Analysis of the Tender Cost Budget for Transportation Infrastructure Construction Works in the City of Surabaya

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Abstract. In government project tenders in Indonesia, there are three types of budget plans, namely budget ceilings, owner estimate, and bid prices, including tenders for transportation infrastructure construction work. Budget ceilings, owner estimate, and bid prices often have considerable mathematical differences, which actually causes the use of the budget for transportation infrastructure development is not optimal. This article aims to see the extent of the differences in the budget ceiling, owner estimate, bid prices and to identify the causes of these differences in tenders for transportation infrastructure construction works in the city of Surabaya. This study uses a descriptive method with data collection carried out through the website https://lpse.surabaya.go.id, https://lpse.jatimprov.go.id, https://lpse.pu.go.id, and https://lpse.dephub.go.id. The data in this study amounted to 174 transportation infrastructure projects in the City of Surabaya which were tendered in 2017 – 2021. The results showed that the difference in the average tender price in the form of a percentage was between owner estimate to the budget ceiling was 90.55%, winning bid price to owner estimate was 82.84%, and the winning bid price to the budget ceiling is 74.80%. The causes of differences in tender prices include differences in basic price data sources, differences in unit price analysis coefficients, differences in estimator perspectives, differences in price information provided, differences in interpretation of material technical specifications, differences in the distribution of overhead and profit figures, and differences in the unit price model used.

Keywords: Budget Ceiling · Owner Estimate · Bid Price · Transport Infrastructure

1 Introduction

The implementation of the construction work tender begins with procurement preparations that can be carried out after The Ministry/Institution Budget Work Plan which contains the Budget Ceiling is approved by People's Representative Council of Indonesia or The Regional Apparatus Budget Work Plan is approved by The Regional People's Representative Assembly [1]. This approved budget ceiling is then used as one of the

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guidelines in determining the owner estimate by The Commitment Making Official [1]. The owner estimate is then used as the basis by the contractor to determine the bid price. Differences that occur between the budget ceiling, owner estimate, and the bid price cannot be avoided, but if the difference is large enough, it will actually cause losses for related parties in the context of budget optimization. The overall contractor's bid price that exceeds the owner's estimate causes the project to be unable to be carried out, while the bid price that is too low from the owner's estimate causes an excess budget that can actually be used for other development activities/construction works. Likewise, the owner estimate which exceeds the budget ceiling causes the project to be unable to be carried out and the owner estimate which is too low from the Budget Ceiling causes the excess budget which can actually be used for other development activities/construction works.

The development of infrastructure and connectivity is one of the main directions of the President as a strategy in implementing The Nawacita Mission and achieving the targets of Indonesia's Vision 2045 [2]. The infrastructure development strategy includes urban infrastructure and economic infrastructure. Urban infrastructure includes urban transportation and economic infrastructure includes land, rail, sea and air connectivity [2]. Connectivity creates domestic mainline development and intermodal integration. Transportation is the main instrument as a means of connecting the various parties [3]. The initial implication of infrastructure development is an increase in the mobility of people and goods which has a positive impact on economic activity [4]. The infrastructure development of the City of Surabaya as the provincial capital is an important instrument to continue to increase the economic activity of the City of Surabaya, East Java, and the national economy. Connectivity infrastructure is believed to accelerate regional economic growth. Transportation infrastructure reduces the problem of obstacles to smooth logistics through land, sea, and air modes [5].

Tenders for transportation infrastructure construction work as government projects are carried out by e-procurement through the electronic procurement system (SPSE), often discrepancies are found between the budget ceiling, owner estimate, and the bid price. Problems related to differences in the budget ceiling, owner estimate, and bid price and the importance of transportation infrastructure in the context of accelerating economic growth will be the main focus of this research, with specific objectives: 1) knowing how the difference in the budget ceiling, owner estimate, and bid price for the Surabaya City Transportation Infrastructure Construction Work; 2) identify the cause of the difference between the budget ceiling, owner estimate, and the bid price for the Surabaya City Transportation Infrastructure Construction Work. Efficiency and optimization of budget use are expected to increase the number and capacity of transportation infrastructure that can be built.

