



Electronic Public Procurement: Process and Cybersecurity Issues

Symbat Issabayeva¹, Botagoz Yesseniyazova², Matúš Grega³

Abstract

E-public procurement has a great potential to improve public procurement processes. It helps to increase competitiveness, and the use of digital technologies also minimizes transaction costs for business, increases trust and the transparency of decisions made by public customers. The goal of this case study is to analyze the functionalities of the Kazakh e-procurement web portal EPP, to evaluate them in a national and comparative perspective and to propose recommendations with a focus on selected process issues and its cybersecurity in the condition of digital transformation of the Republic of Kazakhstan. The analysis of functionalities of EPP from planning to execution of the contract allows it to propose important changes with the potential to increase competitiveness and decrease transaction costs of procurement in the country. The specific focus is on cybersecurity and proposals how to increase it.

Key words:

cybersecurity; e-public procurement; e-government, digitalization; information and communication technologies.

1. Introduction

Public procurement plays a direct role in ensuring the efficiency of the public-sector expenditures (OECD 2017). Moreover, public procurement is often seen today as

- 1 Academy of Public Administration under the President of the Republic of Kazakhstan, Academy of Law Enforcement Agencies under the General Prosecutor's Office of the Republic of Kazakhstan, Kazakhstan.
- 2 Academy of Public Administration under the President of the Republic of Kazakhstan, Public Procurement Office of the Aktobe region, Kazakhstan.
- 3 Department of Finance and Accounting, Faculty of Economics, Matej Bel University, Banská Bystrica, Slovakia.

a means to achieve specific policy objectives, ranging from reducing carbon emissions to creating a more innovative, sustainable and inclusive economy (Semple 2015). At the same time, they also have an impact on achieving social goals, such as reducing unemployment and supporting specific industries, professions or groups disadvantaged (McCrudden 2004).

The economic activity of public procurement is characterized by a significant share of the use of budgetary funds in them. Thus, in 2015 the amount of public procurement on average amounted to almost a third (29 %) of national expenditures of the OECD member countries (OECD 2017), and in the countries of the EU it is approximately 15 % of GDP (Grega et al. 2019, Plaček et al. 2016).

In Kazakhstan, public procurement also represents a large share of the country's public spending. An analysis of data of the Kazakh Ministry of National Economy's Committee on Statistics (CS MNE RK 2017), the portal of public procurement of the Republic of Kazakhstan (<https://v3bl.goszakup.gov.kz>) and the Official website of the Kazakh Ministry of Finance (<http://www.minfin.gov.kz>) showed that in 2016–2018 the share of public procurement averaged 32.3 % of public spending. It can be seen that government agencies and organizations spend many budget funds on public procurement. This process is also a public policy, where public procurement as an instrument of expenditure must take into account procedural guarantees of fairness, transparency, and competition (Semple 2015).

Thus, there is a need for continuous improvement of public procurement as an important mechanism for achieving the goal of state policy, increasing the efficiency of public expenditures and strengthening the trust of citizens. In this context, the central aim of development of public procurement systems is to improve the efficiency of their planning, organization of procurement procedures and provision to consumers. At the same time, the elimination of duplicative processes for the public and private sectors, the transformation of procurement practices through innovative digital management tools and the development of data for decision-making are all essential elements of the modern public procurement system of the 21st century (OECD 2016).

Kazakhstan's public procurement is conducted in electronic form on a single platform of the automated integrated information system "Electronic Public Procurement" (EPP), with the exception of procurement classified as state secrets. AIIS "EPP" allows carrying out procurement procedures, determining the supplier, concluding electronic contracts, publishing information about the concluded contracts, the results of their execution and carrying out control. Kazakhstan's experience in automating public procurement has shown that it is one of the most effective tools to ensure the transparency of the process and budget savings. According to the official Ministry of Finance data (Sultanov 2018), annually the electronic format of public procurement allows saving up to 10 thousand tenge (1 tenge \approx 0.00233803

Eur)⁴ for entrepreneurs on post and travel expenses and more than 200 billion tenge to the state.

