THE ANALYSIS OF PRICE OFFERS IN CONSTRUCTION INDUSTRY FROM PARTICIPANT'S POINT OF VIEW

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Abstract

In construction industry process of creation of bids and offers is the only way, how to attract customers. It is a very specific industry, where company must compete for every product, that it want sell. The presented paper use Slovak construction company as a case study to analyses the process of creation of offers and bids from participant's point of view. It analyses how method of procurement or amount of money estimated in the request for proposal influences money saved due to reduction of winning price, or how e-auctions and tender mechanism influence the cost of proposal preparation.

1. Introduction

Because of very specific and unique product, which is characterized with extremely small standardization, companies in construction industry use process of offers' and bids' creation as a main way to attract their customers. Rowlinson and McDermot (1999) called procurement in construction industry as process of the allocation of resources in order to realize construction project. The procurement actions in construction can be divided into three sections: sourcing, direct procurement and indirect procurement. Indirect one focuses on procurement of daily used supplies. Direct procurement is also known as supply chain management and it's focused on obtaining goods and managing tasks to manufacture products. As Kim and Shunk (2003) claimed, sourcing penetrates both of previously mentioned forms and it involves four stage process based on: 1. information, 2. negotiation, 3. Settlements and 4. After-sales actions). In construction industry sourcing is done on behalf of client through the process of choosing a construction company, which involves first three phases of previously mentioned model. (Eadie et al., 2012)

In Slovakia the process of choosing a construction company have usually two forms, form of tender (electronic or not) and form of electronic reverse auction (further known as e-auction). According to Liu (2015) the tender process is focused on procurement an outstanding contractor to ensure the construction quality and control the construction investment. The same can be said also for process

of procurement contractor via e-auction. In order to differentiate these mechanisms we use Delina and Vajda (2006) which explains that tenders are based on competitive offers or public competitions, where administrator (proposer) setting the rules and conditions, and participants sending their offers. In the end the best offer is chosen. The tenders usually represent RfQ (Request for Quotation) and RfP (Request for Proposal) models. The basic characteristic of tender is that it is a onetime offer only. That is the reason why, scientific literature describe tender, as ineffective method to gain optimal winning price. Apart from tender, there is electronic reverse auction which Carter (2004) defines as ''an online, real-time auction between a buying organization and two or more invited suppliers, where suppliers can submit multiple bids during the time period of the auction, and where some degree of visibility exists among suppliers regarding the actions of their competitors.'' Lots of author (such as Prídavok and Delina, 2013; Eadie et al., 2012; Kim and Shunk, 2003; Szabo et al. 2013; Rowlinson and McDermot 1999) argued that used of e-procurement method such as e-auction will saved hiring company a lot of money due to efficient optimization of winning price. Other authors (such as Hartley et al. 2004, Teich et al.) also suggest that use of e-auctions lower the transaction and administrative costs.

There is also other problem regarding the prices estimated in the RfPs. According to Best and Meikle (2015) "acquiring true purchaser price for construction project is all but impossible, as final account (i.e. out-turn price) information is seldom available." Volatility of the price is causes by delays, changes in design and by many other factors, which mean that that the final sum is not the same as estimated, even if there are available data from same project, which is built in new location, or in the same location but in different time. (Best and Meikle, 2015). These discrepancies motivate clients to estimate proposal price with a reserve. Biding companies in construction industry probably use these estimated prices presented in RfPs as starting point and form their own offers/bids. Question is how far are these companies willing to reduce these reserves in order to produce winning offer/bid. Is there a relationship between proposed price and money saved by minimization of winning offer/bid.

Regarding to all these problems we proposed three research questions, which were tested in chosen Slovak construction company. These are the questions:

1. How procurement method influence money saved due to lower winning price

2. How amount of money estimated in the request for proposal influences money saved due to lower winning price

3. How procurement method influence cost of proposal preparation

2. Methodology

2.1. Description of the sample

The research in this paper is based on case study of Slovakian medium sized construction company from eastern Slovakia. Study provides an analysis of all requests for proposal and offers which company identified and submitted during the years 2009-2013. Although the company operates in the building industry for more than 25 years, the reason why this particular start year was chosen is that the company started to be involved in e-auctions from 2009. According to provided data during this five year period company obtain 139 requests for proposals (RfPs) where tender or e-auction was requested as procurement method. This number also represents all RfPs, which were proposed to company's management and considered for offer preparation. The archived RfPs which were rejected are also included in dataset.

