

DOI: <https://doi.org/10.38035/dijemss.v8i1><https://creativecommons.org/licenses/by/4.0/>

Received: 17 May 2026 | Revised: 20 May 2026 | Accepted: 24 September 2026

The Influence of Human Resource Capacity, Information Technology, and Regulatory Compliance on The Effectiveness of The Procurement Service Unit (UKPBJ) at The Ministry of Environment / Environmental Management Agency of The Republic of Indonesia

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Abstract: This study examines the relationships between human resource (HR) capacity, information technology, regulatory compliance, and the effectiveness of the Procurement Service Unit (Unit Kerja Pengadaan Barang/Jasa, UKPBJ) at the Ministry of Environment of the Republic of Indonesia. Despite the strategic mandate of UKPBJ as a “Center of Excellence”, empirical evidence on the integrated effect of these three institutional pillars within the environmental sector remains scarce. A quantitative explanatory design was employed, involving a census of 100 procurement personnel surveyed through a Likert-scale questionnaire and analyzed using multiple linear regression with classical assumption testing. The results show that HR capacity ($\beta = 0.613$; $p < 0.001$), information technology ($\beta = 0.281$; $p < 0.001$), and regulatory compliance ($\beta = 0.191$; $p = 0.003$) are positively and significantly associated with UKPBJ effectiveness, with the model explaining 62.6% of its variance ($F = 56.289$; $p < 0.001$). HR capacity emerges as the dominant predictor. The study contributes an integrated empirical model that bridges Human Capital Theory, the DeLone and McLean Information Systems Success Model, and Regulatory Compliance Theory in the context of environmental public procurement, offering actionable implications for accelerating digital transformation, professional certification, and compliance governance in Indonesian ministries.

Keywords: HR Capacity, Information Technology, Regulatory Compliance, Procurement Effectiveness, UKPBJ.

INTRODUCTION

Public procurement constitutes one of the largest categories of government expenditure worldwide, accounting for approximately 12% of global GDP and 29% of total government

spending in OECD countries (OECD, 2023). As a strategic instrument, public procurement does not only translate budgets into tangible public services but also shapes transparency, accountability, and the delivery of sustainable development goals (Patrucco et al., 2021; Sönnichsen & Clement, 2020). In Indonesia, this strategic function is institutionalized through the Procurement Service Unit (Unit Kerja Pengadaan Barang/Jasa, hereafter UKPBJ), mandated by Presidential Regulation No. 16 of 2018 jo. Presidential Regulation No. 46 of 2025, and directed by the National Public Procurement Agency (Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah, LKPP) to evolve into a Center of Excellence characterized by professionalism, digitalization, and integrity (LKPP, 2022).

Within the Ministry of Environment of the Republic of Indonesia, UKPBJ plays a particularly critical role because the Ministry's programs—pollution control, waste management, ecosystem restoration, and the PROPER environmental performance rating—rely heavily on the timely and high-quality availability of goods and services (Firmansyah et al., 2024). UKPBJ at the Ministry of Environment currently manages between 3,000 and 4,000 procurement packages per year with only 46 Commitment Making Officers (PPK) and 27 functional procurement officers, generating a structural imbalance between workload and personnel capacity (Andio, 2024). Reports from Indonesia Corruption Watch (2024) and the World Bank (2022) further indicate that the public procurement sector remains highly vulnerable to integrity breaches, specification errors, and inaccurate Self-Estimated Price (Harga Perkiraan Sendiri, HPS) calculation.

Three interrelated challenges undermine the effectiveness of UKPBJ at the Ministry of Environment. First, gaps in human resource capacity persist, as not all officers hold the most recent procurement certification, and technical guidance on HPS calculation and contract management remains uneven (Cahyaningtias, 2022; Santiasari, 2025). Second, technical barriers in information technology continue to hinder operations: national platforms such as LPSE and e-Katalog still suffer from network downtime, manual workarounds, and underutilization of advanced features such as sectoral catalogs and analytics (Cahyadi, 2024; Mazta, 2025; Charnor & Quartey, 2024). Third, regulatory complexity arises because officers must simultaneously comply with general procurement law and sectoral environmental regulations, while audit findings and integrity risks remain non-trivial (Tukamuhabwa et al., 2021; Qamar, 2024).