2 Methods

2.1 Population and Samples

This descriptive study uses a population of transportation infrastructure construction works that were tendered electronically through e-procurement facilities in the City of Surabaya in 2017–2021. The sample selection was carried out at stratified random sampling based on the characteristics of the transportation infrastructure construction works that were tendered for a total of 174 projects.

2.2 Data and Data Collection Method

The data used in this study is the data listed on the e-procurement facility, including the name of the project, year of tender, procurement method, budget ceiling value, owner estimate value, type of contract, project location, company qualification, and bidding price for the winning bidder.

Data collection was carried out by visiting e-procurement facilities that carried out tenders for Surabaya City transportation infrastructure construction work, including: https://lpse.surabaya.go.id, https://lpse.jatimprov.go.id, https://lpse.pu.go.id, https://lpse.dephub.go.id. The data on the e-procurement page is recorded, recapitulated, and stratified based on the factors that affect the project budget. Factors that affect the project cost budget include the type of transportation infrastructure [6], year of procurement, project location [7], type of contract [8], project value, and procurement/tender method [9].

2.3 Data Analysis Technique

Data processing in this study was carried out through descriptive statistics in the form of the average value (mean), maximum value, and minimum value. The difference between budget ceiling data, owner estimate, and winning bid prices is carried out through a different test that begins with testing statistical requirements, namely the Data Normality Test using Kolmogorov-Smirnov Statistics and the Data Homogeneity Test using One-Way ANOVA. Data processing is done with SPSS software.

Data analysis related to the causes of differences between the budget ceiling, owner estimate, and the winning bid price was carried out through literature review and brainstorming with the parties making the project budget plan.

3 Results and Discussion

3.1 Data Description

The amount of data used in this research is 174 projects. Based on the budget ceiling, the highest project value tendered was the STMK Project; Construction of Signal and Telecommunications between Madiun -Kedung Banteng Cross Surabaya – Solo Highway with a ceiling value of IDR 244,131,000,000.00 and the lowest project value being tendered is Bamboo Bridge Construction at Zona 5 with a Ceiling Value of IDR 298,685,312.00. The average value of projects tendered for transportation infrastructure in the City of Surabaya in 2017 – 2021 based on the budget ceiling is IDR 22,942,556,770.62.

Based on the owner's estimate, the highest project value being tendered is The STMK Project; Construction of Signal and Telecommunications between Madiun-Kedung Banteng cross Surabaya – Solo Highway with owner estimate of IDR 235.432.919.000,00 and the lowest owner estimate to be tendered is the New Road Construction of Type 2 (Rusunawa Siwalankerto's Road Access) with owner estimate of IDR 244. 892,000.00. The average value of tendered projects for Surabaya City transportation infrastructure in 2017–2021 based on owner estimates is IDR 22,123,142,973.40.

Based on the winning bid price, the highest project value offered is the STMK Project; Construction of Signal and Telecommunications between Madiun -Kedung Banteng cross Surabaya – Solo Highway with a value of IDR 234,750,700,000.00 and the lowest value offered is the New Road Construction of Type 2 (Rusunawa Siwalankerto's Road Access) with a value of IDR 171,339,297.00. The average project value bid for Surabaya City transportation infrastructure in 2017–2021 based on the winning bid price is IDR 19,365,338,338.19.

Classification based on the characteristics of the project tender data, namely the type of transportation project, year of tender, project location, type of construction contract, project value, and tender method, can be seen in Table 1.

Table 1 shows that the types of transportation infrastructure projects in Surabaya that were tendered in 2017–2021 were the most paving roads with 71 projects (40.80%), in 2017 the highest number of projects tendered was 40 projects (22.99%), the most project locations were tendered The cross-border city of Surabaya is 42 projects (24.14%), the most widely used type of construction contract is the unit price contract, which is 142 projects (81.61%), the highest project value being tendered is the project with a small classification of 101 projects (58.05%), and the most widely used tender method is Tender - One File Post Qualification - Lowest Price Drop System for 79 projects (45.40%).

3.2 Significance of the Tender Price Difference

Statistically, the tender price data generally shows that it is not normally distributed, except for the classification of the Tender - Two File Prequalification - Value System types. In the homogeneity test, the tender price data generally shows homogeneous conditions, except for the classification of lump sum contracts. The results of the different test generally show that there is no significant difference between the budget ceiling and the owner estimate, as well as between the budget ceiling and the winning bid price. There is also a non-significant difference between the owner estimate and the winning bid price. The significant difference only occurs in the small value classification project and the fast tender classification, where there is a significant difference between the budget ceiling and the winning bid price. In the quick tender classification, there is also a significant difference between the owner estimate and the winning bid price.

