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ANALYZING THE DYNAMICS OF CONTRACTOR FAILURES IN E-PROCUREMENT BASED CONSTRUCTION TENDERS: A CASE STUDY IN BANDA ACEH, INDONESIA

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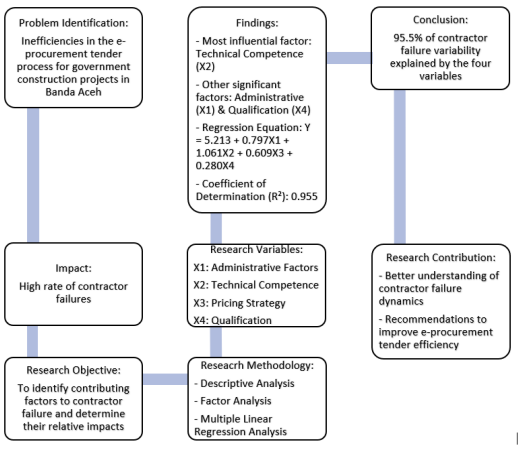
Graphical abstract



Abstract

The inefficiencies in the e-procurement tender process have become a critical issue for government construction projects in Banda Aceh, Indonesia, leading to a high incidence of contractor failures. This research investigates the underlying factors contributing to these failures, aiming to identify the primary influences and their relative impacts. The study employs a comprehensive methodological approach, including descriptive analysis, factor analysis, and multiple linear regression analysis. Key findings reveal that administrative factors (X1) and qualification factors (X4) significantly contribute to contractor failures. However, the analysis shows that technical competence (X2) is the most influential factor. The regression analysis results in the equation Y = 5.213 + 0.797X1 + 1.061X2 + 0.609X3 + 0.280X4, with a coefficient of determination (R^2) of 0.955. This indicates that 95.50% of the variability in contractor failure rates can be explained by the variables of administration, technical competence, pricing strategy, and qualification. This study contributes to a better understanding of contractor failures in e-procurement dynamics and provides actionable insights that can enhance the efficiency and success of future tender processes.

Keywords: E-procurement, construction tenders, contractor failure, tendering process, government tenders.

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1.0 INTRODUCTION

The construction sector plays a pivotal role in supporting the developmental progress of a country by producing various infrastructural assets such as roads, residential buildings, commercial structures, factories, bridges, dams, and public facilities [1]. In the Republic of Indonesia, a developing nation, infrastructure development is a key focus of the government's efforts to advance. Successful execution of infrastructure projects demands meticulous attention to the procurement process, requiring the involvement of experienced and professional construction services companies [2].

Tendering is critical activity undertaken to select qualified contractors for government procurement of goods and services, aiming to identify, obtain, determine, and appoint the most suitable company for specific work packages [3]. This multifaceted process includes stages such as announcement, registration, downloading of selection documents, providing explanations, submission of bidding documents, document opening, evaluation, and contract signing [4-6]. Each of these stages presents unique challenges and opportunities for contractors. In the preparation stage, contractors must ensure that they meet all administrative and technical requirements outlined in the tender documents. During the bid submission stage, contractors must submit their proposals within a

specified timeframe. The evaluation stage involves a thorough review of the submitted bids by the tendering authority. Finally, in the awarding stage, the contract is given to the most suitable contractor based on the evaluation criteria [6].

The success or failure of contractors in the tendering process can often be traced back to these stages. For instance, failure to meet administrative requirements during the preparation stage can lead to immediate disqualification. Similarly, inadequacies in technical proposals or pricing strategies can hinder a contractor's chances during the evaluation stage. Thus, understanding these key stages and the potential pitfalls at each step is crucial for improving contractor success rates in the tendering process [5].

To promote clean governance and combat corrupt practices such as collusion, corruption, and nepotism (KKN) in goods and services procurement, the Indonesian government has introduced electronic procurement (e-procurement). This was formalized in the Presidential Regulation of the Republic of Indonesia Number 12 of 2021, amending the Presidential Regulation Number 16 of 2018 concerning Government Procurement of Goods and Services [7]. E-procurement involves conducting government procurement electronically through web-based platforms, utilizing communication and information technology, as detailed in the Regulation of the Head of Construction Services Development Policy (LKPP) Number 2 of 2010 [8]. The Electronic Procurement Service (LPSE) highlights that electronic tendering is an integral part of this system [9].

