

Impact of electronic auctions on business procurement in Slovakia during COVID-19

Jakub Ševčík¹

¹ University of Economics in Bratislava, Faculty of business management/Department of Information Management, Bratislava, 852 35 Slovak Republic

`jakub.sevcik@euba.sk`

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Abstract. Purchasing processes are involved in large scale innovation opportunities. These innovations will determine future of business procurement. We summarized modern and innovative methods of today's procurement and analyzed impact of electronic auctions on cost avoidance and cost savings, during COVID-19 pandemics and pre-pandemic state. According to our findings, there are several innovative methods of modern procurement such as electronic auctions, online contracting, claim management e.g. Further more, electronic auctions significantly improve cost avoidance opportunities for businesses. Use of electronic auctions was enhanced during pandemic of COVID-19.

Keywords: e-procurement, purchasing, electronic auctions

JEL classification: *M15, M29*

1 Business e-procurement

Purchasing can be understood as the activity of businesses or individuals, with a view to acquiring new goods or services for a specified consideration, at a certain time and quantity, and under agreed conditions. A key aspect of buying companies is the provision of the desired goods or services, at the required time, to the desired place, in the required quality and quantity (1).

If such purchasing operations are carried out using or solely done by means of electronic and information devices, we are talking about electronic procurement (e-procurement). Purchase from a system point of view, we rank among the basic activities of production as well as companies. From the point of view of the production companies, the purchase is the first within the chain of purchase, production, sale. In companies selling services, the chain is simpler and excludes production activities (1). The European Commission characterises e-Procurement as a general term for the transition from classic "paper" processes to electronic process solutions in purchasing systems (2).

According to Pratt, we can characterize E-procurement or electronic purchasing as the process of queuing, ordering and purchasing in the B2B segment, using electronic devices and internet services (3).

Such a process is provided by e-procurement software that is adapted for the activities. We know several forms of electronic purchasing in companies (4):

I. RFI (request for information) tools- online tools and software services in order to obtain information about suppliers as well as information from suppliers for required purchase projects.

II. RFP (request for proposal) tools– these are online tools providing first revaluations or feasibility analyses with given suppliers, via the Internet or 3D virtual inspections.

III. FPQ (request for quotation) tools – ensure online revaluation or inquiries of suppliers.

IV. Tendering tools – a set of tools thanks to which buyers carry out tendering procedures of suppliers and dealings. These include, for example, electronic auction portals or online communication software.

V. Electronic catalogues - these are tools thanks to which the company is able to implement external catalogues into the internal system. Thanks to this, individual employees can directly purchase goods and services at pre-arranged prices, themselves and without the support of the purchasing department.

VI. Automatic purchasing systems – it is a set of systems that, under predetermined conditions, automatically purchase certain goods or services. Such a system can be imagined on the automation of material purchase, when the internal system detects a lack of certain items in stock, on the basis of which it automatically generates and sends an order.

In addition to these systems, separate electronic purchasing systems for logistics, warehousing and control, such as:

I. Stock Solutions - This is a toolkit where employees gain access to their suppliers' stock information, so they can order the required items in the required quantities.

II. Electronic audits, self-assessments and control of suppliers – tools through which the system automatically invites the supplier for self-assessment, the supplier fills in the required information and records the required documents, on the basis of which self-assessment is automatically evaluated and corrective measures are taken, etc. This is specifically useful in terms of ongoing COVID-19 pandemics.

III. Autonomous warehouse systems- these are now well known in bigger companies or logistics firms. In advance, new innovative methods of stock management are used such as GPS location of specific parts and so on.

We have to mention, that digitization of business procurement processes is enhanced also by the fact of ongoing pandemics of COVID-19, due to which management of companies needs to prevent personal contact of employees. This increases need for internet and cloud based solutions for large scale business procurement processes including tendering, negotiating, logistics, and so on.

E-procurement systems can take different forms in terms of automating the sub-processes that individual subsystems operate, especially (5):

- a) Automated systems - most or all partial processes are implemented by the system automatically, without the need for user intervention. These include, for example, automated purchases of spare parts in case the system detects a shortage of spare parts in stock. These are very useful, modern and efficient tools that allow the enterprise to respond quickly and perform simple as well as complex operations based on system instructions.
- b) Combined systems - it is a penetration of automated and non-automated systems, when system user intervention, data import and so on are needed. However, manual intervention induces or, conversely, terminates the system process, which is also automated. These are, for example, electronic auction systems commissioned by the responsible purchaser, but their actual execution as well as evaluation are further automatic.

Mostly, complex e-procurement systems are already programmed and companies are able to buy a licenses for most of needed solutions. In case there are specific needs of companies for specific procurement processes, they have to program it or buy solution from an authorized IT company.