2.2. Variable selection

Based on the analysis of provided RfPs we identify several characteristics, which are essential for proposed research questions. They represent the general characteristics, which can be found in every RfP. On the other hand, the costs of proposals are estimated from accounting data of the company. These variables together with their values are presented as variables in Table 1.

Variable name:	Variable description:	Variable values:	Variable type:
Procurement type	The type of procurement method which were defined in the proposal by investor.	0-"Tender", 1-"E-auction"	Nominal
Price of RfPs (PRfPs)	The price of construction project estimated by investor listed in RfPs	Prices in €	Continuous
Proposed price (Pp)	Last price of the offer/bid proposed by company	Prices in €	Continuous
Offer	This variable represent if the proposed offer win loose or management decide not to participate on the contest and cancel RfPs.	0-"No participation" 1-"Loss", 2-"Win"	Nominal
Proposal costs	All costs (labor costs, operational costs, fees and charges) that company declared for creation of offer proposal	Prices in €	Continuous
Price change	The difference between Price of RfPs and Proposal price calculated as percentage of Price of RfPs: $$\text{Price change} = \frac{\text{PRfPs} - \text{Pp}}{\text{PRfPs}} \times 100 \quad (1)$$	Percentage	Continuous

Table 1: Description of the variables used in the study

In order to provide answers to proposed research questions the distributions of these variables and relation between them had to be determined. For this purpose we use the scatter-plot analysis, and boxplot analysis. Because of non-normal distribution of few variables, the non-parametrics measurements of association known as Spearman's rho coefficient and Kendall's tau-c are also used.

3. The results

3.1. Company profile

As was stated in the methodology part, the tested sample is based on 139 RfPs identified by sales department of the construction company during the five year period. As can be seen on Figure 1, only less than one quarter of RfPs, which were presented by sales department to management of the firm for consideration were rejected. The rest of the RfPs, were transformed into the offers/bids to take part in tender (78,42%) or e-auction (21,58%). The winning rate of company and archive of