The implementation of e-procurement aligns with the principles of government procurement, emphasizing efficiency, effectiveness, transparency, openness, competitiveness, fairness, and accountability [7]. Despite these advancements, contractors often face failures during the tender process. Research indicates that failure can result from various factors, including administrative, technical, price, and qualification issues [9-13].

The study aims to identify the factors causing contractor failures in the e-procurement tender process, pinpoint the most dominant factor contributing to these failures, and determine the percentage of failures experienced by contractors due to these factors. By analyzing these dynamics, the research seeks to enhance the efficiency and success of future tender processes.

The primary objective of this research is to analyze the factors causing contractor failures in the e-procurement tender process. Specific objectives include identifying the dominant factor involved and determining the percentage of failures experienced by contractors due to these factors. This research contributes to a better understanding of contractor failures in e-procurement, providing valuable insights for improving tendering processes in government procurement.

2.0 METHODOLOGY

This research focuses on contractor companies based in Banda Aceh that are actively participating in the construction tender process using the e-procurement system organized by the Banda Aceh City Government. The study targets these contractor companies located in Banda Aceh.

Data collection involves distributing questionnaires to respondents within these contractor companies. The questionnaires are specifically designed for companies operating in Banda Aceh and participating in the e-procurement system. A Likert scale is used to enable a comprehensive and structured assessment of the factors influencing contractor failures in the tender process.

Given the frequent occurrences of contractor failures during the bidding process, a thorough analysis of the variables affecting these failures in electronic tenders is essential. The study examines variables including administrative (X1), technical (X2), price (X3), qualification (X4), and tender failure (Y).

The sample size is determined using non-probability sampling with a purposive sampling technique. A total of 37 small-sized contractors (K1, K2, and K3) who meet the qualifications are selected. K1, K2, and K3 represent different levels of small-sized contractors. This selection ensures a representative sample of contractors involved in the e-procurement-based construction tender process in Banda Aceh.

The research employs both Exploratory Factor Analysis (EFA). EFA is used initially to identify underlying factors and determine the relationships among variables without predefined hypotheses. This method helps uncover the fundamental dimensions of the constructs. In summary, EFA was conducted to identify and explore the potential factors.

The Presidential Regulation of the Republic of Indonesia Number 12 of 2021, amending Presidential Regulation Number 16 of 2018, defines government procurement as the process through which ministries, institutions, regional work units, or institutions obtain goods or services [7]. The procurement process, from planning needs to the final delivery, aims to acquire suitable goods/services within allocated funds, measured by quality, quantity, time, cost, location, and provider [14].

E-procurement is a crucial method in government procurement [15]. It allows suppliers to submit bids online through electronic platforms, enhancing efficiency and transparency in the selection process [16]. E-procurement systems streamline bid submission, evaluation, and selection, promoting fair competition and optimal value for procurement investments [17]. E-procurement adheres to principles of transparency and fairness, crucial for efficient procurement [7, 18].

The procurement method is determined during the planning phase, with various methods available such as e-purchasing, direct procurement, direct appointment, fast tender, and tendering [6, 7]. The tender process involves multiples stages including announcement, registration, document download, explanation session, bid submission, document opening, evaluation, qualification verification, and contract signing [10]. These stages ensure a systematic, transparent selection process for qualified providers [4].

Contractors often encounter failures in the bidding process due to various factors [10, 20]. The key factors influencing contractor failures are detailed Table 1.