The goal of this case study is to analyze the functionalities of the web portal EPP, to evaluate them in a national and comparative perspective and to propose recommendations. The authors of the article consider three core issues connected with EPP use, namely the identification of processes that can be duplicated, and the development of practical mechanisms for their optimization; confidence-building; ensuring cybersecurity in the field of electronic public procurement. As a result of the study, the following questions will be answered:

- 1) How is electronic procurement organized?
- 2) What processes can be optimized to reduce duplicate processes?
- 3) How to increase measures to protect the system of electronic public procurement from possible threats of cyberattacks?

The structure of this case logically follows the goal and defined research questions. In the first chapter, a short literature review on the topic is delivered. Afterwards the authors describe the organization of e-procurement in Kazakhstan and the EPP portal. The analysis of selected core functionalities of EPP is the base for delivering a proposal how to improve the functioning of EPP. The final specific part focuses on cybersecurity of the system and highlights the main challenges and ways how to manage them.

2. Literature review

The study of the advantages and risks of e-government implementation is of wide interest to researchers. Weerakkody et al. (2015) conducted a systematic review of 132 studies posted in the online databases Scopus and Google Scholar, dedicated to the study of the costs, opportunities, benefits and risks of e-government. However, the researchers concluded that there is not enough empirical research and statistical evaluation in this area. Peter Adjei-Bamfo et al. (2019) noted that e-government studies on e-public procurement are limited in the context of developing countries that know little about their sustainable public procurement practices. At the same time, these scientists also note that e-government offers the developing countries a platform to exchange requirements in the field of sustainable procurement with the aim of eliminating information gaps in the practice of public procurement.

Overall, many articles argue that e-procurement has several significant positive effects. Togan et al. (2017) argue that the advantages of using electronic methods in public procurement are reducing administrative costs, streamlining and speeding up procedures, increasing transparency, ensuring better monitoring, stimulating cross-border competition; stimulating integration work of various administra-

4 Tenge exchange rate on 9 October 2019 (XE Currency Converter).

tive processes and support for developments that make the process more efficient. Svidroňová (2016) looks at it as an innovative way of delivering public services by using information and communication technologies. Positive effects may include reduced corruption, transportability of management, convenience, increased revenue and reduced costs (Po-Ling Sun et al. 2015). The introduction of electronic procurement can also improve competition in public procurement, making the bidding process and the awarding of contracts more accessible and transparent (Grega et al. 2019).

Moreover, it can reduce application costs, attract better identifiers, and reduce corruption (Kochanova et al. 2016). It can be highlighted that Langr (2018) in his study pays precise attention to corruption issues in the public procurement of the Czech Republic, and it takes place due to “the failure of a public institution and over-use of illegal and non-standard methods of tendering.” Kochanova et al. (2016) claim that the benefits of both e-filing and e-procurement often depend on the level of development of the country, human capital and technology. Institutional reforms should therefore accompany investment in e-government, especially in low-income countries. What is more, studying the issue of developing electronic procurement systems, Bromberg and Manoharan (2015) came to the results that despite the value of electronic procurement in improving the efficiency and accountability of public authorities, it is necessary to improve them gradually rather than instantly. Additionally, the authors believe that the potential benefits of e-procurement depend significantly on the application of foresight in management.

On the other hand, researchers also note negative aspects of the use of ICT in public administration. Thus, increased transparency and openness of the activities of public authorities with expanded access to digital data and the widespread use of the Internet make them more vulnerable in cyberspace (Abuchakra and Khuri 2015). Automation of systems, that is digitalization of services, leads to a number of risks. Nowadays one of the main risks in cyberspace is to ensure the security of digital information. Clark et al. (2014) in their study noted that nations have become increasingly dependent on information technology due to the global introduction of them in both the public and private sectors. The population's dependence on information technology makes cybersecurity an important issue. By operating in cyberspace, digital service providers and service recipients are vulnerable to cyberattacks, as their personal data, money and intellectual property are at risk of being misappropriated by cybercriminals.

