

Features of the Architecture of Information Resources in the Field of Public Procurement (Russian Contract System)

Mamedova N.A.¹, A.I. Urintsov² and A.N. Savrukov

Associate professor, Department of State and Municipal Management, Russian Economic University named after G.V. Plekhanov, Moscow, Russia.

Ph.D., Professor, Department of Applied Computer Science in Management and Knowledge Management, Russian Economic University named after G.V. Plekhanov, Moscow, Russia.

Ph.D., Professor, Department of Financial Management, Russian Economic University named after G.V. Plekhanov, Moscow, Russia.

¹Orcid: 0000-0002-8934-7363, & ¹Author Scopus ID: 56181485600, ²Author Scopus ID: 56203510800

Abstract

The article examines the architecture, content and current parameters of information resources used for public procurement. Determined the basic conditions of functioning of information resources needed to create optimal information architecture. The paper studied the needs and preferences of users of information resources in the field of public procurement. The article provides a detailed procedure for interaction of the official website for posting information about purchases and sites of social control institutions for monitoring, analysis and evaluation of the results of procurement of accommodation. The result of the research is the organizational chart of accumulation, transformation and formalization of the data site organization of public control, which ensures the implementation of searches by site users upload data from the official website for posting information about procurement.

Keywords: information architecture, automated system, information exchange, information on procurement, contract system in the sphere of public procurement, public control in procurement.

Effective implementation of the measures of social control in the procurement of information is impossible to ensure the publicity and transparency of government customers. Speaking about the role of information in the system of public oversight in the area of procurement, should be understood as information support for the creation of information environment functioning facility management, providing the necessary information, including the system of means to seek, receive, store, storage, transmission, data processing, organization of data banks [1]. A mandatory condition for

the establishment, implementation and use of information support is the construction and operation of the information-analytical automated control systems [2]. Moreover, the information architecture allows you to make the user experience more productive. Information security is a life-giving mechanism that allows public entities to implement fully control the powers granted to them within the framework of an open information space. In Russia, contract system in the procurement of established and developing in such a way as to ensure maximum transparency of the processes related to the planning, deployment and procurement execution. The level of development of information architecture is a basic factor in the effectiveness of the instruments of social control [3]. The main indicators of the level of development of information architecture are the quantitative and qualitative characteristics of information resources used by subjects of public control.

Differentiating the totality of information resources in the area of procurement, the following groups should be allocated. Firstly, resources that are created on the initiative of the State - Unified Information System (UIS) for the provision of procurement information (www.zakupki.gov.ru), central government websites. Secondly, resources that are created on the initiative of public control subjects - sites of public organizations and associations.

Subjects for the realization of public control functions need access to a full, open, reliable information about the activities of customers, specialized organizations, operators of electronic platforms, control bodies in the field of procurement. Using this information, public control entities carry information monitoring, used to appeal actions instruments (inaction) of individual customers, and have the opportunity to take part in public discussion of major

purchases. Based on the received official, centralized information resource data subjects of public control form their own information resources, which illustrate their activities - carried out studies and activities.

The state creates and regulates the formal and centralized information resources (websites). In the first place, these resources are necessary for the functioning of the system of procurement of accommodation, whereby the purchases, participants can be informed about planned, ongoing and completed procurement customers. However, the higher the degree of openness of resources than more strictly regulated activity of the customer to place the resource on the procurement planning documents, procurement procedures, negotiation and execution of contracts, the more opportunities for social control entities for the implementation of the special function. On the other hand, there are resources and develop information support, which are created and work on the initiative of the public control of public entities in order to promote the objectives and results of their activities. These resources are designed to inform the public, on the involvement of voluntary or other basis of active citizens and civil society organizations in the implementation of public control functions.

So, to answer the question to what extent the resources of information support as created on the initiative of the state, and on the initiative of public control subjects, contribute to the development of public oversight systems in procurement, initially need to determine what should be the information architecture of information resources?