Despite a growing body of literature on public procurement reform, three research gaps remain. First, prior studies tend to examine the influence of HR competence, e-procurement, or regulatory compliance partially rather than simultaneously (Prasetyo & Isnowati, 2025; Mazta, 2025; Sönnichsen & Clement, 2020). Second, most quantitative evidence has been generated in the context of general state agencies, state-owned enterprises, or local governments, while research specifically on procurement units in the environmental sector remains scarce (Firmansyah et al., 2024; OECD, 2023). Third, limited empirical research has integrated Human Capital Theory, the DeLone and McLean Information Systems Success Model, and Regulatory Compliance Theory within a single model in the Indonesian public sector (Patrucco et al., 2021; Tyler, 2006).

This study addresses these gaps by formulating four research questions: (1) Does HR capacity significantly influence UKPBJ effectiveness at the Ministry of Environment? (2) Does information technology significantly influence UKPBJ effectiveness? (3) Does regulatory compliance significantly influence UKPBJ effectiveness? (4) Do the three variables simultaneously influence UKPBJ effectiveness? The novelty of this study lies in proposing an integrated empirical model that simultaneously tests three institutional pillars of procurement effectiveness within the environmental sector—an area that is methodologically and contextually underexplored.

The theoretical framework is grounded in three established perspectives. Human Capital Theory (Becker, 1964; Dessler, 2020) posits that investment in employees' knowledge, skills, and experience increases organizational productivity. The DeLone and McLean Information Systems Success Model (DeLone & McLean, 2016) and the Technology Acceptance Model (Davis, 1989; Venkatesh et al., 2016) explain that system quality, information quality, and perceived ease of use shape organizational benefits derived from information technology. Regulatory Compliance Theory (Tyler, 2006; Parker & Nielsen, 2017) argues that compliance is driven by the legitimacy of rules, internal monitoring, and the credibility of sanctions. Organizational effectiveness is interpreted following Steers (1985) and LKPP (2022) as the degree of goal achievement, time and cost efficiency, transparency, and stakeholder satisfaction.

Based on the theoretical synthesis, four hypotheses are formulated: H1: HR capacity has a positive and significant influence on the effectiveness of UKPBJ at the Ministry of Environment. H2: Information technology has a positive and significant influence on UKPBJ effectiveness. H3: Regulatory compliance has a positive and significant influence on UKPBJ effectiveness. H4: HR capacity, information technology, and regulatory compliance simultaneously have a positive and significant influence on UKPBJ effectiveness.

METHOD

This study adopted a quantitative explanatory design to examine relationships among predefined variables (Creswell & Creswell, 2023; Sugiyono, 2023). The research was conducted at the UKPBJ of the Ministry of Environment of the Republic of Indonesia in Jakarta between January and April 2026. The unit was selected purposively because it manages a strategically high volume of environmental procurement and has been formally designated as a Center of Excellence candidate by LKPP (2022).

The population consisted of 100 personnel directly involved in the procurement process, including Commitment Making Officers (PPK), functional procurement officers, members of the selection working group (Pokja Pemilihan), and technical and administrative staff. Because the population was finite and accessible, total sampling (census) was applied, resulting in the inclusion of all 100 personnel as respondents (Hair et al., 2019).

Data were collected through three complementary instruments. The primary instrument was a structured questionnaire using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), comprising nine items for HR capacity (X1), nine items for information technology (X2), nine items for regulatory compliance (X3), and fifteen items for UKPBJ effectiveness (Y), adapted from previously validated instruments (Dessler, 2020; DeLone & McLean, 2016; Tyler, 2006; Steers, 1985). Non-participant observation complemented the quantitative data by capturing workflow patterns in the e-procurement system, while documentary studies reviewed internal regulations, standard operating procedures, organizational structures, and procurement performance reports for 2023–2026.

Prior to the main survey, the instrument underwent a two-stage validation process to ensure both content validity and construct validity. Content validity was assessed through expert judgment by three experts—one academic in human resource management, one certified senior procurement practitioner, and one auditor with experience in public procurement oversight—who independently reviewed the relevance, clarity, and representativeness of each indicator. Items that received consensus below the agreed threshold were either revised or removed in consultation with the expert panel. A pilot test was subsequently conducted on 30 respondents from a comparable procurement unit outside the main sampling frame to evaluate item comprehension, response distribution, and the internal consistency of each construct (Hair et al., 2019). Minor wording refinements were incorporated based on the pilot results before the final instrument was administered to the 100 census respondents.

Instrument quality was then re-tested on the full sample using Pearson product–moment correlations for validity and Cronbach’s alpha for reliability, with thresholds of Sig. < 0.05 and $\alpha > 0.70$, respectively (Ghozali, 2018). The summary of the reliability results is presented in Table 1.

