 managers across 87 firms), while avoidance and acceptance had negative or insignificant effects (Lambaino, 2019). In 16 Tanzanian public higher learning

institutions, procurement planning, ethical capacity building, and compliance control improved organizational performance (Mwalukasa & Sallwa, 2024). Expert judgment in the Iranian crude oil supply chain identified regulatory and environmental risks as most critical and cooperation and risk transfer as the most effective responses (Fazli et al., 2015). Joint risk management reduced delays in Indian city gas distribution projects (Rawat et al., 2022), and prioritized mitigation actions reduced procurement disruptions in Indonesia, although cost, timeliness, and quality were not measured (Handayani & Rabihah, 2022).

4) *Risk Monitoring*: Evidence here is the least uniform. Risk mitigation and monitoring had significant positive effects on cost efficiency and timely delivery in Ghana (Osei-Tutu et al., 2018). By contrast, risk monitoring had a negative and insignificant effect on petroleum product distribution performance among 181 respondents in Nigeria, which was read as weak implementation rather than absence of monitoring (Omonori & Ayegbo, 2025). This divergence suggests that effects may depend on contextual, institutional, or sectoral conditions.

### D. Research Gap and Conceptual Framework

Taken together, the studies show that managing procurement risk can affect performance, but most were conducted in other industries or examined single risk dimensions. Studies of the full process do exist for Tanzanian public procurement and public-sector supply chains (Kavishe & Chalu, 2021; Nchindiuza, 2023), so the gap addressed here is narrower: among the studies reviewed, none tested the four processes together for crude oil supply projects at TPDC. This study tests all four processes together in one model. The conceptual framework, adapted from Lambaino (2019), treats the four processes as independent variables and procurement performance as the dependent variable (Figure 1).

Four hypotheses were formulated from agency theory and the studies reviewed above. Each predicts a positive effect on procurement performance and is tested through the regression coefficients reported in the Results section.

*H1*. Risk identification has a positive and significant effect on procurement performance. Identification gives the principal information it would otherwise lack before contract signature, and earlier studies report positive effects (Cheng'e, 2014; Mbae & Ismail, 2022; Nchindiuza, 2023).

*H2*. Risk assessment has a positive and significant effect on procurement performance. Assessment supports the fair allocation of risk between buyer and supplier, and earlier work links planning-stage assessment to better project outcomes (Kassem, 2022; Mwaiseje et al., 2024; Sohrabi & Noorzai, 2021).

*H3*. Risk mitigation has a positive and significant effect on procurement performance. Safeguards limit the losses that arise from divergent interests and moral hazard (Eisenhardt,

1989), and earlier studies report improved resilience and performance (Fazli et al., 2015; Lambaino, 2019; Mwalukasa & Sallwa, 2024).

H4. Risk monitoring has a positive effect on procurement performance, expected to be the weakest of the four. Agency theory expects monitoring to curb moral hazard (Eisenhardt, 1989), but the evidence is mixed: positive in Ghana (Osei-Tutu et al., 2018) and negative and insignificant in Nigeria, where monitoring was weakly implemented (Omonori & Ayegbo, 2025). The effect is therefore expected to depend on implementation quality.

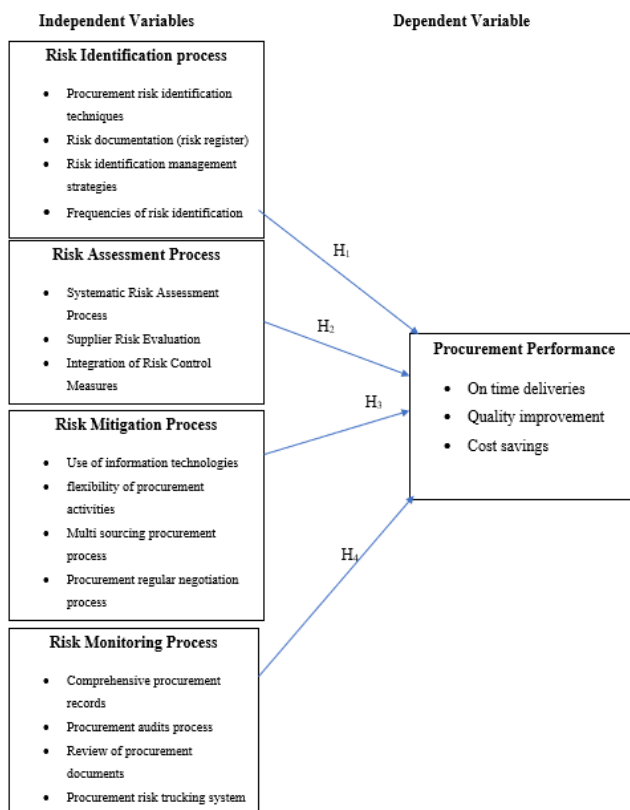


Figure 1: Relationship between risk management processes and procurement performance