The experiences from different countries support the arguments above. The Korean Public Procurement Service has advanced experience in the implementation of the electronic public-procurement platform. Mandatory procurement through the Korean on-line e-procurement system has not only increased competition and reduced administrative burden but also improved transparency by establishing greater accountability of officials (OECD 2016). For example, in the EU

the e-procurement is more or less compulsory, prescribed by relevant directives. E-auctions are successfully used to increase participation and decrease the final price (Plaček et al. 2016).

What is more, in Russia electronic public procurement was established for the first time in 2001. Then it was decided to publish announcements by all customers on a single site instead of alternative placement on their own Internet resources. The main advantage of the single platform is its contribution to the creation of “Russian economic space”, where suppliers can analyze the needs of government agencies and organizations in manufactured or supplied goods throughout the country (Samarin and Melnichuk 2016). Since the beginning of 2014, Russia’s transition to a public-procurement contract system has made it possible to optimize the mechanism for providing electronic documents. Moreover, electronic systems are obliged along with the amounts of security to return the benefits received from them (Samarin and Melnichuk 2016). In 2017 Russia adopted the Strategy for the development of the information society in the Russian Federation for 2017–2030 (Decree of the President of the Russian Federation 2017), where in order to promote the state on the way to the information society, one of the main directions of its implementation is to improve the efficiency of the state apparatus, interaction of the population and business with public authorities, the quality and efficiency of public services, through the further development of e-government and the transition to digital government (Decree of the President of the Russian Federation 2017).

Moreover, e-government leaders are now moving to a new stage of the digital transformation. This stage involves the complete transition of services to digital format from the beginning to the end of the process relying on digital data, moving away from traditional documents (World Bank 2016). Ojha and Pandey (2014) highlighted that the implementation of digital projects has led to the emergence of new technological processes and systems that improve productivity, efficiency, transparency as well as reducing operating costs and increasing revenues.

An integrated approach to the development of digitalization in Kazakhstan is designed to solve the State programme “Digital Kazakhstan”, which was approved by the government of the Republic of Kazakhstan (State programme “Digital Kazakhstan” 2017). Along with the main aspirations to accelerate the pace of the development of the economy of Kazakhstan and improve the quality of life of the population, the State programme is aimed to create conditions for the transition of the economy to a new vector – the digital economy of the future. One of the directions of the State programme “Digital Kazakhstan” is called “Government-to-Business”, where the digitalization of the relationship between the two sides should reduce the transaction costs of entrepreneurs and increase the transparency of decisions made by state bodies and organizations (State programme “Digital Kazakhstan” 2017).

3. Methodology

The authors of the study use the case-study method. The use of the case study provides an opportunity for an in-depth, detailed study of electronic public procurement in Kazakhstan. Thus, the study directly examines Kazakhstan's experience of e-public procurement and its ensuring cybersecurity in the context of the digital transformation in the country. The authors consider and describe the current state of electronic public procurement in Kazakhstan, providing a high level of detail, combining both objective and subjective data to achieve a deep understanding of public procurement in Kazakhstan. The main method of research is the in-depth analysis of functionalities of the studied web portal of public procurement, EPP. The article also uses the data of the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, the Ministry of Finance of the Republic of Kazakhstan, Computer incident response service of the RSE "State technical service" of the National Security Committee of the Republic of Kazakhstan as well as reports generated directly in the EPP and analyzes the existing legal acts and state programme documents of the Republic of Kazakhstan in the field of public procurement, cybersecurity and digitalization.

4. The organization of e-procurement in Kazakhstan and the functionalities of EPP

E-public procurement in Kazakhstan is a project that was created within the framework of Electronic commerce (e-commerce). Its owner is the Ministry of Finance of the Republic of Kazakhstan (MF RK). The development of Kazakhstan's e-public procurement system began indirectly already in 1978, when the information and computer centre of the MF RK of the Union of Soviet Socialist Republics was created. In 1992, it became the Main computer centre of the MF RK, and then in different years it was transformed in its organizational and legal form, and since November of 2018 it has acted as JSC "Centre of Electronic Finance" (<https://ecc.kz/ru>).