Table 1. Construct Reliability of the Research Instrument

Variable	Number of Items	Cronbach's Alpha	Decision
HR Capacity (X1)	9	0.934	Reliable
Information Technology (X2)	9	0.918	Reliable
Regulatory Compliance (X3)	9	0.811	Reliable
UKPBJ Effectiveness (Y)	15	0.971	Reliable
Threshold (Hair et al., 2019)	—	> 0.70	—

Source: Processed primary data (2026)

As shown in Table 1, every construct produced a Cronbach’s alpha above the 0.70 threshold, with values ranging from 0.811 for regulatory compliance to 0.971 for UKPBJ effectiveness, demonstrating strong internal consistency for all four instruments. Classical assumption tests were subsequently performed, including the Kolmogorov–Smirnov test for normality, Variance Inflation Factor (VIF) and tolerance for multicollinearity, the Glejser test for heteroscedasticity, and the Durbin–Watson statistic for autocorrelation. Hypothesis testing employed multiple linear regression with the model $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$, complemented by partial t-tests, simultaneous F-tests, and the adjusted coefficient of determination (Adjusted R^2). All statistical analyses were performed using IBM SPSS Statistics version 26.

RESULTS AND DISCUSSION

Respondent Profile and Descriptive Statistics

The 100 respondents, 48% were Commitment Making Officers (PPK), 27% were functional procurement officers, and the remainder were members of the selection working group, technical staff, and administrative personnel. The majority held a bachelor’s degree or higher, possessed valid procurement certifications, and had more than five years of professional experience. The descriptive statistics of the four research variables are presented in Table 2.

Table 2. Descriptive Statistics of Research Variables

Variable	N	Mean	Std. Deviation	Category
HR Capacity (X1)	100	25.03	3.42	High
Information Technology (X2)	100	25.33	3.18	Moderately High
Regulatory Compliance (X3)	100	27.74	3.05	High
UKPBJ Effectiveness (Y)	100	42.24	5.91	Moderately High

Source: Processed primary data, 2026

Regulatory compliance recorded the highest mean score (27.74), indicating relatively high perceived compliance among respondents (LKPP, 2022). HR capacity (25.03) and information technology (25.33) were classified as high and moderately high, respectively, while UKPBJ effectiveness (42.24) was in the moderately high category, indicating sound performance in timeliness and output quality but room for improvement in stakeholder satisfaction and cost efficiency.

Validity, Reliability and Classical Assumption Tests

All questionnaire items were valid (Pearson correlation, Sig. < 0.05) and reliable, with Cronbach's alpha values ranging from 0.811 to 0.971, well above the 0.70 threshold (Ghozali, 2018; Hair et al., 2019). The Kolmogorov–Smirnov test produced an asymptotic significance of 0.200 and a Monte Carlo significance of 0.404, confirming normally distributed residuals. Tolerance values for all independent variables were above 0.10 and VIF values ranged from 1.055 to 1.092, indicating the absence of multicollinearity. The Glejser test showed significance values of 0.546, 0.361, and 0.173 for X1, X2, and X3, respectively, confirming the absence of heteroscedasticity. The Durbin–Watson statistic of 2.116 demonstrated no autocorrelation. Consequently, the regression model satisfies the Best Linear Unbiased Estimator (BLUE) properties.

Multiple Linear Regression Analysis

The multiple linear regression analysis produced the following estimated equation:

$$Y = -9.929 + 1.059 X1 + 0.512 X2 + 0.458 X3$$

Table 3. Multiple Linear Regression Results

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	-9.929	3.987	—	-2.490	0.014
HR Capacity (X1)	1.059	0.111	0.613	9.576	< 0.001
Information Technology (X2)	0.512	0.117	0.281	4.380	< 0.001
Regulatory Compliance (X3)	0.458	0.151	0.191	3.031	0.003

Source: Processed primary data, 2026 (SPSS 26)

The positive sign of all regression coefficients indicates that every one-unit increase in HR capacity, information technology, and regulatory compliance is followed by an increase in UKPBJ effectiveness of 1.059, 0.512, and 0.458, respectively, holding other variables constant.

Hypothesis Testing

As reported in Table 3, the partial t-test confirms that each independent variable has a positive and statistically significant influence on UKPBJ effectiveness, supporting H1, H2, and H3. The simultaneous F-test yielded $F = 56.289$ ($p < 0.001$), supporting H4 and confirming that the three variables jointly influence UKPBJ effectiveness. The adjusted coefficient of determination (Adjusted R^2) of 0.626 indicates that the model explains 62.6% of the variation in UKPBJ effectiveness, while 37.4% of the variation remains unexplained by the predictors included in the model (Patrucco et al., 2021; Firmansyah et al., 2024).