Adapted from Lambaino (2019)

collected data at a single point in time from a large sample (Creswell & Creswell, 2018), as in earlier work on procurement processes and organizational performance in oil and petroleum supply chains (Cheng'e, 2014; Mbae & Ismail, 2022).

## B. Study Area and Population

The study was conducted at TPDC's head office in Dar es Salaam, Tanzania, where most procurement and risk management activity for crude oil supply projects is coordinated. TPDC has about 400 staff in seven directorates and three units (Devex, 2026). The target population was 180 employees in the five functions directly responsible for risk identification, assessment, mitigation, procurement execution, contractual compliance, and operational implementation: the Risk Management Unit, the Procurement Unit, the Directorate of Internal Audit, the Directorate of Legal Services, and the Directorate of Upstream (figures from TPDC's human resources department, 2026).

## C. Sample Size and Sampling Technique

Yamane's formula for finite populations (Yamane, 1967),  $n = N / (1 + Ne^2)$ , with  $N = 180$  and margin of error  $e = 0.05$ , gives the sample size:

$$n = 180 / (1 + 180 \times 0.05^2) = 124$$

Stratified random sampling by job role was used so that each functional category was represented (Mugenda & Mugenda, 2013) (Table I). Allocation across strata was not proportional. The Procurement Unit (20 of 20) and the Directorate of Legal Services (15 of 15) were fully enumerated, while the Risk Management Unit (35 of 40), the Directorate of Internal Audit (15 of 25), and the Directorate of Upstream (39 of 80) were sampled. Proportional allocation would have given about 28, 14, 17, 10, and 55 respondents for the Risk Management, Procurement, Internal Audit, Legal, and Upstream units respectively. Selection within strata and any adjustment for non-response are not detailed here, which is noted as a limitation. Because small units are over-represented in the pooled sample, the pooled results should be read with this in mind (see Limitations).

## II. METHOD

### A. Research Design

The study adopted a positivist philosophy, which suits research that explains causal relationships among measurable variables through empirical observation and statistical analysis (Saunders et al., 2019). It followed a deductive approach, testing theorized relationships against quantitative data (Saunders et al., 2019). A cross-sectional survey design

TABLE I  
SAMPLING FRAME AND ALLOCATION

| Unit (respondent category)                                         | N          | n          | n<br>(proportional) |
|--------------------------------------------------------------------|------------|------------|---------------------|
| Risk Management Unit (risk management officers)                    | 40         | 35         | 28                  |
| Procurement Unit (procurement officers)                            | 20         | 20         | 14                  |
| Directorate of Internal Audit (internal auditors)                  | 25         | 15         | 17                  |
| Directorate of Legal Services (legal officers)                     | 15         | 15         | 10                  |
| Directorate of Upstream (engineers, technicians, project officers) | 80         | 39         | 55                  |
| <b>Total</b>                                                       | <b>180</b> | <b>124</b> | <b>124</b>          |

### D. Instrument and Measurement

Data were collected with a structured questionnaire (Saunders et al., 2019) containing a demographic section (gender, age, education, work experience) and five items for each of the four independent constructs and for procurement performance, all rated on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree) (Likert, 1932). A sample item reads: “The organization has formal procedures for identifying procurement risks.” Indicators were adapted from Lambaino (2019). Two items are close in meaning: the identification item on risks being recorded as they occur and the monitoring item on procurement records. Their shared content may inflate the correlation between the two constructs, and this overlap is noted as a limitation. Procurement performance was measured through perceptions only; no objective indicators (for example, delay days, cost variance, or audit compliance scores) were collected.

### E. Data Collection, Validity, and Reliability

Questionnaires were self-administered, distributed in person, and collected within an agreed timeframe. Content validity was addressed through expert review of the items (Mugenda & Mugenda, 2013). The number and expertise of the reviewers and the results of any pilot testing are not reported here. Reliability was assessed with Cronbach’s alpha, with 0.70 or above taken as acceptable (Mugenda & Mugenda, 2013); all constructs met this threshold (Table II). Alpha shows internal consistency only. Construct validity was not examined with exploratory or confirmatory factor analysis, and discriminant validity (average variance extracted, HTMT, or cross-loadings) and common-method bias (for example, Harman’s single-factor test) were not assessed, which matters because identification correlates strongly with performance ( $r = .81$ ). These points are listed as limitations.