UIS, as well as central sites of state authorities should in fact be the portals, because a large number of users visits these resources and the resource itself contains a lot of services, links and content. In this connection, the user experience is ensured intuitive interface, virtually intuitive navigation and original content. Modern user to work effectively on the portal are also required communication services - forums, news ticker with the possibility of thematic subscription, rating data and other feedback. If we consider the classification sign of division portals on the vertical and horizontal, the portal official site for the procurement of accommodation, as well as portals and government websites are vertical structures [4].

Vertical (specialized) portals as opposed to the universal horizontal portals have a specific theme and are designed for a specific range of users. Content vertical portals thematically limited, but it can provide a large number of services. For UIS the following features characterize portals and centralized sites:

- affiliation certain state structure;
- limit portal access control;
- a special procedure for work with citizens and legal entities;
- strictly legitimacy hosted informational content.

- Regarding the content should be noted. Content management is carried out by means of special systems
 - Content Management System (CMS), which is a software that functions on the side of the web server and multiple simplifies operation of the site administrator. Using this control system only requires technical skills for editing text and multimedia information. Specialists of state bodies regulating the operation of the site prepare the content of the information content. The CMS allows you to manage large volumes of structured information (databases), using a clear and intuitive interface. The total content of a site originally is a set of data unstructured type, so data management using one of the varieties of CMS system: Enterprise Content Management System (ECMS) - content management system of the organization-wide or Web Content Management System (WCMS) - Web content management system. The first system is used for structuring the content data of the official website for the procurement of accommodation, since the content integrates data, hosted customers. The second type of system is used to control the content of the centralized government sites that post information about their activities.

The establishment and regulating the work of the test sites are used ready-made content management systems that differ in the way of work. For example, the site pages can be generated by a user's request, the method used in all information resources with the presence and function of the context of expanded search criteria for user-defined sample. In the case of ready content management, system for editing site administrator information stored in the database, and the database information should be in the presentation module when processing queries of visitors. The second method works ready content management systems - where the website pages are generated when editing information by the administrator, the third method is a mixed type.

Most of central government sites as well as the official website of the procurement function to accommodate the third method of content management. This is due to the presence of a relatively stable information content - news ticker, the user registration module, feedback module with the technical service, the module summary legal database, structure, and other contacts; and the presence of a constantly changing (supplemented) the content generated by users (for the official website - customers, other authorized bodies (organizations), operators of electronic platforms).

The result of using a content management system is expressed in the characterization of the information architecture of an information resource, which is the process of systematization of content and site navigation. The main objective of the

information architecture - to simplify the user to search for the right information with the help of competent placement site modules, hyperlinks, as well as the organization of a comfortable stay visitor to the site.

Design information architecture consists of two sequential processes - analysis of the content of the information resource and the development process of its structure. A properly designed information architecture provides the following benefits:

- high index of relevance of pages in the index of search engines;
- reducing the time the user costs of moving the site and search for the right information;
- reducing the time spent on technical support website and update the content of the information resource.

Thus, the logical construction site modules provides the user interface understanding and usability services.

Information architecture site of paramount importance attaches to the organization of the navigation system, which is a menu system that allows the virtual mode, navigate the interface and use the resources of the site. It is believed that there is no perfect navigation, and the main difficulty is the harmonization of the graphic component, setting the ratio and placement of modules, as well as the hierarchy of the elements of the information content. Fast move between pages, working hyperlinks inadmissibility hovering processes of displacement and load, moderate contrast of the visual elements, and, of course, the accuracy of the information content - is the basic conditions of navigation efficiency, which are necessary to the modern user and to ensure that should the body (organization), administers an information resource . Site sections management should be one that is visualized through the navigation menus and organizing a thematic catalog.

Subject Directory is a collection of links on the site, which are united by topic. The catalog can also include links to various resources that share a common theme, so that the user can switch to other thematically related websites. Despite the fact that usually links to the directory are selected automatically for the functioning of the official website and centralized government sites selected references made by the moderator, these measures help prevent fraud, false references. more characteristic of the automatic selection of the links, and if the possibility of free add links, they must undergo inspection by the moderator to provide information security for sites of public control subjects.

Subjects of public control that administer information resources, should also be treated with special attention to the content of the content. Literacy, richness, relevance and accuracy of the content - its basic characteristics, which ensure the inflow of users of the site. Developers and site administrators must take into account the difference in the speed of your internet users. Using a large amount of "heavy"

elements - multimedia, graphics, and promotional materials reduces the page loading speed, a system error, which reduces the user's interest in the site.