Table 1 Research variables of failure factors in the tender process

No.	Variable	Indicator
1	Administration	Participants do not attach a cooperation agreement letter [12]. Lack of detailed price breakdown (quantity and price list) [12]. Failure to attach a bid bond letter [13]. Failure during the bid document upload process [13]. Lack of bank support [10].
2	Technical	Work implementation method does not comply with the selection documents (does not explain work completion) [9]. Technical specifications submitted are less than the required [9]. Personnel experience for the field execution position does not meet the requirements as per the selection documents [9]. The submitted implementation schedule does not comply with the selection documents [9]. Failure to attach evidence of ownership / purchase invoices of supporting equipment [9].
3	Price	Offered price is not competitive with other participants [12]. Price and budget analysis do not show the unit of labor, materials, and equipment requirements [12]. Inexperienced estimator [10]. Errors in predicting price fluctuations [10]. Errors in price survey [10].
4	Qualification	Participants do not fill in company qualification data [13]. Unprepared with evidence of qualifications possessed [9]. Participants do not submit proof of meeting tax obligations for the last tax year (SPT) [9]. Failure to attach construction services business license (SIUJK) [9]. Failure to attach the company's business certificate (SBU) [9].
5	Tender failure	The number of participants who submitted bids is less than three [11]. No bids pass the bid evaluation [11]. Participants' objections to the tender implementation [11]. Winning and reserve winning candidates are absent during clarification and qualification verification [11]. All bids, after correction, are higher than the Estimated Budget (HPS) [10].

Understanding these factors is crucial for improving the tender process and increasing contractor success rates in securing government projects through e-procurement systems. Addressing these factors can enhance the efficiency and fairness of the tendering process [16].

3.0 RESULTS AND DISCUSSION

3.1 Respondent Demographics

Figure 1 illustrates the highest education levels attained by respondents. It reveals that 2 respondents (5%) have a high school education, 7 respondents (19%) hold a diploma, 24 respondents (65%) possess a bachelor's degree, and 4 respondents (11%) have a master's degree.

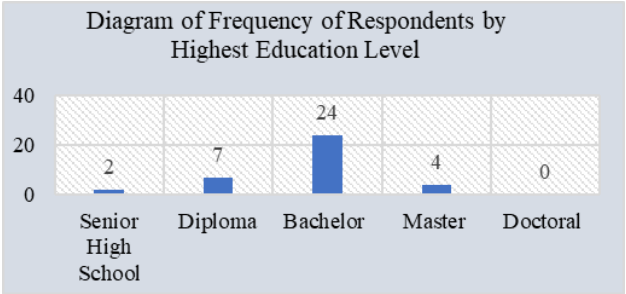

Figure 1 Frequency of respondents by highest education level

Figure 2 shows the respondents' work experience distribution, indicating that 15 respondents (41%) have 1-5 years of experience, 12 respondents (32%) have 6-10 years of experience, and 10 respondents (27%) have more than 10 years of experience.

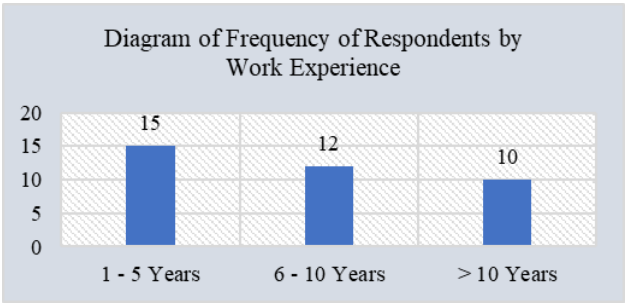

Figure 2 Frequency of respondents by work experience

Figure 3 categorizes respondents by job positions, revealing that 6 respondents (16%) are directors, 9 respondents (24%) are vice directors, 11 respondents (30%) are expert staff, 6 respondents (16%) are administrative staff, and 5 respondents (14%) hold other positions.