TABLE II  
RELIABILITY OF THE MEASUREMENT SCALES

| Construct               | Items | Cronbach’s $\alpha$ |
|-------------------------|-------|---------------------|
| Risk identification     | 5     | .854                |
| Risk assessment         | 5     | .800                |
| Risk mitigation         | 5     | .800                |
| Risk monitoring         | 5     | .853                |
| Procurement performance | 5     | .845                |

### F. Data Analysis

Data were analyzed in IBM SPSS Statistics 27. Means and standard deviations summarized respondents’ perceptions, with means interpreted as 1.00–1.80 strongly disagree, 1.81–2.60 disagree, 2.61–3.40 neutral, 3.41–4.20 agree, and 4.21–5.00 strongly agree. Pearson correlation tested associations at the 0.05 level, and multiple linear regression estimated the effects, with the sign and significance of each coefficient used to test hypotheses H1 to H4 (95% confidence intervals are reported in Table VI):

$$PP = \beta_0 + \beta_1 RI + \beta_2 RA + \beta_3 RM + \beta_4 RMon + \varepsilon$$

where PP is procurement performance, RI risk identification, RA risk assessment, RM risk mitigation, RMon risk monitoring, and  $\varepsilon$  the error term.

Likert composites (the mean of five items) were treated as interval data, as is common in survey research. Multicollinearity was checked with variance inflation factors (VIF) and tolerance, and the relative importance of the predictors was examined with a Shapley-value decomposition of  $R^2$  computed from the correlation matrix in Table V. Residual diagnostics (normality, linearity, homoscedasticity, independence, and outliers) are not reported here, which is noted as a limitation. Unit, experience, and education were collected but not entered as control variables; this is noted as a limitation.

### G. Ethical Considerations

Participation was voluntary, respondents were told the purpose of the study, confidentiality was maintained, and respondents could withdraw at any time without consequence. The National Institute of Transport issued a data collection letter, and TPDC issued an approval letter for data collection.

## III.RESULT AND DISCUSSION

### A. Response Rate and Respondent Profile

Of 124 questionnaires distributed, 101 were returned, a response rate of 82%, above the 70% level described as excellent (Mugenda & Mugenda, 2013). Men and women were fairly evenly represented (Table III). Most respondents (75 of 101) were aged 26 to 45, 79 of 101 held a bachelor’s or master’s degree, and 81 of 101 had four or more years of experience, so they were well placed to judge TPDC’s procurement practice.

TABLE III  
RESPONDENT CHARACTERISTICS (N = 101)

| Variable   | Category           | n  | %    |
|------------|--------------------|----|------|
| Gender     | Male               | 52 | 51.5 |
|            | Female             | 49 | 48.5 |
| Age        | 18–25 years        | 12 | 11.9 |
|            | 26–35 years        | 36 | 35.6 |
|            | 36–45 years        | 39 | 38.6 |
|            | 46 years and above | 14 | 13.9 |
| Education  | Certificate        | 9  | 8.9  |
|            | Diploma            | 13 | 12.9 |
|            | Bachelor's degree  | 55 | 54.5 |
|            | Master's degree    | 24 | 23.8 |
| Experience | 1–3 years          | 20 | 19.8 |
|            | 4–6 years          | 35 | 34.7 |
|            | 7–10 years         | 21 | 20.8 |
|            | Above 10 years     | 25 | 24.8 |

### B. Descriptive Statistics

Respondents agreed that all four processes are in place at TPDC, with composite means between 3.71 and 3.79 (Table IV) and low standard deviations (0.47 to 0.58). Procurement performance received the lowest and most dispersed ratings ( $M = 3.63$ ,  $SD = 0.73$ ), though still within the “agree” band. Within performance, compliance with procurement policies ( $M = 3.68$ ) followed timeliness, cost savings and quality were rated equally ( $M = 3.56$ ), and supplier reliability had the lowest mean and the highest dispersion ( $SD = 1.00$ ).