RfPs, which is pretty detailed, are the reasons why this company was chosen for a case study. From all 139 requests company create and win 55,4% of offers/bids and lose only 20% of them. Results like these lead to conclusion, that company understand the construction market in region and know, which RfPs should be selected to prepare offers/bids.
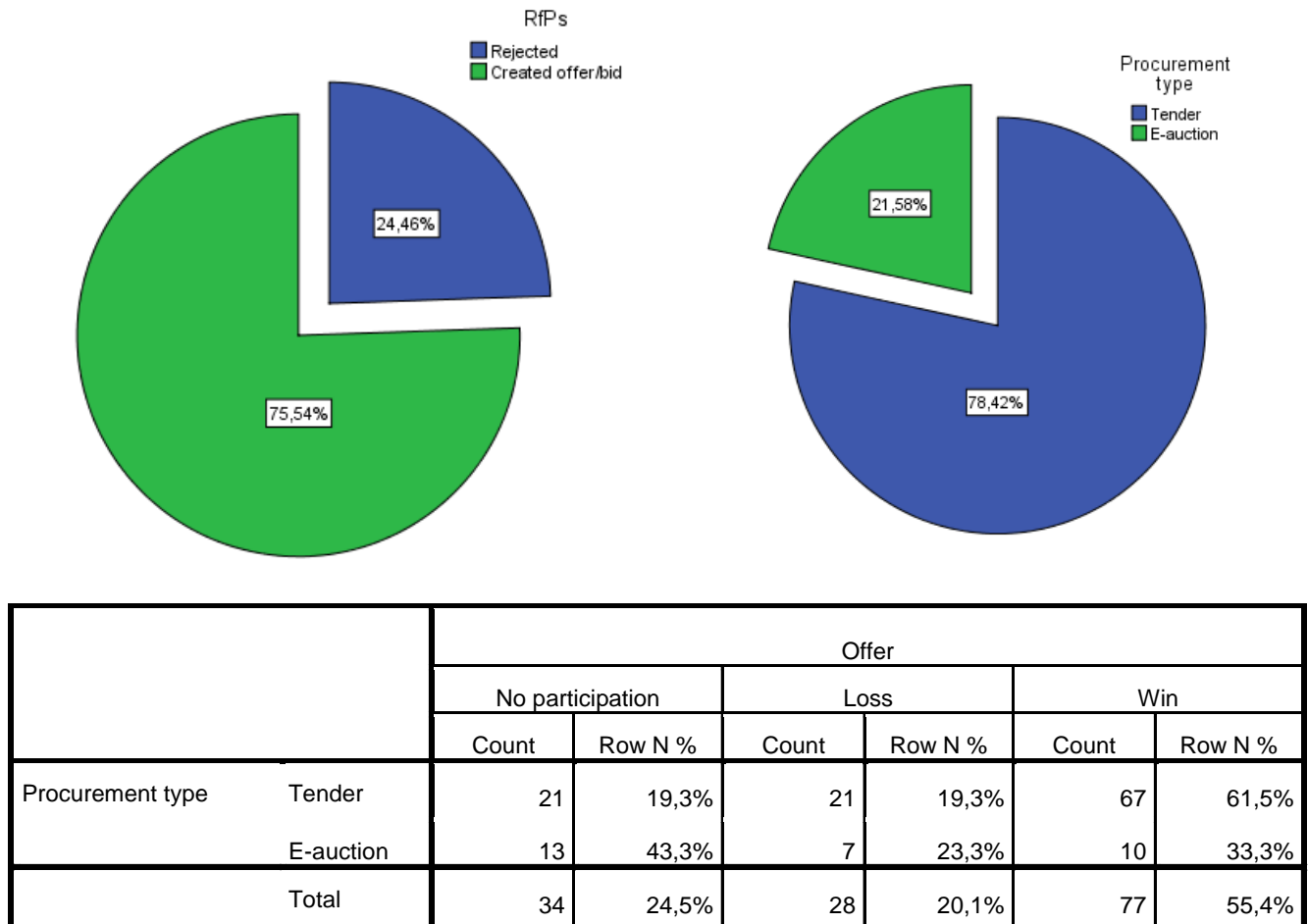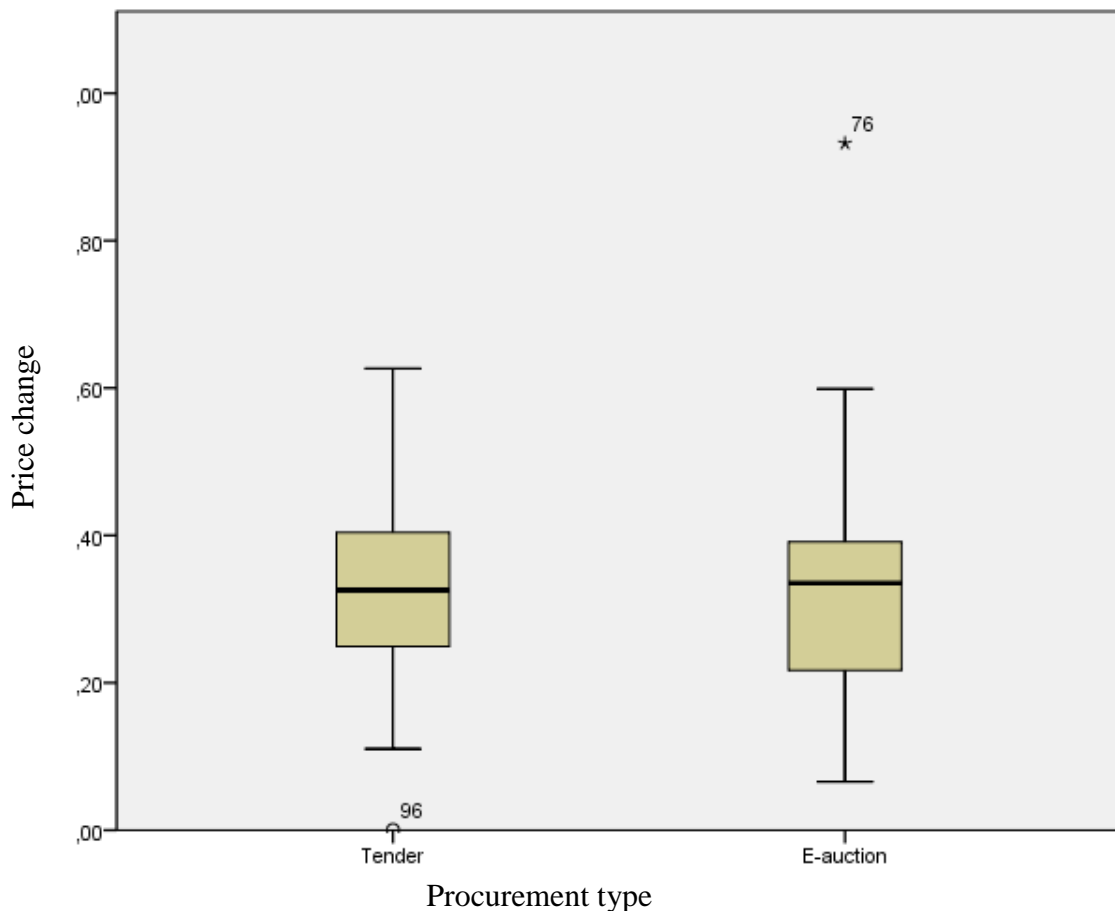