Another important aspect of setting information architecture and content of the site content is to use duplicate content. First, duplicate content can distort the results of indexing pages of a site by search engines. Secondly, it reduces the potential of the navigation system and results in loss users. Duplicate content may be within one information resource, i.e. its contents is repeated for different pages, and may be at different sites, when the content is repeated sites with different domain names. The user can check the content on the site is unique, for it is possible to apply the program, the services to check the uniqueness of the text (Similar Page Checker, Copyscape, Xenu Sleuth), or use the search engine duplicate content in any search engine.

Even with the obvious differences in the methods of obtaining content for centralized sites of state bodies, the official site for the placement of procurement and for the sites of social control subjects, it should be noted that compliance with copyright rules of citation, the presence of links to official sources of information - have the necessary conditions for the formation of content which depend on the quality of public confidence placed on information resources data. Of particular importance are the conditions for the sites of social control entities for which the number of authorized user is one of the performance indicators.

Authorization is a confirmation of the user's identity. By login site administrators, determine the level of access rights, the user profile. It also makes it clear the system and network resources that the user is at any given time on the site, performs certain actions, and enjoys certain services. User authentication occurs by login and password, the user fills in the registration data itself, checking the person filling in the data - one of the standard registration procedures (to avoid the risk of manipulating data on the number of registered users and their activity on the site). Password access can be assigned automatically to enable or disable the option to change the password-authorized user, or may be initially set by the user when registering on the site. Sites of social control entities often use a user profile fill option for more efficient interaction of the type "user - administrator" and "user - user". It provides an information exchange, the feedback efficiency, growth of the volunteer movement and other mechanisms of development activities.

Accumulated system statistical and analytical information is used by administrators for the preparation of internal ratings, content updates, verification and diversification of site services. For websites of public organizations are characterized by fast (simple) authorization, or lack thereof, though in most cases, and authorization is required only in very special cases - when sending a treatment, maintenance request, to participate in a forum or a particular procedure. On

On the one hand this simplifies the user experience with a site in the early stages, it saves time, serves to preserve the necessary distance and privacy of personal data. On the other hand, even fast-authorization allows the site administrator to collect primary statistical data and services for the development of the site can be used by user suggestions processing function or comments when an error is detected on the website.

Suffice rare is the use of complex authorization. An example is the procedure for registering a user to host the official website to participate in the procurement of public discussion of the major purchasing procedure. To do this, the user needs to go beyond the site and register on the portal of public services (<http://www.gosuslugi.ru/>), related to the disclosure of personal data, rather long identity verification, access coding and other "challenges" to which most people are not used. It is obvious that in this way the government wants to limit the abusive and unprofessional use of the service for the organization of one of the stages of the public discussion of large purchases directly on the official website. However, it is also clear that such an approach to reduce the number of authorized users.

- Thus, for authorization to study sites are characterized by the following features:
- protection of data (including personal) from access by third parties;
- establishment and implementation of individual access rights to system resources (eg, user profile defines the official site the opportunity to work in an open and closed part of the site);
- the ability to use digital signatures.

Modern information resources should provide the opportunity to work with the services of the website in different browser programs that allow you to view and process data site. This basic characteristic of the websites of public organizations of subjects, but for the government sites, the official website of this characteristic is not obvious. In this case, user information must be provided that the correct display modules of the site is possible with the opening of the site in a browser. Basic users' preferences in Russia are distributed among the following programs browsers: Internet Explorer; Opera; Google Chrome; Mozilla Firefox; Netscape Navigator. For government sites characteristic preference for the Internet Explorer browser, this limitation is due to the possibilities of operating systems, site administrators.

The main purpose of the program browser - to display information in the form of well-designed pages. Modern browsers also offer additional features:

- contextual search through the pages;
- spell checker;
- the ability to block pop-up windows;
- warning on the availability and load cookie;
- availability of downloads and other managers.

Browsers differ interface, features, platform and Internet protocols, data rates, the relevance of pages, features the construction of the search query results, supported image formats, information security algorithms. The developers and site administrators must take into account those differences to ensure the effective operation of search and user friendly website.