The web portal of public procurement of Kazakhstan, "goszakup.gov.kz", launched in 2009, based on the "box solution" on the Oracle E-business Suite platform. Since 2010, in real time, purchases began using the "request for quotations" method. In 2012, a new module, "competition and auction", was implemented on the web portal for electronic procurement by means of "Open tender" and "Auction". At the same time, the legislation was improved, which established the requirements for mandatory public procurement on the web portal. With the signing of the new Law of the Republic of Kazakhstan "On public procurement" (the Law 2015) and the approval of new Rules for public procurement (the Rule 2015) on the basis of open-source technologies, "Open Source", a new operating platform was developed, called AIIS "EPP" (Nurgisayev 2018).

Two limits of EPP should be mentioned here, without further investigation. First, Kazakhstan's public procurement web portal nowadays does not have a mobile application. At the same time, the use of mobile technologies in public procurement would allow users to receive timely notifications generated by EPP, to increase the availability of general information at any convenient time for the user (this can be SMS messages, instant messengers, mobile applications, etc.). Second, the specific problem of EPP is the fact that the Law and the Rules of public procurement of Kazakhstan are characterized by their dynamism. Every six months, innovations are introduced in them, including through the introduction of new procurement methods (by now, according to the Legal system <http://adilet.zan.kz/rus/docs/Z1500000434/history>, amendments and additions to the Law have been adopted more than 20 times and 15 times to the Rule <http://adilet.zan.kz/rus/docs/V1500012590/history> since 2016). In this context, EPP also faces an important task of constant updating and improvement in accordance with the provisions of the Law and Rule.

Functionalities of EPP

EPP is a single point of access where state bodies and organizations of Kazakhstan carry out purchases for their needs and the implementation of their functions, except for those classified as state secrets, and suppliers can enter into contracts participating in public procurement. From 1 January 2016 EPP automates all phases of public procurement in the online mode (in accordance with article 5 of the Law (2015), the process of public procurement is carried out in stages: “development and approval of the annual plan” (planning), “selection of a supplier and signing of the contract on public procurement”, and “execution of the contract on public procurement”).

The web portal provides access to all information about planned and ongoing public procurement as well as, for the convenience of users, posts step-by-step instructions, answers frequently asked questions and provides a contact centre, e-mail technical support and an updated news feed. Its main modules are described in Table 1.

In the web portal EPP approx. 240,000 potential suppliers are registered (87,457 limited-liability companies, 136,610 individual entrepreneurs and farms and others), as well as approx. 25,000 state customers – representatives of central and local government agencies, public institutions and enterprises of education, health, housing and communal services, construction and others.

The annual volume of purchases through the web portal EPP is described in Figure 1 with the exception of purchases classified as state secrets and purchases of national holdings and companies.

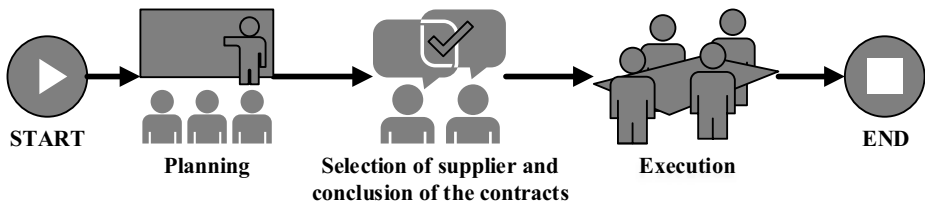
Table 1
EPP Modules

Modules	Functions
Start page of the public procurement web portal	<ul style="list-style-type: none"> • Reference information, step-by-step user instructions, regulatory framework, frequently asked questions, explanations, contact information; • Login to the personal account of the participants of the public-procurement process after registration; • Information on planned, ongoing and implemented public procurement; • Statistics and reporting on public procurement; • Registers formed in the field of public procurement; • Links to external services.
Participants	<ul style="list-style-type: none"> • Registration and authorization of participants using Electronic digital signature (EDS); • Filling in and managing personal data; • Receiving notifications about the actions performed and (or) the need to perform actions in the personal account after logging in; • Participation in the public-procurement process based on the functions of the customer, organizer, single organizer, supplier or auditor.
Search engine	<ul style="list-style-type: none"> • Search for lots and purchase announcements; • Search filters and advanced search.
E-public procurement: customers, the organizers, the organizers unified	<ul style="list-style-type: none"> • Publication of approved annual plans of public procurement, their changes and additions; • Publication of announcements on public procurement in the manner prescribed by Law, placement of tender and auction documentation; • Formation of a competitive and (or) auction commission; • Consideration of competitive and (or) auction applications and the documents of potential suppliers presented in them; • Publication of minutes of consideration of competitive and (or) auction applications of potential suppliers and decisions on the results of public procurement.