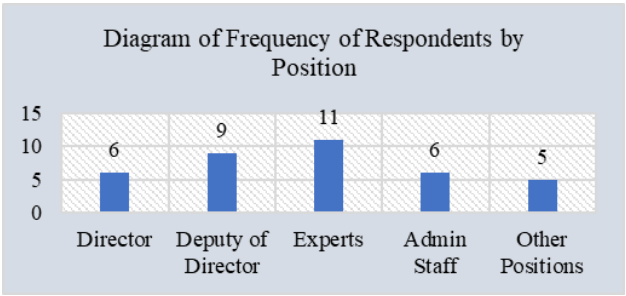

Figure 3 Frequency of respondents by position

Figure 4 summarizes the qualifications of the companies represented by the respondents. It shows that 9 respondents (24%) are from companies with K1 qualification, 13 respondents (35%) are from companies with K2 qualification, and 15 respondents (41%) are from companies with K3 qualification. K1, K2, and K3 represent different levels of small-sized contractors.

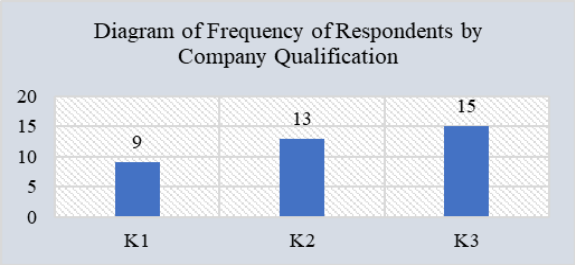

Figure 4 Frequency of respondents by company qualification

Here, K1 represents small-sized contractors with the smallest qualifications, K2 signifies medium qualifications within the small-sized category, and K3 indicates contractors with the highest qualifications within the small-sized category.

3.2 Descriptive Analysis

Descriptive analysis provides mean values for each variable, offering insights into the perceived influence of each indicator on contractor failures in the e-procurement tender process. The mean values serve as a quantitative measure of the relative importance of different factors in the tender process. Higher mean values indicate factors that are perceived by respondents as having a greater impact on contractor failure. This information is vital for both contractors and government authorities, as it highlights the areas where improvements are most needed.

By addressing the factors with higher mean values, contractors can enhance their chances of success in the tender process. Similarly, government authorities can use this information to refine tender requirements and evaluation criteria, ensuring a fairer and more effective procurement process. The mean values provide actionable insights that can guide efforts to reduce contractor failure rates and improve the overall efficiency and transparency of the e-procurement system.

Figure 5 summarizes these mean values for the variables: administration (X1), technical (X2), price (X3), qualification (X4), and the outcome variable tender failure (Y).

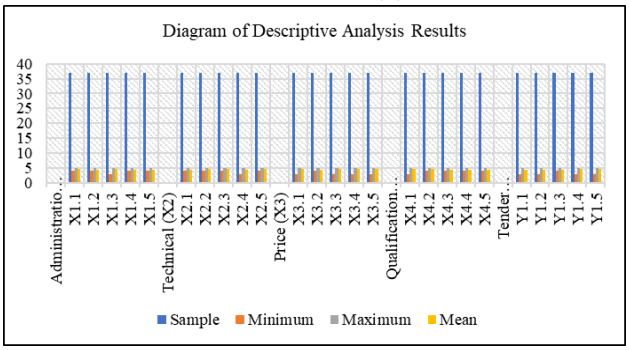

Figure 5 Results of descriptive analysis

For administrative factors, the mean value of 4.78 for "Participant does not attach a cooperation agreement letter" (X1.1) indicates a high perceived impact on tender outcomes. Similarly, a mean value of 4.43 for "Lack of detailed price breakdown" (X1.2) emphasizes its significance.

In technical factors, a mean value of 4.50 for "Work implementation method does not comply with the selection documents" (X2.1) suggests that compliance with technical specifications is crucial. Other technical factors with high mean values include "Technical specifications submitted being less than required" (X2.2) and "Personnel experience for the field execution position not meeting requirements" (X2.3).

For price-related factors, a mean value of 4.38 for "Offered price is not competitive" (X3.1) highlights the importance of competitive pricing. Other factors include "Price and budget analysis not showing unit of labor, materials, and equipment requirements" (X3.2) and "Inexperienced estimator" (X3.3).