Discussion

The finding that HR capacity is the dominant predictor ($\beta = 0.613$) of UKPBJ effectiveness reinforces Human Capital Theory (Becker, 1964; Dessler, 2020), which posits that the knowledge, skills, and experience of personnel are decisive determinants of organizational performance. This result is consistent with the findings of Prasetyo and Isnowati (2025) and Santiasari (2025), who emphasized that procurement competence and structured HR development directly enhance procurement budget performance, and with the international evidence from Patrucco et al. (2021) and Sönnichsen and Clement (2020), who showed that procurement professionalization is the single strongest driver of public procurement performance. However, the present study contributes evidence from the environmental sector, where procurement may involve complex technical specifications related to ecosystem and

pollution-control programs. The practical implication for the Ministry of Environment is that investment in advanced procurement certification, technical training on HPS calculation and contract management, and structured career pathways for functional officers must be prioritized.

The significant influence of information technology ($\beta = 0.281$) supports the DeLone and McLean Information Systems Success Model (DeLone & McLean, 2016) and the Technology Acceptance Model (Davis, 1989; Venkatesh et al., 2016), which explain that system quality and perceived usefulness translate into organizational benefits. The moderately high mean score (25.33) indicates generally positive perceptions of information technology, although the aggregate score alone does not identify which specific system features are underutilized. This finding aligns with Cahyadi (2024), Mazta (2025), and Charnor & Quartey, (2024), who argued that the marginal contribution of e-procurement increases sharply when supported by stable infrastructure, interoperable systems, and trained users. It also qualifies the techno-centric narrative of e-government literature: in environments where HR capacity is uneven, technology alone yields only partial gains.

Regulatory compliance also exerts a positive and significant influence ($\beta = 0.191$), consistent with Regulatory Compliance Theory (Tyler, 2006; Parker & Nielsen, 2017), in which adherence to procurement rules safeguards integrity, minimizes legal disputes, and protects budget execution from adverse audit findings. The highest mean score for this variable (27.74) indicates that UKPBJ at the Ministry of Environment has cultivated a strong compliance culture; however, the relatively smaller standardized coefficient compared with HR capacity suggests that compliance alone—without competent personnel—cannot maximize procurement effectiveness (Firmansyah et al., 2024; Qamar, 2024; Tukamuhabwa et al., 2021).

Taken together, the simultaneous explanatory power of 62.6% confirms that UKPBJ effectiveness should be understood as the result of synergy among three institutional pillars: competent human resources, optimized digital systems, and a strong compliance regime. The remaining 37.4% of unexplained variance points to additional factors—leadership commitment, organizational culture, budget policy, and inter-agency coordination—that warrant further investigation (Patrucco et al., 2021; Sönnichsen & Clement, 2020). From a managerial standpoint, these findings may be considered alongside organizational performance indicators, including the reported 5.82% procurement budget efficiency rate in 2025.

This study has several limitations. First, the cross-sectional design limits causal inference across budget cycles. Second, the single-ministry setting may constrain generalizability to other sectoral procurement units. Third, the model excludes contextual moderators such as leadership style and organizational culture, which could be addressed in future research using longitudinal or mixed-method designs (Hair et al., 2019; Creswell & Creswell, 2023).

CONCLUSION

This study concludes that human resource capacity, information technology, and regulatory compliance each exert a positive and statistically significant influence on the effectiveness of the Procurement Service Unit at the Ministry of Environment of the Republic of Indonesia, and that the three variables simultaneously explain 62.6% of the variance in UKPBJ effectiveness. HR capacity emerges as the dominant predictor, underscoring that the transformation of UKPBJ into a Center of Excellence cannot rely on systems and regulations alone, but must be anchored in competent and certified procurement professionals.

Theoretically, this research contributes an integrated empirical model that bridges Human Capital Theory, the DeLone and McLean Information Systems Success Model, the Technology Acceptance Model, and Regulatory Compliance Theory within the specific institutional context of the Indonesian environmental sector. Practically, the Ministry of Environment is advised to accelerate targeted competency development for procurement

personnel, strengthen the integration and stability of LPSE and e-Katalog infrastructure, refine standard operating procedures, and reinforce internal audit and key performance indicators to monitor procurement effectiveness. Future research should extend the model by incorporating variables such as leadership support, organizational culture, risk management, and green public procurement, and adopt longitudinal or mixed-method designs that observe UKPBJ effectiveness across multiple budget cycles.

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