		Offer					
		No participation		Loss		Win	
		Count	Row N %	Count	Row N %	Count	Row N %
Procurement type	Tender	21	19,3%	21	19,3%	67	61,5%
	E-auction	13	43,3%	7	23,3%	10	33,3%
	Total	34	24,5%	28	20,1%	77	55,4%

Figure 1: Description of companies RfPs

3.2. The impact of type of procurement on reduction of estimated price

The first research question deal with impact of two mostly used types of procurement methods on minimization of estimated price. It reflects how different type of bidding mechanisms influence difference between estimated and winning price. To measure these differences we established variable called price change. This variable determines the percentage of estimated price which was saved by lower winning price and its calculation is presented in methodology. The research question was analyzed by boxplot analysis presented in the Figure 2. Here the distribution of price change variable for tender offers and winning e-auction bids are presented.
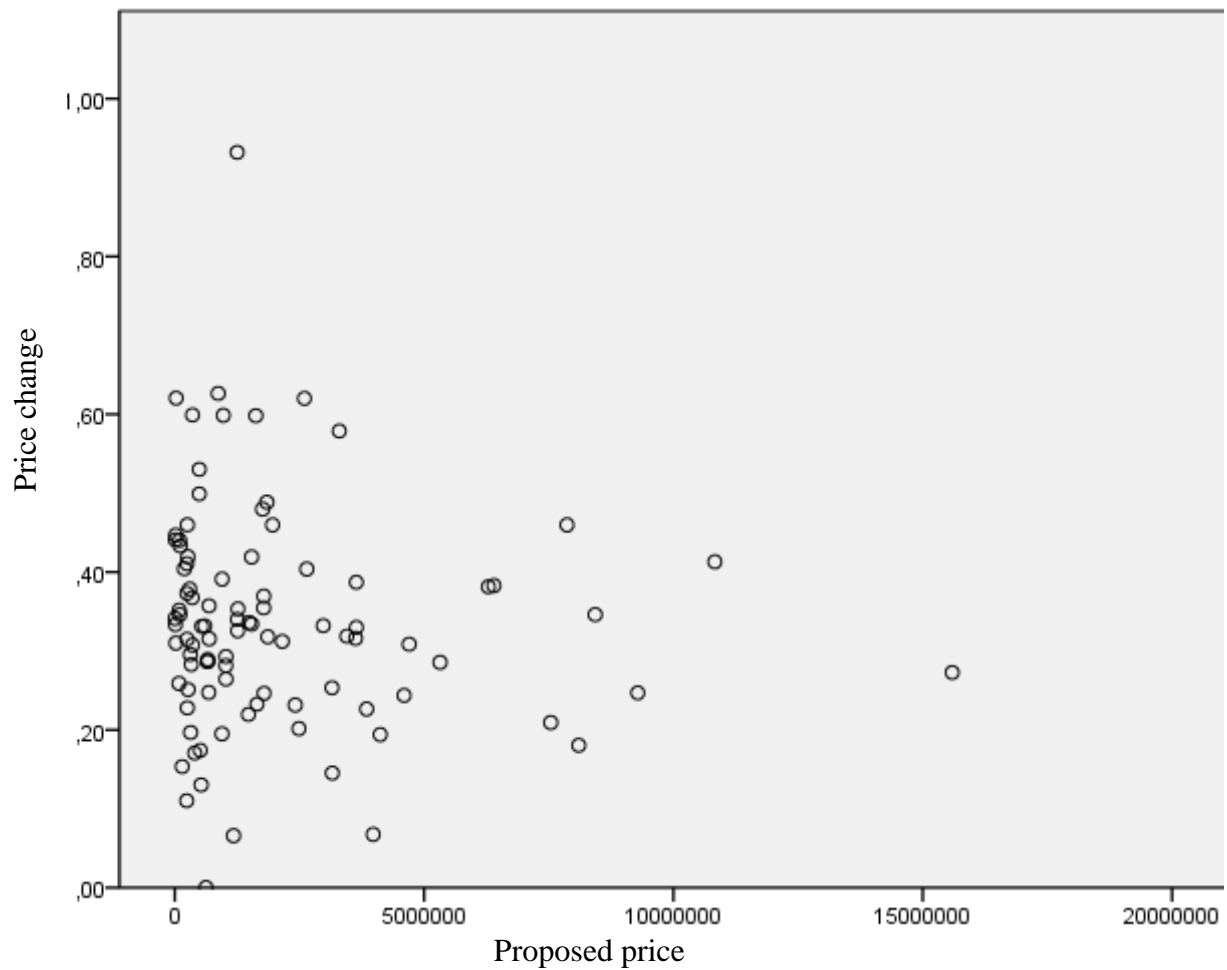
Figure 2: Boxplot analysis of price change distribution across various procurement types