In qualification, the mean value of 4.20 for "Participants do not fill in company qualification data" (X4.1) underscores the critical nature of qualification data. Other factors include "Unpreparedness with evidence of qualifications" (X4.2) and "Failure to submit proof of meeting tax obligations" (X4.3).

Regarding tender failure (Y), factors include the number of participants who submitted bids being less than three (Y1), no bids passing the bid evaluation (Y2), and all bids being higher than the estimated budget (Y5).

3.3 Factor Analysis

The Kaiser-Mayer-Olkin (KMO) and Barlett's Test of Sphericity were conducted to assess the validity of the factors in the research and to determine if the questionnaire items are suitable for further analysis.

Table 2 Results of KMO and Barlett's test of sphericity

Kaiser-Meyer-Olkin Measure of sampling adequacy		0.758
Barlett's test of sphericity	Approx. Chi-square	716.266
	Df	105
	Sig.	0.000

Table 2 shows a KMO value of 0.758, indicating that factor analysis is appropriate. The significant Bartlett's Test of Sphericity ($p < 0.05$) confirms the validity of the factor analysis. The Measure of Sampling Adequacy (MSA) values for all variables were above 0.5, indicating good correlation and suitability for further analysis.

Following the initial assessment of data suitability for factor analysis, Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis (PCA) with Varimax rotation. The analysis aimed to identify the underlying factor structure of the questionnaire items.

Table 3 Component matrix

Variable	Component
Administration	0.838
Technical	0.887
Price	0.755
Qualification	0.956
Tender Failure	0.898

Table 3 shows the component loadings for each variable after rotation. Items with loadings greater than 0.7 are considered to have a strong relationship with the identified factor.

Table 4 Anti-image matrices

Variable	Anti-image covariance	Anti-image correlation
Administration	0.075	0.621[a]
Technical	-0.058	-0.919
Price	0.036	0.842[a]
Qualification	0.107	0.922[a]
Tender Failure	0.107	0.922[a]

Table 4 presents the Anti-Image Covariance and Anti-Image Correlation matrices. Values in the diagonal (denoted with "a") are the MSA for each variable, indicating that all variables have adequate sampling adequacy for factor analysis. The EFA results suggest that the questionnaire items converge on a common underlying factor.

3.4 Multiple Linear Regression Analysis

A multiple linear regression analysis was conducted to determine the influence of variables administration (X1), technical (X2), price (X3), and qualification (X4) on the dependent variable tender failure (Y).

Table 5 shows that the coefficients from the multiple linear regression analysis indicate the degree of influence each factor has on contractor failures.

Table 5 Results of multiple linear regression analysis

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std.error	Beta		
(Constant)	5.213	1.969		2.648	0.001
Administra-tion	0.797	0.185	0.592	4.307	0.000
Technical	1.061	0.177	0.855	5.978	0.000
Price	0.609	0.192	0.493	3.180	0.000
Qualification	0.280	0.126	0.025	8.223	0.000
Dependent variable: Tender failure					

The regression model is: Y = 5.213 + 0.797 X1 + 1.061 X2 + 0.609 X3 + 0.280 X4. Technical factor (X2) has the highest influence on contractor failure, with a coefficient of 1.061, indicating a strong impact on tender outcomes.

The significance levels associated with each coefficient indicate the statistical reliability of these relationships. A p-value less than 0.05 suggests that the relationship between the variable and contractor failure is statistically significant, meaning that there is strong evidence to conclude that the variable indeed influences contractor failures.

In this study, all independent variables had p-values less than 0.05, indicating that administrative, technical, pricing, and qualification factors are all significant predictors of contractor failures. This finding underscores the importance of addressing these factors to reduce failure rates in the e-procurement tender process.

The primary purpose of the regression model in this research is to identify which factors have the most significant impact on contractor failure in the e-procurement tender process. By quantifying the influence of administrative, technical, pricing, and qualification factors, the model helps pinpoint the areas that need the most attention and improvement. This targeted approach allows stakeholders to develop strategies that specifically address the critical factors contributing to contractor failure, ultimately enhancing the efficiency and success of the tender process.