When managing an important information resource tool for promoting thematic site profile is the exchange of links to other resources. For this section of the site is formed, where links are placed, usually with feedback. Optimize the tool can be achieved by forming a multi-level directory of links or pagination links. All this allows us to increase technical citation index, as well as the overall rankings, that is, to optimize the indexing of the site.

Site Administration is aimed at achieving one goal - to find the target visitor. The target visitor - a user who is completely satisfied with the result of a search query, which is oriented to the page of a particular site, and can fully take advantage of the site services, realizing the purpose of this resource, options and service capabilities, which took advantage of, and ideally - become a regular user. To increase the number of users and secure their online used multiple approaches, but there is one approach, the use of which occurs infrequently - a design version of the site for people with disabilities.

Many sites of state authorities declare on their websites availability version for visually impaired people, but in some cases, special design tools are not applicable sites, then using the limited version of the site more visually distinguishable fonts, decrease in the number of graphic elements and other tools. There are standards and verification of conformity of the content structure of the site-specific validators (quality system requirements), for example, W3C (<http://www.w3.org/QA/Tools/>) standard. In order to match the site an adequate degree of validation is necessary to create a separate site with its own settings, and content selection. On the page of the site should be available user guide, provides site configuration style, the ability to use shortcuts. Of course, it should be possible to customize the appearance of information, formation and processing of the request, which will allow the user to easily change settings, some CSS properties and save them.

Presented in research settings and the content of the functional capabilities of information resources are the basis of information support system of public control in the field of procurement. A logical extension of this study is to develop a methodology and rating formation of centralized resources of state authorities and public organizations resources, associations engaged in social control measures in the area of procurement. With regard to the official site of the All-Russian advisable to conduct a comparative analysis with the same information resources of foreign countries in which the operating system in the contract procurement.

In Russia, the main source of information on the implementation of the procurement by government customers is the UIS for posting information about placing orders for goods, works and services. UIS consolidates information on all the purchases based on the disclosure of the full procurement cycle technology - from procurement planning to make information about the completion of the contract. The public part of the UIS is used to search for information, analysis and monitoring of data on the activities of customers, supervisory bodies, of the public discussion of the procurement.

However, the UIS is not designed to handle user requests for aggregated data selection, for example, a summary of the procurement on a particular region or a summary of the procurement activities of the individual customer. Integration with related systems the UIS ensured by transmission of electronic documents of a certain format, transformed using an XML markup language (hereinafter - XML-documents), transmitted in electronic form via telecommunication channels. The list of related systems involved in the process of receiving and transmitting the information is private. Under adjacent systems, understand the hardware and software systems (HSS) of the following subjects:

- HSS electronic trading platforms (ETP);
- HSS external systems of order placement (ESPL);
- HSS Russian Federal Antimonopoly Service (FAS);
- HSS Russian Federal Treasury (FTAS).

Certain formats are XML-documents are intended to convey information during all modes of procurement of accommodation, registration of contracts (including information on their performance and termination), registering complaints, recording the results of the control activities (including information on the implementation of the decisions and instructions of controlling bodies).

The UIS receives data from the adjacent via HTTPS system uploads data to ftp-server and communicates with external parties (ETP; ESPL; FAS) data protocol Applicability Statement 2 (hereinafter - AS2) [5]. List of electronic platforms and external systems of placing an order with which data is exchanged in AS2 format, strictly defined. Established following on the AS2 protocol communication parameters:

- XML format;
- secure telecommunication links with APKSH "Continent" 3.5 (certified FSC and FSTEC Russia);
- compliance with the XML-schema document integration fcsIntegration.xsd;
- the amount transferred XML-documents from 1 to 100 MB (for the flow of information, «the UIS ↔ HSS ETP»);
- the number of connected external automated systems is not changed (not made new connections) (for the

flow of information, «the UIS ↔ ESPL HSS»).

Procedures for receiving and transmitting information using the HTTPS protocol are presented in the following list:

- formation of information;
- publication of documents;
- upload data to ftp-server the UIS;
- provision of published documents and background information.