As can be seen on the Figure 2, the price change distribution of tender offers is not very different from price change distribution of winning bids of e-auction. However there are some differences between them. Firstly, the median (horizontal line in the boxes) is slightly higher in e-auction boxplot than in tender one, which means that the proportion of higher savings by use of e-auction mechanism is bigger than in tender one. On the other hand, as boxplot analysis showed e-auction winning bids represent more variability and has lower first quartile than tender ones. This discrepancy shows that saving from tender bids are less volatile and the proportion of lower price saving is more probable by use of e-auction mechanism than by use of tender one.

3.3. The impact of estimated price on price change

The second research question dealt with dilemma whether amount of money estimated on the proposal price influence the difference between estimated and winning price, known also as savings. To analyses this relationship, we decide to use the scatter plot analysis. In the analysis, the proposed price was chosen as dependent variable and as in the previous research question, also here we use price change as independent variable. The results of the analysis are presented in Figure 3.

Figure 3: Scatter-plot analysis of proposed price and price change

According to the Figure 3, it can be seen than amount of money prosed in RfPs doesn't influence the volume of the money saved by lower winning price. The Relationship between these variables was tested by correlation analysis. The essential assumption for choosing correct characteristics is normal distribution of the dataset. We test it by use of Shapiro-Wilk's test. This test operates under null hypothesis of normal distribution and its results are presented at Table 2. At 5% level of significance the normal distribution was rejected for both variables.

	Shapiro-Wilk's Test of normality			Proposed price vs. Price change		
	Statistic	df	Sig.	Measure	Value	Approximate Significance
Price change	0,950	95	0,001	Spearman's rho	-0,382	0,144
Proposed price	0,715	95	0,000	Kendall's tau-c	-0,300	0.093

Table 2: Test of normality and association analysis

Based on the results of normality test, we used two non-parametric measures Spearman's rho and Kendall's tau-c to confirm level of association between selected variables. Both measures show week relation between these variables and their statistics are determined in Table 2.

On the other hand scatter plot analysis presented in Figure 3 showed that the bigger savings are presented where low prices are proposed. This lead to a conclusion, that construction costs of small projects (represented by small proposed prices) are more overvalued than large projects which costs more.

3.4. The impact of type of procurement on cost of proposal

Last research question analyze how type of procurement method specified in RfPs influence money spent on creation of offer. To provide answer to this question we decided to determine two (one for e-auction offers/bidds, another for tender offers/bidds) distributions of variable proposal costs, specified in methodology section. These distributions were transformed into boxplots and are presented in Figure 4.