TABLE IV  
COMPOSITE SCORES BY CONSTRUCT (FIVE ITEMS EACH)

| Construct               | M    | SD   | Highest-rated item (M)                        | Lowest-rated item (M)                                   |
|-------------------------|------|------|-----------------------------------------------|---------------------------------------------------------|
| Risk identification     | 3.76 | 0.58 | Risks recorded as they occur (3.79)           | Risk sources analyzed before award (3.73)               |
| Risk assessment         | 3.78 | 0.49 | Risks assessed before activities begin (3.81) | Systematic process; integration of controls (3.76 each) |
| Risk mitigation         | 3.79 | 0.47 | Regular supplier negotiation (3.85)           | Postponement strategies (3.75)                          |
| Risk monitoring         | 3.71 | 0.57 | Records; activity tracking (3.72 each)        | Document review (3.68)                                  |
| Procurement performance | 3.63 | 0.73 | Timely completion (3.82)                      | Supplier delivery reliability (3.51)                    |

### C. Correlation Analysis

All four processes correlated positively and significantly with procurement performance (Table V): identification ( $r = .810$ ), assessment ( $r = .589$ ), mitigation ( $r = .454$ ), and monitoring ( $r = .387$ ), all at  $p < .01$ . Identification was also correlated with the other three processes ( $r = .232$  to  $.417$ ), whereas assessment, mitigation, and monitoring were not significantly correlated with one another ( $r = .121$  to  $.123$ ). The highest correlation among predictors (.417) is modest.

TABLE V  
PEARSON CORRELATIONS (N = 101)

|                            | 1      | 2      | 3      | 4      | 5 |
|----------------------------|--------|--------|--------|--------|---|
| 1. Risk identification     | 1      |        |        |        |   |
| 2. Risk assessment         | .232*  | 1      |        |        |   |
| 3. Risk mitigation         | .417** | .123   | 1      |        |   |
| 4. Risk monitoring         | .352** | .121   | .123   | 1      |   |
| 5. Procurement performance | .810** | .589** | .454** | .387** | 1 |

Note: \*  $p < .05$ ; \*\*  $p < .01$  (two-tailed).

### D. Regression Analysis

The model was significant and explained most of the variance in procurement performance ( $R = .921$ ,  $R^2 = .848$ , adjusted  $R^2 = .842$ , standard error of the estimate = 0.290),  $F(4, 96) = 134.29$ ,  $p < .001$ . About 15% of the variance is left unexplained, which includes measurement error as well as omitted factors. Because the same respondents rated both the processes and the outcome, the high explained variance may partly reflect shared perceptions and should be interpreted with caution. All four processes had positive, significant effects (Table VI), so H1 to H4 were supported. Identification had the largest standardized effect ( $\beta = .623$ ), followed by assessment ( $\beta = .417$ ), mitigation ( $\beta = .130$ ), and monitoring ( $\beta = .101$ ). In unstandardized terms, a one-point increase in identification was associated with a 0.777-point increase in procurement performance, holding the other processes constant; the figures were 0.615 for assessment, 0.201 for mitigation, and 0.128 for monitoring. Multicollinearity was not a concern (VIF = 1.06 to 1.41; tolerance = .71 to .94). Differences between the standardized coefficients were not formally tested, so the ranking is descriptive. The 95% confidence intervals for mitigation and monitoring overlap and lie above zero. A Shapley decomposition of  $R^2$  attributes 52.7% of the explained variance to identification, 28.2% to assessment, 11.3% to mitigation, and 7.8% to monitoring, so mitigation and monitoring contribute modestly and by similar amounts.

TABLE VI  
REGRESSION OF PROCUREMENT PERFORMANCE ON THE FOUR PROCESSES

| Predictor           | B      | SE    | $\beta$ | t      | p      | 95% CI for B |
|---------------------|--------|-------|---------|--------|--------|--------------|
| (Constant)          | -2.852 | 0.335 |         | -8.511 | < .001 | -3.52, -2.19 |
| Risk identification | 0.777  | 0.059 | .623    | 13.226 | < .001 | 0.66, 0.89   |
| Risk assessment     | 0.615  | 0.060 | .417    | 10.189 | < .001 | 0.50, 0.73   |
| Risk mitigation     | 0.201  | 0.067 | .130    | 2.978  | .004   | 0.07, 0.33   |
| Risk monitoring     | 0.128  | 0.054 | .101    | 2.373  | .020   | 0.02, 0.24   |

$$PP = -2.852 + 0.777RI + 0.615RA + 0.201RM + 0.128RMon$$

### E. Discussion

The findings suggest that all four processes are positively associated with procurement performance at TPDC, in line with hypotheses H1 to H4. Risk identification and assessment carried most of the weight, while mitigation and monitoring contributed smaller and broadly similar amounts. Because the data are cross-sectional perceptions from one organization, the results are best read as associations rather than proof of causation.