Formation of information is carried out by the direction of the external systems of order placement in the UIS XML-documents (for example, notification of the purchase or information about the contract) in UTF-8. XML-document signed by the electronic digital signature (hereinafter - EDS), formed with the help of the authorized body of the certificate. This ensures that the XML-document contains information coordinated properly. By electronic signature must meet the following requirements: the formation in accordance with CadES-BES standard [6]; Base64 (detached) format.

Web form for the implementation of the XML-document downloads available at <http://zakupki.gov.ru/pgz/extegration.jsp>. Information transfer funds from the adjacent systems in the UIS determined taking into account the following parameters:

- information is transmitted via secure telecommunication channels at (<https://zakupki.gov.ru/pgz/services/upload>) open part of the UIS for the HTTPS protocol. It uses the TLS cryptographic protocol (client authentication is not required);
- XML-documents allows the transfer of no more than 100 megabytes;
- a time limit for the HTTPS-session for slow connections - 120 seconds;
- as investments in XML-documents are accepted file formats pdf, docx, doc, rtf, xls,lsx, jpeg, jpg, bmp, tif, tiff, txt, zip, rar, gif, csv, odp, odf, ods, odt , xsc, sxw.

The information in the UIS is sent using the POST method (Content-Type: multipart / form-data), using the following parameters:

- login (type - string, required) - name of the user performing the download information (login to log in to My Account the UIS);
- password (type - string, required) - The user's password to log in to My Account the UIS;
- client Type (type - string, optional) - the type of client, the possible values of EPO, VSRZ (default VSRZ);

- signature (type - file optional) - electronic signature of the XML-document.

After receiving the POST-request application software monitors the UIS received information on the following algorithms:

1. Checking authentication information:
 - control authentication information transmitted in a POST-request login and password parameters, the definition of users to download the notice or information about the contract in the UIS;
 - control user access rights on the formation of the transmitted XML-type document.
2. The verification of XML-document:
 - monitoring compliance with the format specified by these requirements;
 - control on the logical integrity and consistency of the information transmitted;
 - control exercised by the subsystem of the automated control of information posted in the UIS;
 - control on the format, the size of the attached files, as well as anti-virus control.
3. The electronic signature verification (performed if the digital signature of the XML-document is sent as part of the POST-request):
 - control certificate for compliance with these requirements: the certificate must be issued by TC FC must not be expired or revoked, must be issued by the authority employee of the authorized body in accordance with the document "Rules One universal certificate";
 - control of the lack of information distortion in the XML-document.

If for control results in the transmitted information does not contain critical violations, application software the UIS will download the information in My Account, an organization that appears in the XML-document as an organization to place orders. The downloaded information is made available to users of the UIS in a private office in a state which excludes changes in the user interface, in accordance with the powers of organization, privileges and user access rights and settings the UIS.

If the XML-document that was sent as part of the POST-request requires approval to another entity (such as the authorized body), analyzed that passed in the parameter «signature» electronic signature belongs to the organization that is to implement the agreement. If so, the document shall be deemed approved and is displayed in the dashboard organization that appears in the XML-document as an organization to place orders. Otherwise, auto-negotiation does

not occur, and the document is displayed in the dashboard organization that appears in the XML-document as an organization to coordinate.

By monitoring the results generated synchronous protocol, download data in XML format. Formed protocol is transmitted in response to the POST-request in the form of XML-messages. download protocol may include:

- information on the result of loading data into the Personal Area;
- a list of detected errors and irregularities (in the protocol reflects a list of detected errors and violations);
- status "in processing" and boot room.

Query Protocol the UIS is performed using the GET method. The answer will be given a download protocol, which in the case of a successful download of a document, the protocol will be specified identifier of the loaded document and the hyperlink to the form display of the loaded document. At this stage of formation of the information in the UIS ends and begins the phase of published documents.

After the download, protocol request by the organization to place the information must be logged in My Account, the UIS and start publishing process with the following features:

- in case of incorrect information have been added to the Dashboard, you must correct the information by re-loading the XML document (indicating the ID (data download ID-protocol) in the formation of the XML-document to reload);
- the need for coordination is determined by the settings of the UIS.