3.3 Tender Price Difference

The difference in the tender price is calculated based on the percentage of the owner's estimate to the budget ceiling, the winning bid price to the owner estimate, and the winning bid price to the budget ceiling. Overall, the percentage of owner estimates to the budget ceiling is a maximum of 100%, a minimum of 30.61%, an average of 90.55%. The percentage of the winning bid price against the owner estimate is a maximum of 99.91%, a minimum of 49.99%, an average of 82.84%. The percentage of winning bid price against the budget ceiling is maximum 99.26%, minimum 21.42%, average 74.80%.

Table 1. Data and Tender Price Difference

No.	Characteristics of the Project	Number of Projects		Average OE/BC	Average WBP/OE	Average WBP/BC	Average Difference
		Frequency	%				
A.	**Type of Transportation Project**						
1.	Paving Road	71	40.80%	92.40%	78.25%	72.17%	27.83%
2.	Flexible and Rigid Pavement	53	30.46%	87.08%	82.20%	71.26%	28.74%
3.	Bridge	16	9.20%	80.67%	88.43%	70.49%	29.51%
4.	Train	32	18.39%	96.53%	91.21%	88.11%	11.89%
5.	Harbor	1	0.57%	99.69%	86.00%	85.74%	14.26%
6.	Terminal	1	0.57%	100%	81.96%	81.96%	18.04%
B.	**Year of Tender**						
1.	2017	40	22.99%	87.80%	88.07%	78.01%	21.99%
2.	2018	39	22.41%	89.76%	81.36%	72.42%	27.58%
3.	2019	31	17.82%	89.32%	83.02%	73.38%	26.62%
4.	2020	29	16.67%	88.97%	81.27%	72.32%	27.68%
5.	2021	35	20.11%	96.95%	79.64%	77.12%	22.88%
C.	**Project Location**						
1.	North Surabaya	24	13.79%	89.27%	81.46%	72.82%	27.18%
2.	South Surabaya	32	18.39%	86.96%	80.65%	69.66%	30.34%
3.	East Surabaya	36	20.69%	88.73%	81.84%	72.18%	27.82%
4.	West Surabaya	30	17.24%	88.57%	81.63%	71.62%	28.38%
5.	Central Surabaya	10	5.75%	87.56%	85.14%	74.48%	25.52%
6.	Crossing Surabaya City Borders	42	24.14%	97.68%	86.46%	84.46%	15.54%
D.	**Type of Construction Contract**						
1.	Unit Price	142	81.61%	89.01%	81.49%	72.16%	27.84%
2.	Lump Sum	2	1.15%	100%	75.38%	75.38%	24.62%
3.	Combined Lump Sum and Unit Price	30	17.24%	97.20%	89.72%	87.30%	12.70%
E.	**Project Value**						
1.	Small	101	58.05%	87.95%	81.49%	71.25%	28.75%

(*continued*)

Table 1. (*continued*)

No.	Characteristics of the Project	Number of Projects		Average OE/BC	Average WBP/OE	Average WBP/BC	Average Difference
		Frequency	%				
2.	Non-Small	73	41.95%	94.14%	84.71%	79.72%	20.28%
F.	**Tender Method**						
1.	Public Auction - One File Post Qualification - Lowest Price Drop System	43	24.71%	84.74%	85.61%	72.39%	27.61%
2.	Public Auction - Two Stage Prequalification - Value System	11	6.32%	99.04%	96.96%	96.02%	3.98%
3.	Public Auction - Two File Prequalification - Value System	1	0.57%	100%	81.96%	81.96%	18.04%
4.	Public Auction - Two Stage Prequalification - Lowest Price Drop System	1	0.57%	99.70%	80.57%	80.32%	19.68%
5.	Public Auction - One File Prequalification - Lowest Price Drop System	1	0.57%	100%	79.17%	79.17%	20.83%
6.	Direct Election Auction - One File Post Qualification - Lowest Price Drop System	1	0.57%	100%	78.98%	78.98%	21.02%
7.	Tender - Two File Post Qualification - Value System	13	7.47%	94.96%	84.54%	80.28%	19.72%
8.	Tender – One File Post Qualification - Lowest Price Drop System	79	45.40%	91.72%	80.24%	73.22%	26.78%