1) *Risk Identification*: Identification had the strongest association with performance, both on its own and when the other processes were held constant. This agrees with a strong, significant effect of identification on supply chain performance in a Tanzanian public agency (Nchindiuza, 2023) and with links between recognizing transportation, delivery, and procurement risks and performance in Kenya's petroleum sector (Cheng'e, 2014; Mbae & Ismail, 2022). Clear specifications, careful bidder selection, and pre-contract negotiation are themselves early forms of identification (Mchomvu, 2022). Agency theory offers an explanation: TPDC's formal procedures, risk register, and pre-award analysis of risk sources narrow the information gap between buyer and supplier, so uncertainty is dealt with before it becomes cost overruns, delays, or disputes. At the same time, pre-award analysis of risk sources was rated lowest among the identification items, which is consistent with audit reports of weak procurement planning (Controller and Auditor General, 2022) and marks this step as the clearest place to strengthen identification.

2) *Risk Assessment*: Assessment was the second strongest predictor, consistent with evidence that internal and external risks strongly affect success in oil and gas projects (Kassem, 2022) and that the planning stage, where most assessment happens, matters most for contractor and delay risks (Sohrabi & Noorzai, 2021). It also echoes the large reduction in construction duration reported from early assessment (Jo et al., 2018) and the value of supply risk management and diversified sourcing (Ackah & Boadu, 2025; Mwaiseje et al., 2024). In agency terms, risk-based supplier evaluation and assessment before activities begin help allocate risk between principal and agent. The slightly lower rating for integrating risk controls into procurement decisions suggests that assessment results are not always fully carried through into decisions.

3) *Risk Mitigation*: Mitigation had a significant but smaller effect. Risk reduction and transfer strategies improved resilience in Kenyan petroleum companies (Lambaino, 2019), which parallels TPDC's high ratings for insurance and supplier negotiation. Cooperation and risk transfer were the most effective responses in the Iranian crude oil supply chain (Fazli et al., 2015), and planning, capacity building, and compliance control were linked to better performance in Tanzanian public institutions (Mwalukasa & Sallwa, 2024).

Joint risk management and prioritized mitigation add directional support (Handayani & Rabihah, 2022; Rawat et al., 2022). From an agency perspective, mitigation supplies the safeguards that protect the principal once risks are identified and assessed. Its smaller incremental effect may reflect that these safeguards add less once earlier stages are in place, although the cross-sectional design cannot confirm this.

4) *Risk Monitoring*: Monitoring had the smallest effect, though it remained significant and was similar in size to mitigation. This differs from a negative and insignificant effect in Nigeria (Omonori & Ayegbo, 2025). Together, the two studies suggest that monitoring may be especially sensitive to implementation quality, helping performance when done reasonably well, as respondents indicated at TPDC, and failing to help when done poorly. Broader support comes from monitoring-related activities in other settings (Mwalukasa & Sallwa, 2024; Osei-Tutu et al., 2018). Agency theory treats monitoring as the safeguard against moral hazard, the risk that a supplier behaves differently after contract signature. TPDC's records, audits, and tracking fit that role, but the modest coefficient suggests oversight adds less than getting identification and assessment right earlier. Regular document review was the lowest-rated monitoring item.

## F. Implications

For TPDC and similar enterprises, effort invested early in the risk sequence, in structured identification and assessment before contract award, is associated with the largest performance differences, with mitigation and monitoring acting as complements. Effect size and room for improvement answer different questions: effect size shows how strongly performance varies with a process, while room for improvement shows where current practice is weakest. The weakest-rated practices within the two strongest processes (pre-award analysis of risk sources and integration of controls into decisions) are therefore the most promising targets, whereas improvements in mitigation and monitoring should be expected to yield smaller returns. Performance was rated lowest on supplier delivery reliability ( $M = 3.51$ ) and cost savings and value for money ( $M = 3.56$ ), where better risk management should be expected to pay off. For regulators, the findings come from one organization and are suggestive only, but they support testing sector-specific procurement risk guidance for oil and gas. Theoretically, the pattern is consistent with the proposition that agency theory's three problems (information asymmetry, risk sharing, and moral hazard) can be mapped onto the four risk processes, with mitigation and monitoring both addressing moral hazard and with the processes aimed at information asymmetry and risk sharing carrying the most weight. The study does not test this mapping directly, and future work should do so.