Published XML-documents are uploaded to ftp-server the UIS. These are discharged in the form of XML-files generated in accordance with the scheme fcsExport.xsd and packed in ZIP-archive. Each archive contains in its name and an indication of the type of discharge time period for which the archive contains details. Unloading subject to the following data types:

- full discharge of all outstanding regional / the UIS published documents;
- upload data bank guarantees;
- unloading of reference;
- upload data on the contracts for the AU TSAFK.

Archives landings documents may include a set of files, each of which is only one XML-document. In this case, one file can contain different types of documents are XML-documents and contain no more than 1000 XML-documents. Each file in the archive contains a filename views contained therein XML-document (actually XML-tag facility in accordance with the scheme fcsExport.xsd) or record number of the object

described by the XML-paged document or object Roster number variable paged XML-document. In addition, the file name is usually specified in a document identifier UIS.

All unloading can be performed automatically (default) mode, and can be run manually by the operator. Landings of published documents, launched by the Operator, characterized

in that in the name of a file upload is added to specify the date and time of unloading. For information about published in the open part of the UIS documents the user can take advantage of the public discharge of all published data in the UIS. Organizational chart of all the processes of reception and transmission of information (data generation, data publishing, data upload) in the UIS is presented in Figure 1.

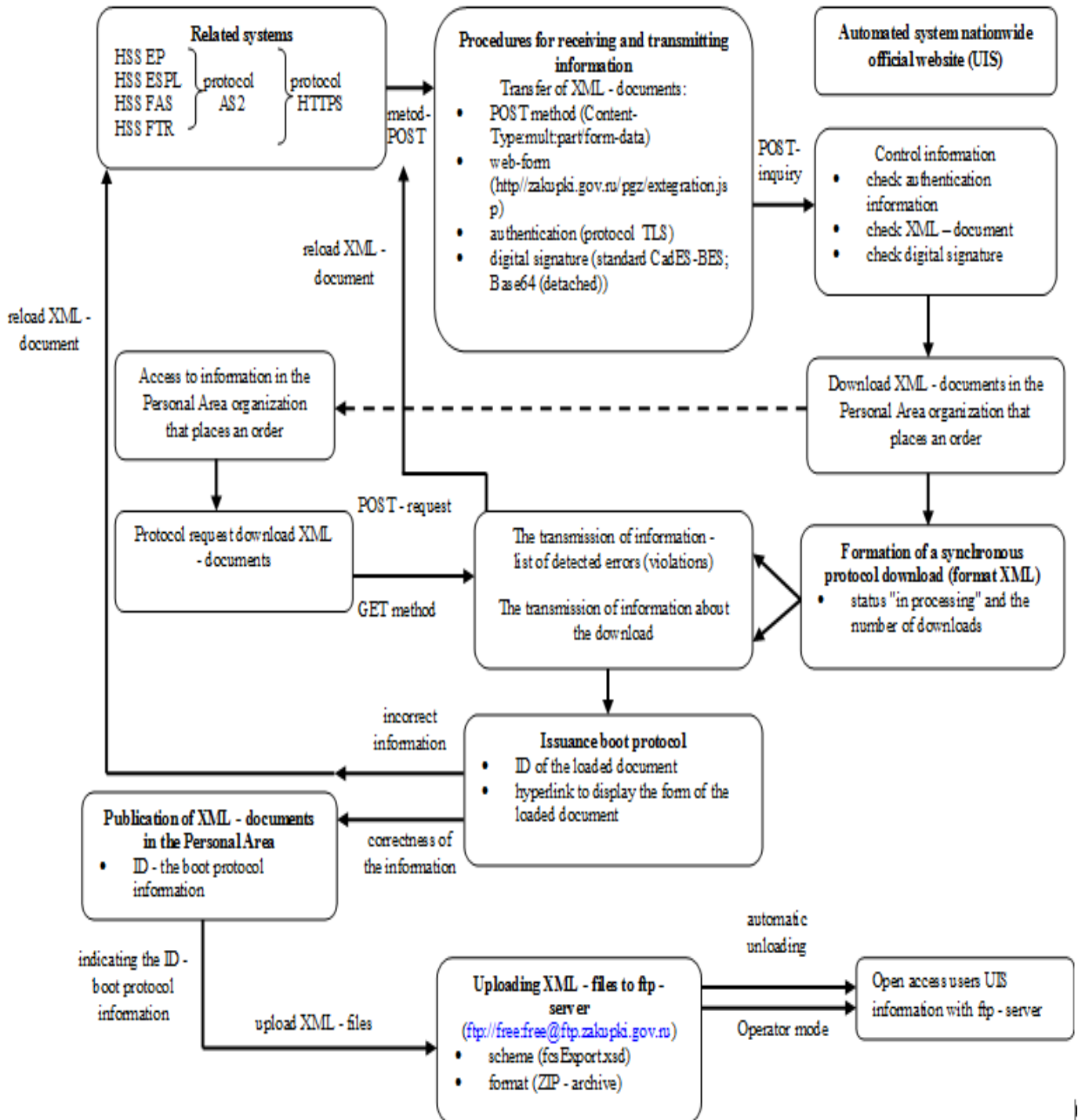


Figure 1: Scheme of processes of reception and transmission of information between the UIS and related systems

All generated and archived XML-files are uploaded to the server free@ftp.zakupki.gov.ru. Since XML-upload files to ftp-server as they become available for download any information systems, with any frequency and in any amount. This can be a one-time operation and constant load on the sites ftp-server updates. In Russia, there is a market of consulting services for organizations involved in procurement. The portfolio of services typically involves the selection of the procurement placed in accordance with the profile of procurement participant, analysis, documentation, accounting and legal support party activities on the preparation, filing (offers) prior to the conclusion of the contract. All organizations providing similar services, carried out the procurement selection, documentation of purchase, form their own base of planned, ongoing, completed purchases using the UIS ftp-server resources.