Participation in e-public procurement: Potential suppliers	<ul style="list-style-type: none"> • Search for announcements about public procurement of goods, works and services; • Creation and submission of applications for participation in public procurement; • Requests to state databases; • E-Bank guarantee; • Submission of complaints and (or) appeals.
e-government procurement agreement	<ul style="list-style-type: none"> • Creation and approval of the public-procurement contract; • Signing of the contract on public procurement by the parties using EDS; • Sending the contract on public procurement to the Treasury for registration by the customer; • Execution of the contract, filling in and signing of the act of work performed (acceptance and transfer of goods, services rendered) using EDS.
Cameral control (remote control in online mode)	<ul style="list-style-type: none"> • Generation of reports on public procurement subject to cameral control and sending for execution; • Implementation of Cameral control for purchases by means of "Open tender", "Auction", "Request for quotations", "Commodity exchanges", "From one source"; • Creating and sending notifications for detected violations; • Creating, sending, viewing and working with objections based on the results of control.

Source: own construction based on public-procurement web portal.

Figure 1
E-Public procurement of the Republic of Kazakhstan for 2016–2018



Source: own construction based on EPP

All mandatory forms of documents (more than 110 different documents) used in public procurement, including forms of announcements, contracts, applications for participation in procurement, protocols, acts of inspections are transferred to an electronic format where they are formed and signed with an Electronic digital signature (EDS). This means that it is no longer necessary to visit state bodies and organizations to submit envelopes of applications for participation in announced purchases with printed documents, certified copies and other information as well as to file a complaint or challenge the decision of the relevant authorities. EPP also provides for the ability to conduct online inspections (Cameral control), allows you to identify and eliminate violations of the law on public procurement at all stages as well as to respond to complaints of participants before the conclusion of the contract on public procurement.

Planning of public procurement at EPP

The public-procurement plan, according to article 5 of the Law (2015) is developed and approved by the public body for one financial year, and the basis is the allocated budget, development plan or individual financing plan. The public-procurement plan is directly related to budget planning and financing, in this regard, today the MF RK activates the work on the inter-system integration of public procurement and budget planning, which will ensure the automatic formation of financing plans and procurement plans. It is expected for this integration of these three planning processes to improve the overall efficiency by improving the discipline of budget planning as the initial stage of the whole process; eliminating the risks of inconsistencies between the declared needs and the purchased goods, works, services; the ability to conduct online compliance of public procurement with financing plans, which will help to solve the problems of late budget development.

The Rule (2015) defines the structure and form of the annual procurement plan. The annual procurement plan of a public body is a set of items that necessarily contain information about the name of the goods, work, services, their character-

istics, quantity (volume), delivery conditions as well as the allocated amounts and planned terms of the procurement announcement (month) and other information (Table 2).

Table 2
Contents of the Annual public-procurement plan

	Information
1	Identification code of public procurement defined by the web portal
2	Type of plan item
3	Budget Programme Administrator
4	Programme, Sub-programme, Specificity (classification of expenses within the framework of which procurement will be carried out)
5	Source of financing
6	Purchasing Item Type
7	Product, work, service code
8	Name of purchased goods, works, services
9	Brief description (description) of goods, works, services
10	Additional characteristic (in Kazakh and Russian)
11	Procurement method
12	Unit of measurement
13	Quantity, volume
14	Price per unit, tenge
15	Total amount approved for purchase, tenge
16	Approved amount for the first year of the three-year period
17	Forecast amounts for the second, third year of the three-year period, tenge
18	Planned duration of the procurement announcement (month)
19	Delivery time for goods, work, services (in Kazakh and Russian)
20	Code, Place of delivery of goods, performance of work, rendering of services (in Kazakh and Russian)
21	Advance payment amount, %
22	Supplier sign

Source: own construction, based on the public-procurement law and rules

The planning process on the web portal EPP is carried out by performing actions to fill in the appropriate forms, select the plan items, click icons, select actions and confirm the selected actions and others. This process includes some elements, which can be improved. For example, the analysis of the planning stage showed that for each product, work or service, it is necessary to separately create an application for organizing public-procurement procedures to the organizer and send it to the web portal.