#### IV. CONCLUSIONS

##### A. Conclusion

Procurement risk identification, assessment, mitigation, and monitoring each have a positive and statistically significant effect on procurement performance in crude oil supply projects at TPDC, and together they explain 84.8% of its variance, a figure that may be inflated by shared perceptions. Identification is the most influential process, followed by assessment, mitigation, and monitoring, although mitigation and monitoring are close in size. The weakest practices sit in the early stages: pre-award analysis of risk sources and the integration of risk controls into procurement decisions were among the lowest-rated items in identification and assessment, which fits the audit evidence of weak planning. Because these are also the stages with the largest effects, they offer the greatest return on improvement, while mitigation and monitoring matter but are likely to add less. Procurement performance is generally rated satisfactory, but supplier delivery reliability and consistent cost savings leave room for improvement.

##### B. Recommendations

1) *Pre-award risk analysis (Procurement Unit and Risk Management Unit)*: Make a documented analysis of risk sources (supplier, logistics, price, and regulatory) a required step before every crude oil supply award, and record it in the risk register. Evidence: it was the lowest-rated identification item ( $M = 3.73$ ), although identification had the largest effect ( $\beta = .623$ ). Indicator: share of awarded contracts with a documented pre-award risk analysis.

2) *Integration of assessment into decisions (Risk Management Unit and tender evaluation committees)*: Attach the risk-assessment result and proposed response to each award recommendation, and require the committee to record how it was used. Evidence: integration of controls was among the lowest-rated assessment items ( $M = 3.76$ ), and assessment had the second largest effect ( $\beta = .417$ ). Indicator: share of award decisions that carry a completed risk-assessment attachment.

3) *Monitoring of documents and supplier delivery (Internal Audit and contract management)*: Schedule regular review of procurement documents, contracts, and supplier performance, and track delivery reliability for each major supplier. Evidence: document review was the lowest-rated monitoring item ( $M = 3.68$ ), supplier delivery reliability was the lowest-rated performance item ( $M = 3.51$ ), and monitoring had a small but significant effect ( $\beta = .101$ ). Indicator: share of scheduled reviews completed and the on-time delivery rate.

4) *Conversion of risks into mitigation measures (Procurement Unit and Legal Services)*: Assign an owner and a specific measure, such as performance securities, supplier

negotiation, or contingency plans, to each high-rated risk, rather than treating assessment as an administrative requirement. Evidence: mitigation had a significant effect ( $\beta = .130$ ), postponement strategies were its lowest-rated item ( $M = 3.75$ ), and audits report inadequate use of performance securities (Controller and Auditor General, 2022). Indicator: share of high-rated risks with an assigned and funded mitigation action.

5) *Government and regulators (tentative)*: This is a single-organization study, so these findings alone do not establish what regulators should require. The Public Procurement Regulatory Authority could consider piloting sector-specific procurement risk guidance for oil and gas in several organizations before making it binding, building on the compliance gaps found in its own evaluations (Public Procurement Regulatory Authority, 2024). Indicator: change in compliance scores among the pilot entities.

##### C. Limitations and Future Research

The study was conducted at one organization and focused on crude oil supply projects, which limits generalization. Several further limitations apply. First, the processes and the outcome were self-reported by the same respondents at a single point in time, so common-method bias and social desirability cannot be ruled out. Second, sampling fractions differed across units (Table I), so small units are over-represented in the pooled results, and non-response by unit is not known; no weighting or sensitivity check was applied. Third, no objective performance data (such as delay days, cost variance, or audit compliance scores) were used. Fourth, the cross-sectional design does not support causal conclusions. Fifth, construct validity was not tested with factor analysis, discriminant validity was not assessed even though identification correlates strongly with performance, and two items (risks recorded as they occur; procurement records) overlap in meaning. Sixth, the instrument was adapted from earlier work and was not re-validated beyond expert review and reliability testing. In addition, the expert review and any pilot test are not described in detail, residual diagnostics are not reported, selection within strata is not detailed, and unit, experience, and education were not controlled for, and the predictor ranking is descriptive because differences between coefficients were not tested. Future studies could examine other state-owned enterprises and sectors in Tanzania, combine multiple sources (managers, suppliers, and audit records), test mediation and moderation (for example, by experience, unit, and leadership support), use qualitative or mixed methods to explore why monitoring had the weakest effect, include variables such as organizational culture and technology adoption, and adopt a longitudinal design.

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