Sites designed for monitoring, analysis, evaluation of the placement of these purchases, downloads, and ftp-server updates. Traditionally this is done by the robot and lodged in accordance with the regulations, for example:

- each calendar day (daily) loaded list of documents published in the previous calendar day;
- each calendar month (monthly) cleans prevMonth directory, move files from the directory in currMonth prevMonth catalog directory and cleaning currMonth;
- each calendar month (monthly) loaded list of documents published in the previous calendar month;
- daily and monthly loads are always loaded with all types of documents published for the last calendar day or calendar month, respectively. If at the time of formation of load during this period there have been no published document of any type, the XML-file with this type of document is loaded empty;
- after completion of monthly downloads, catalogs with daily downloads for the last month cleared.

Thus, the UIS provides everything needed to download data in XML format via the FTP protocol. These are grouped by date and are updated daily. At each date of the file is generated in the ZIP-file format, which includes data on all procurement contracts published on the relevant date. Each publication corresponds to one of the XML-document archive. Unfortunately, XML format is designed for quick and easy retrieval. This information exchange format between applications, so it cannot be used to perform site user requests public control. To meet the challenge of achieving the efficient operation of the site database to be developed, in which the search data according to user request. Now it is the best solution for comprehensive monitoring, analysis and evaluation of the results of procurement of accommodation.

REFERENCES

- [1] Borisov A.B., Large economic dictionary, M: Book World, 2003, 895 p.
- [2] Mamedova N.A., The role of automated information systems (AIS) in the implementation of the principles of the federal contract system in the region, Open Education, 2013, vol 2, p. 11-15.
- [3] Turutina E.E., Matrosov E.V., Sailors Formation and development of a unified information space of Russia: political and economic aspect, Scientific notes KGAVM Bauman, 2014, p. 284-290.
- [4] Urintsov A., Dik V., Pavlekovskaya, I., Monitoring systems of application effectiveness are back. Scientific journal «Herald of Khmel'nitsky National University», 2015. vol. 3, 2015. 53-57 pp.
- [5] MIME-Based Secure Peer-to-Peer Business Data Interchange Using HTTP, Applicability Statement 2 (AS2) / <http://www.ietf.org/rfc/rfc4130.txt>.
- [6] CMS Advanced Electronic Signatures (CAES) / CAES Basic Electronic Signature (CAES-BES) / <http://tools.ietf.org/html/rfc5126.html#section-4.3.1>.