Table 6 shows that the coefficient of determination (R^2) for the regression model is 0.955, indicating that 95.50% of the variability in contractor failure rates can be explained by the variables of administration, technical, pricing, and qualification.

Table 6 Results of determination test coefficient

R	R square	Adjusted R square	Std. error of the estimate	Sig.
0.993	0.971	0.955	0.995	0.000

This high R^2 value demonstrates the strong explanatory power of the model and highlights the significant role these factors play in influencing contractor outcomes.

3.5 Discussion

The findings of this study underscore the significant impact of technical factors on contractor failure within the tender process. Our analysis reveals that technical capabilities are the most critical factor influencing tender outcomes, followed closely by administrative processes, pricing strategies, and contractor qualifications. This multifaceted approach helps contractors navigate the complexities of the e-procurement tender process more effectively.

The descriptive statistics highlight the high mean values for administrative thoroughness and technical compliance, confirming their critical roles in tender success. The elevated mean values indicate that these areas are highly valued and should be prioritized by contractors to improve their performance in the tendering process.

Exploratory Factor Analysis (EFA) results indicate a robust underlying factor structure, emphasizing that the variables under study converge on a common factor. This supports the validity of our analysis and confirms that our measures are appropriate for assessing the impact of various factors on contractor success.

While our study focused primarily on EFA, future research could benefit from conducting CFA to confirm the factor structure and validate the findings. CFA would provide additional robustness to the model and ensure that the identified factors are consistent across different datasets and contexts

The regression analysis supports the descriptive findings, with technical competence emerging as the most influential factor in contractor success. By analyzing the coefficients and their significance levels, we can pinpoint specific areas that require improvement. The regression model provides valuable insights for stakeholders, enabling them to prioritize interventions and allocate resources more effectively.

By understanding the coefficients and their significance levels, stakeholders can better identify which areas require attention and improvement to enhance the overall success rate of contractors in the e-procurement tender process. The regression model thus serves as a valuable tool for decision-makers to prioritize interventions and allocate resources effectively, ensuring a more robust and competitive bidding environment.

Implications for contractors, to enhance tender success rates, contractors must focus on thorough administrative documentation, competitive pricing, and strict adherence to technical and qualification requirements. Emphasizing these areas will better align with the identified success factors and improve overall performance.

Implications for government authorities, the insights derived from this study can guide the refinement of tender requirements and evaluation criteria. By incorporating these findings, government authorities can promote a fairer and more effective procurement process, which benefits both contractors and the public sector.

Future research should explore specific strategies to mitigate the identified challenges and continue improving e-procurement practices. This may include investigating new approaches for enhancing technical capabilities, optimizing administrative processes, and developing better evaluation criteria.

In summary, addressing the factors identified in this study can enhance both the efficiency and success of the e-procurement system, leading to better project outcomes. By focusing on the identified areas for improvement, stakeholders can contribute to a more robust and competitive bidding environment.

4.0 CONCLUSION

The analysis of factors influencing contractor failure in the e-procurement tender process in Banda Aceh has highlighted several critical areas requiring attention and intervention. The study identifies administrative, technical, and qualification factors as significant contributors to contractor failure, with technical competence emerging as the most influential factor. These findings emphasize the urgent need for targeted strategies to address the identified issues to reduce contractor failure rates in government tenders. For government authorities and contracting parties, incorporating these insights into their procurement practices is essential. Doing so can enhance the efficiency and effectiveness of the procurement process, leading to improved project outcomes and more successful contractor participation. Decision-makers are encouraged to leverage these research findings when designing and implementing e-procurement systems. Addressing the key factors identified can create a more supportive environment for contractors, ultimately fostering successful engagements in government tenders. Looking ahead, future research should focus on exploring specific strategies and interventions to address the challenges identified in this study. Such research could offer valuable insights for refining and advancing e-procurement practices, thereby benefiting all stakeholders involved. Ongoing research is crucial for the continuous improvement and development of e-procurement systems, contributing to the overall progress of procurement practices in Banda Aceh and beyond.

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Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper

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