Boxplot analysis showed differences in distribution of proposal costs between various procurement types. According to Figure 4, the costs of offer creation for e-auctions are usually higher than costs of offer creation for tender.
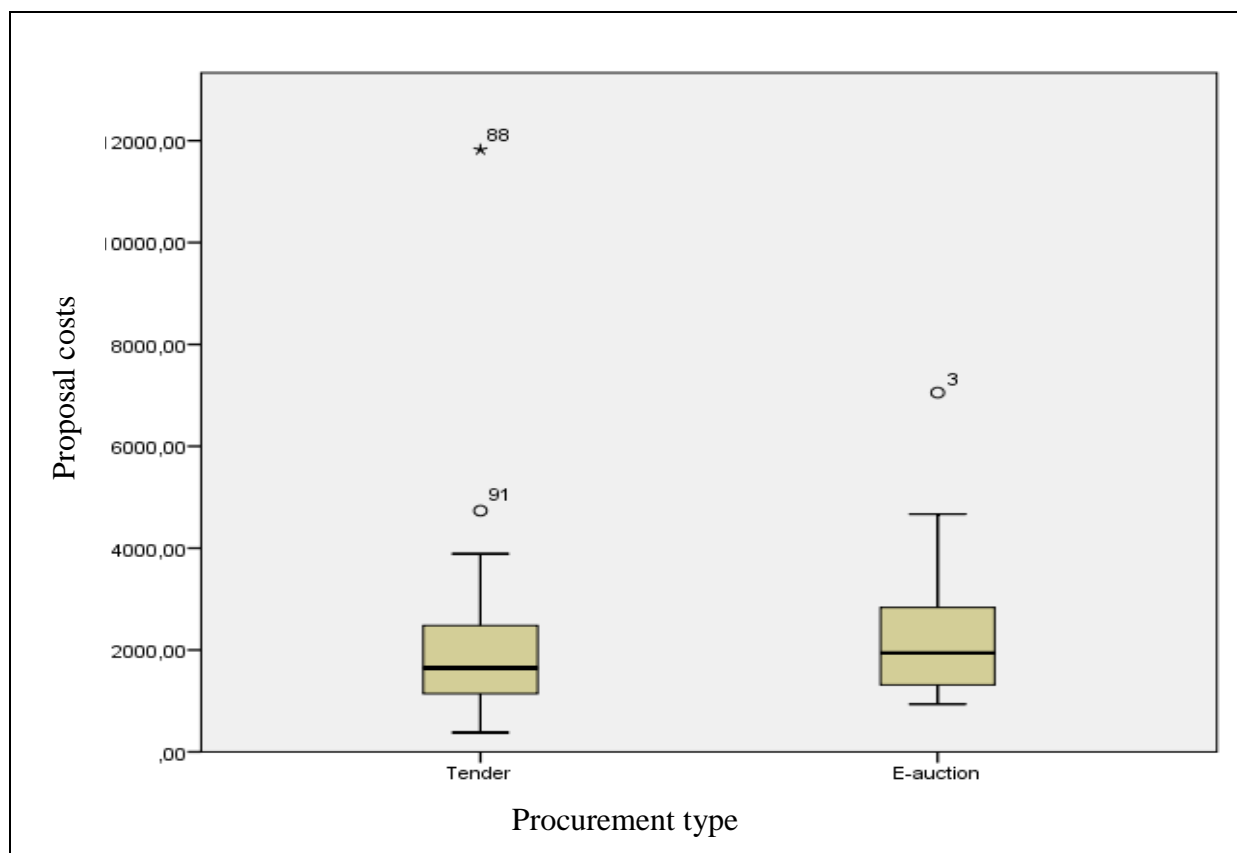

Figure 4: Boxplot analysis of proposal cots across various procurement types

4. Conclusions

The presented paper dealt with analysis of offers/bids of chosen Slovakian construction company. The motivation for this study was to analyze offer/bids from participant's point of view and provide

some tribute to on-going discussion regarding procurement. According to the results it can be said that there is no big difference between use of e-auction and tenders in term of savings due to lower winning prices. However tender offers show relative less volatile and slightly better results than e-auction winning bids. Moreover, other analyses discover that preparation cost for offers which use e-auction mechanism are higher, than preparation costs for tender offers. The study also showed that higher savings due to lower winning prices are usually possible in small projects, which are usually badly evaluated and because they are overvalued they also have high estimated prices. In the end, it has to be reminded, that this study analyses company within very specific industry where every offer/bid is very unique and specific, so these results has to be interpreted with the great cautiousness.

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