1.1 Electronic auctions in business procurement

In the business as well as in private spheres, the first electronic auctions began to appear in the 1990s and very quickly gained popularity, mainly due to their efficiency and capability to gain significant cost avoidance and cost savings. The first electronic auctions for the public were conducted by FreeMarkets company and were thus pioneers in this field (6). They also found their application in the public sector, where public authorities such as governments use them to select suppliers of public tenders. On this topic, several studies has been already conducted as these tools are very popular in public sector, mainly due to fact that it is significantly harder to undergo corruption in such tenders.

Electronic auctions may be of a dual nature, purchase or sell (some companies conduct selling operations by procurement department, for example byproducts and so on). Sales auctions are an ideal tool to find the best price at which buyers are willing to buy goods (7). Electronic Reverse Auctions (ERA) are reversed in nature and are mainly, but not exclusively, declining in terms of price.

An electronic auction is also defined by the European Directive, which defines it as: " a repetitive process using an electronic device to submit new prices adjusted downwards and/or new values relating to certain characteristics of tenders, which occurs after the initial full evaluation of tenders and which allows the ranking of tenders to be compiled using automatic evaluation methods (3)".

The basic types of electronic auctions (9):

In terms of the number of criteria:

- A) One-critical- we decide according to one, predefined criterion, mostly it is the price
- B) Multicritical- we take into account more than one criterion, and we are able to at weight the criteria. It is a combination of, for example, price and warranty period, etc.

With regard to the visibility of the tenders submitted:

- A) Price-gours see competitive prices or the best and their price in the competition. This type of auction is motivating in nature, as there is a price fight between the bidders. However, this type is not appropriate if the price differences are large or if the lowest bid is significantly lower than other competitors.
- B) Positionally visible: candidates do not see competitive prices, but they see their ranking, either in the selection procedure as a whole or in individual items.
- C) Anonymous or closed- the participants in the auction do not see their ranking or the ranking of competitors, nor do they see competitive prices but only their own. These are mainly Japanese types of auctions, their advantage is the uncertainty of the supplier due to ignorance of the ranking, this motivates suppliers to lower the price.

With a view to the completion of the auction:

- A) Soft-ended auction - in the event of a price change or ranking in the final seconds of an auction, the auction is extended and all bidders receive the same reaction time.
- B) Auctions with a hard end after a set time limit, the auction ends "hard", so if, for example, someone climbs the lowest bid at the last second, others will not be able to react and the auction will close.

In terms of number of auction stages:

- A) The one-stage selection procedure has exactly one stage, which is decisive.
- B) Multi-stage- is a predetermined number of rounds of the selection procedure. Differences in rounds must have clear rules and procedures. However, candidates may not fall out between rounds, there may be different decision-making criteria between rounds and so on. Such auctions depend heavily on the creativity of the promoter.

In this paper, we will recognize mainly 2 auction types defined by company PROEBIZ

(4) :

- ERMMA (English Reverse Multi-item Multicriteria eAuction)- is a multicritical, multi-item auction where a specified group of selected items forming a project unit competes. In addition to price items, other cricket items such as warranty period, invoice maturity, delivery date, etc. may be included in the auction. In doing so, the auction announcer may determine the weights of each criteria in the auction. The prize prize can be total from one vendor or distributed among multiple vendors, according to the best prices or terms of each item.

- NIPPON is a so-called Japanese auction, where the total price decreases over predetermined periods of time. The supplier company reduces the price at periodic intervals and at constant, preset value to the level at which it is willing to perform the work. It is also suitable for investments with a single potential supplier, as suppliers do not see other participants and do not know how many participants participate in the auction. Contractors, so to speak, are "fighting with themselves."

2 Main goals

Main aim of our research in this paper is to quantify effect of electronic auctions during pandemics of COVID-19. It is important for our research to quantify cost avoidance and cost savings that has been reached via electronic reverse auctions.

As a partial goals we determined especially these:

- Summarize theoretical knowledge base of e-procurement ERA
- Structurizing all relevant data of pandemic and pre-pandemic state
- Analyze all relevant outcomes
- Comparison of outcomes with data before pandemics of COVID-19

Both theoretical as well as numerical outcomes of this research is a very realistic overview of effect of using modern e-procurement methods, which can be useful for further research as well as for business use and benchmarking.

3 Methods and data

For our research, we were dedicated to do a research methods as described:

- Composition
- Decomposition
- Analysis
- Statistical methods
- Comparison
- Deduction

For our research, it was very important to gather a long term data from business use of electronic auctions, especially those from ongoing pandemics of COVID-19. These data were gathered from 2 big companies from Slovakia (over 1000 employees). Our main interest into data are specified as:

- Theoretical data from renown scientific papers such as WOS and Scopus
- Quantitative data of e-auctions
- Monetary data from procurement and e-auction softwares
- Qualitative data from employees of procurement department in researched companies

It was very important for our research, not only to gather data from the dates of ongoing pandemics, but also from pre-pandemic dates, in order to do a simple comparison between these two states. In order to achieve a relevant quantity of data needed for our research, we gathered over 5000 specific data blocks, which we further worked with. As not all of data gathered were relevant and useful for us in order to achieve our main goal, we structured this data into relevant groups.