According to our opinion, the items of the annual public-procurement plan contain all the necessary information for the automatic creation of applications for public-procurement procedures. Thus, it is possible to automate the actions of customers on the formation and sending of the web portal application to the organizer for each purchase. The proposed automation, firstly, optimizes the actions of customers on the portal, and, secondly, it will increase the discipline of planning; thirdly, it will make the approved data on the period (month) of public procurement useful; fourthly, the organizers and unified procurement organizers will be able to plan in advance and qualitatively the organization of their activities and rationally allocate resources for the timely conduct of competitive and auction procedures.

Registration of suppliers

The stage of selecting a potential supplier ensures compliance with the most important principles of public procurement, the principle of fair competition among potential suppliers and prevention of corruption. Competitive methods of public procurement in Kazakhstan are open competition, competition with pre-qualification, competition using two-stage procedures, auction and request for quotation. In cases regulated by article 39 of the PP Law, “single source procurement” can be exceptionally applied, and “through commodity exchanges” (article 42 PP Law) purchases of goods provided for in the list of exchange goods in accordance with the legislation of the Republic of Kazakhstan on commodity exchanges are carried out. According to the MF RK (Sultanov 2017), procurement for works achieves the highest level of competition – on average 7–8 companies participate. However, the picture is more complicated. The real problem is the large use of single-source procurement – this method is still used far too frequently – in 2016, it was used for 69 % of the total number of purchases (a third of all such purchases was used as the second stage of failed tenders, 80 % of which are associated with construction).

Potential suppliers of public procurement can be both legal entities and individual entrepreneurs, peasant farms. To participate in the public procurement announced at the EPP they need to cope with a lot of bureaucracy. For example they need to provide many materials to confirm their compliance with the qualification requirements – and the current rules require a large number of documents to be submitted to the system – generating extra costs and problems, important especially for smaller firms. Thus, the (at least partial) automation of these processes will increase the availability and transparency of the public-procurement system for potential users. Already today, potential suppliers can update the information accessible in the state databases by submitting a request in the personal account on the web portal of EPP. The processes of processing such requests takes no more than 10–15 minutes, and accuracy can be also easily checked.

The legislation of the Republic of Kazakhstan does not prohibit potential suppliers from participating in two or more tenders for public procurement at the same

time. To do this, the supplier forms an application for each competition where they individually attach their supporting documents on experience and possession of the material and human resources. The contest commission considers the submitted information and makes decisions about each purchase separately. For each purchase, the lawfulness of the actions of the members of the tender commissions is supervised by the cameral control. Such submissions can also be interlinked in order to simplify the life of suppliers.

The authors' opinion is that the automatic formation and updating of data of potential suppliers in the "Supplier portfolio" in the personal account of EPP, as well as using them for each participation in public procurement by providing access or obtaining ready-made information is feasible. Following duplicate operations can be optimized: information on the results of cameral control in relation to the experience of a potential supplier in the market of purchased goods, works and services; information download from state databases; information on the proper and timely implementation of the obligations assumed under the previously concluded contracts on public procurement, which can be used in decision-making by the organizers and customers of public procurement. Such changes support also one of the core goals of the EPP – to ensure equal access to potential suppliers to participate in public procurement.