(*continued*)

Table 1. (*continued*)

No.	Characteristics of the Project	Number of Projects		Average OE/BC	Average WBP/OE	Average WBP/BC	Average Difference
		Frequency	%				
9.	Tender - Two File Prequalification - Value System	4	2.30%	88.79%	91.31%	80.56%	19.44%
10.	Fast Tender - One File Post Qualification - Lowest Price Drop System	19	10.92%	88.90%	76.30%	67.69%	32.31%
11.	Tender - Two File Post Qualification - Lowest Price Threshold	1	0.57%	97.25%	92.49%	89.95%	10.05%

Note: OE = Owner Estimate; BC = Budget Ceiling; WBP = Winning Bid Price; Average Difference = 100% - (WBP/BC)

Referring to the available budget ceiling and the winning bid price, on average there is 25.20% of the budget that cannot be used optimally for transportation infrastructure development in Surabaya City from the budgeted funds.

Based on the characteristics of the type of transportation infrastructure project, the type of railway project shows a very optimal use of the budget with an average of 88.11%, while the bridge project has the largest budget difference between the winning bid price and the ceiling of 29.51% which cannot be utilized optimally. Based on the project tender year, 2017 shows the most optimal use of the budget, which is 78.01%, while the budget year that cannot utilize the largest budget occurs in 2020, which is 27.68%. The area with the most optimal budget utilization is Surabaya City Cross Boundary at 84.46%, while the least optimal in budget utilization is South Surabaya at 30.34%. Based on the type of construction contract, the most optimal average budget utilization is the combined lump sum and unit price contract type of 87.30%, while the largest less than optimal is the unit price contract type of 27.84%. The value of the project with a non-small classification can utilize a budget of 79.72%, while the value of a project with a small classification result in the least optimal use of the budget, which is an average of 28.75%. The tender method of Public Auction – Two Stage Prequalification - Value System can result in the most optimal use of the budget, which is 96.02%, while the Fast Tender - One File Post Qualification - Lowest Price Drop System method has the largest remaining budget that cannot be utilized, which is 32.31%. More details on budget optimization based on the characteristics of project tenders can be seen in Table 1.

3.4 Cause of Tender Price Difference

The cause of the difference in the tender price needs attention even though statistically there is generally no difference, in reality there is a price difference that causes the available budget cannot be used optimally. Based on some literature and discussions with the drafting team of budget ceiling, owner estimate, detail engineering design consultant, and contractor, the causes of the price difference include:

1. The basic price data for construction resources that are used as references are different, some are taken from the basic price guideline issued by the governor, and some are from the mayor or regent, whose basic price values are different [10].
2. The taking of the coefficients used in the work is different where each of the budget planners has their own reasons that can be justified [10].
3. Different perspectives of the estimator in identifying aspects that were not previously considered [11].
4. Price sources provide different information for materials with the same specifications when a price survey is carried out by owners, detail engineering design consultants, and contractors.
5. Differences in interpretation of the technical specifications of some materials to be used, due to incomplete technical specifications in the detail engineering design documents.
6. The percentage of overhead and profit given to the unit price analysis differs between owners, detail engineering design consultants, and contractors.
7. There are several contractors who make bids not using unit price analysis, but based on the subcontractor and/or foreman's wholesale price.

4 Conclusions

Based on the results of data processing and discussion Analysis of the Tender Cost Budget for Transportation Infrastructure Construction Works in the City of Surabaya can be concluded as follows: (1). The average difference in the tender price of the Surabaya City transportation infrastructure construction work in percentage form is between the owner estimate against the budget ceiling is 90.55%, the winning bid price against the owner estimate is 82.84%, and the winning bid price against the budget ceiling is 74.80%. (2) The causes of differences in tender prices include differences in sources of basic price data, differences in unit price analysis coefficients, differences in estimator perspectives, differences in price information provided, differences in interpretation of material technical specifications, differences in the distribution of overhead and profit, and differences in unit price models used.

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