4 Results

In order to analyze current state of use of e-auctions and its further research, we calculated total number of e-auctions done during pandemics in comparison with pre-pandemic state:

Table 28. total quantities of electronic auctions (EA)

Total EA in 2019	138
Total EA in 2020	209

Source: own processing

As of this results, we can see that number of electronic auctions held during pandemic were significantly higher than during pre-pandemic state. This clearly clarifies that companies were much more interested in electronic ways of negotiation. By analyzing this numbers, we spoke with employees responsible for managing e-auctions and they clarified, that they did not intend to do more EA than in pre-pandemic state, just because of comfort and ease of negotiation while working in home office, this method is very useful and user-friendly for them. Procurement manager from one of researched companies also mentioned, that they increased KPI (Key performance indicators) in field of e-procurement and EA in terms of increasing minimum number of EA required per buyer, which could be also another motivation for buyers to use these online methods. We can see increase of use of digital applications almost everywhere from start of pandemics of COVID-19. Businesses are a big part of whole world communication chain, and therefore it is clear that all digital methods that can be used in business procurement, shall be used even more during pandemics of COVID-19.

Another, even more important overview, is an overview of a total cost spent via electronic auctions during researched periods, this will even further clarify, whether increase of total EA held, is done by just increase of budget or not:

Table 29. total cost spent via EA

Total cost spent via EA in 2019	4 mil. EUR
Total cost spent via EA in 2020	3,6 mil. EUR

Source: own processing

From our research, it is clear that overall cost spent via EA is reduced during COVID. We assume that this decrease of total cost spent via EA is mainly caused by total decreases of budgets in between companies. As known, EA's are commonly used for investment procurement and COVID pandemics rapidly cut these budget in most of a production companies worldwide. On the other hand, this results clarifies that total increase of use of EA was not caused by increase of budget, therefore higher cost.

For further comparison, we wanted to see, if increased use of EA also caused better understanding of its work and increased efficiency from point of view of cost avoidance done by EA. We found following:

Table 30. cost avoidance via EA in %

Cost avoidance via EA in 2019 in %	8,58
Cost avoidance via EA in 2020 in %	8,82

Source: own processing

As we can see from upper table, cost avoidance average was slightly increased. This increase is very minor and can not be relevant even in a big scale. We can clarify that procurement EA were not more efficient during its empowered use during pandemics. It is probably also illogical to predict, that just by mean of increased quantity of EA held in businesses, these will be more effective. We also have to assume that pandemics made all of subjects risk-averse, therefore supply chain did not want to provide better prices or to undergo any kind of risk from too low selling price for their customers.

In next step, we analyzed total number of purchase orders created in companies. We have to mention that these numbers are only from investment purchase orders, major repairs and services. We excluded procurement of spare parts, materials and consumables as these are very sensitive to production changes, which could bring us a not relevant point of view on this topic.

Table 31. total number of purchase orders

Total number of Purchase orders in 2019	6343
Total number of Purchase orders in 2020	5827

Source: own processing

As we can see from table above, total number of purchase requisitions was significantly lowered. We assume that it is also caused by decrease of business cost budgets. Positive is that even that companies held significantly less purchases during pandemics, higher percent of these requisitions were negotiated and picked by digital methods – electronic auctions.

At the end, we analyzed if use of electronic auctions helped also in terms of digitization of procurement processes, via data transfer from e-auctions into purchase orders. Findings are represented in table below:

Table 32. purchase orders created via EA tenders

Total number of Purchase orders via EA in 2019	122
Total number of Purchase orders via EA in 2020	174

Source: own processing

As we can see from this table, there is significant increase in purchase orders created via EA tenders, therefore increase of digitization of procurement processes. We can summarize, that during pandemics, digitization was improving across business procurements. Even though that budgets were decreased and there were less total purchase requisitions, more auctions has been done, therefore more purchase orders has been transferred from EA into purchase orders.

5 Discussion

E-procurement is well known term these days and businesses has several options on how to use it and what methods to use. We can claim that main feature of all methods is its usability via internet and digital technologies. These applications are used for variety of cases, from tendering, through logistics and claim management.

During pandemics of COVID-19, world has been digitized even further. Procurement use of electronic auctions has been enhanced. It is simplest and probably most effective way these days for tendering and simple price negotiating. We have to mention that we can use electronic reverse auctions in much more cases than just price negotiation. For example demanding, RFI cases and so on. Pandemics decreased budgets of companies which led to less purchase requisitions in production companies, on the other hand, it enhanced use of digital technologies.

We believe and assume, that use of these digital methods and also all e-procurement, will increase its popularity not only during ongoing pandemics, but also after it. Field of digital innovations is very wide and it will definitely find its new ways into business procurement.

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