5. The protection of the e-public-procurement system against possible threats of cyberattacks

The issue of cybersecurity is one of the pressing problems in the digital space. The problem of cybersecurity is a critical issue in Kazakhstan's public administration. It should be noted that Kazakhstan is currently undergoing a period of digital transformation. Many public services are delivered in cyberspace, including public procurement. According to article 17 of the Law (2015), "E-finance Centre" JSC is a single operator in the field of public procurement that provides information security for storing electronic information resources which are posted on the e-public-procurement web portal in order to prevent the risk of cyberattacks on the web portal. The chairman of the board of the "E-commerce Center" JSC, Temirlan Nurgisayev, mentioned that AIIS "EPP" is constantly attacked, and most of them are DDoS attacks from China, Europe and Southeast Asia (Nurgisayev 2018). According to statistics of the Computer incident response service of the RSE "State technical service" of the National Security Committee of the Republic of Kazakhstan the number of Internet incidents in cyberspace increases every year. For example, in the first 9 months of 2018 the number of information security incidents was more than 14,000, while in the same period the number of registered incidents in 2019 exceeded 16,000 (KZ-CERT). Lloyd's study defines cyberattacks as one of the costly risks. According to their calculations – it could cost the global economy more than 120 billion pounds (*Guardian* 2017).

In their study, Stephens and Valverde (2013) note that the security of electronic public-procurement researchers has not been studied enough and requires more attention. They note the importance of ensuring the confidentiality, integrity and availability of digital data in integration processes. In addition, Nanang et al. (2018) pointed out that the success of e-public procurement depends on the security and confidentiality of the system. Thus, ensuring cybersecurity is an important factor that directly affects the success of e-public procurement.

Along with the digitalization of public services, Kazakhstan needs to consider cybersecurity issues. It should be noted that according to the Global Cybersecurity Index 2018 Kazakhstan took 40th place (GCI 2018, 63), lagging 2 positions behind the IMD World Digital Competitiveness rating in 2018 (IMD WDC 2018, 40). In 2017, the GCI was behind the IMD WDC by 45 positions (GCI 2017 61; IMD WDC 2018 40). As a result, the government of Kazakhstan has taken a number of measures in the field of cybersecurity that has significantly raised the level of cybersecurity in the country. Kazakhstan, like most countries of the world, has established the Concept of Cybersecurity (Concept of Cybersecurity 2017). In addition, a clear action plan for the implementation of the Concept of Cybersecurity was approved.

What is more, a number of administrative reforms have been carried out in the Executive branch in the field of digitalization and cybersecurity. The Committee of information security under the Ministry of digital development, innovation and aerospace industry of the Republic of Kazakhstan was formed.

The authors of the article believe that there are a number of basic suggestions which can improve cybersecurity in e-public procurement, especially with a focus on improving the standard-setting practice in the field of cybersecurity; attracting highly qualified experts (also from other countries) on a regular basis to serve in the system; on providing funds and licensing software to authorized bodies that are directly involved in the introduction of public electronic procurement and other activities that will be barriers against the leakage of digital personal data; and on training employees of the Ministry of Finance on an ongoing basis in the field of digitalization and cybersecurity in order to improve computer literacy.

6. Conclusions

The aim of the authors was to study the functions of the electronic public-procurement information system of the Republic of Kazakhstan and propose measures to develop their efficiency and ensuring its cybersecurity in the context of digital transformation in the country. The implementation of EPP already delivered important results. The transparency of public procurement has improved, and the number of participants in procurement conducted in competitive ways has increased (according to the Minister of Finance of Kazakhstan (Sultanov 2017), the average number of participants per competition has been increased by a factor of almost 4.) These

changes should deliver important public finance savings. As a result, for the first year of EPP implementation the budget savings in public procurement increased by a factor of 3 from 43 to 130 billion tenge (Sultanov 2017).

However, our analysis of e-public-procurement processes on the current EPP web portal showed the presence of duplicate actions, which are time-consuming as well as possible risks of making mistakes when performing repetitive operations. The authors propose how the existing web portal features can be used to automate and optimize operation actions with a focus on procurement planning and the registration of suppliers and documenting their qualification.

In terms of technological development, the issue of cybersecurity of the country and its e-procurement is relevant. The ongoing changes increase the vulnerability of information systems to cyberattacks. The risk of loss of digital data and hacking of information systems increases, which leads to the importance of the issue of cybersecurity. The development of cybersecurity at the national level will increase the protection of e-public procurement systems in the country.

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