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NEWEST TECHNOLOGY IN CADASTRAL ACTIVITIES

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The article provides comparative analysis of multiple innovative technology in the field of cadaster activities. This analysis covers almost all currently available intellectual developments in this area. Paying tribute to contemporary trends in cadastral areas, the authors note the urgent need to upgrade the cadastral activities in the Russian Federation in relation to the transformation of the national economy. The authors suggest classifying the cadastral activities depending on type and kind of activity carried out with an object of cadaster registry. The article covers the most urgent issues in the area of functionality of existing special software packages in order to improve the labour efficiency of a cadaster engineer. It is concluded that the main purpose of existing software systems for cadastral engineers is creation of documents in electronic format for facilitating the process of interaction with public authorities in the sphere of land property relations. It examines in detail several software packages («TechnoKad-Express», «ARGO», «PKZO», «Poligon», «ProGeo»). The article provides comparative analysis of special software systems according to a number of authors' criteria. Based on the characteristics of programs and their comparative analysis, it is concluded that all the described software systems to greater or lesser degree, meet the needs of the working cadastral engineer. The choice of a specific program depends on the financial possibilities, personal preferences and level of computer-literacy of cadastral engineer, including in the sphere of GIS-technologies.

Key words: innovative technology, cadaster registration of real estate objects, cadaster engineer

Introduction. The development of innovative technology in our country is a top priority. The field of cadastral activity is not an exception. The research in this area have theoretical and practical aspects as well. In his papers professor S.A.Galchenko describe the chronology of changes in special systems for performing cadastral registry keeping activities by government authorities [2]. The researchers also pay great attention to application of modern GIS-technology in cadastral sphere. These issues have been studied by such scientists as S.A.Subbotin, A.V.Skvortsov [11], I.N.Rotanova; K.V.Vorobiev; G.A.Steklova, V.S.Fedotova [10]; P.M.Mazurkin, A.N.Fadeev [5]; A.Dawidowicz (Poland), R.Zorbek (Poland) [13] and others. The new technological innovations in the field of cadastral activities are not left unattended too: N.V.Klyushnichenko – «one window» principle application [4]; G.F.Gorn, D.A.Krylov [3]; D.K.Rosu (Romania), V.Ciolac (Romania), O.N.Coltan (Romania) [12] – government authorities using electronic technology; V.L.Belyaev; V.M.Romanov; V.N.Nikitin [7]; N.A.Nikolaev [6]; N.V.Gavrushina [1]; V.A.Pavlova [8] – 3D-cadaster application.

Problem description. The efficiency of land resources management depends on relevance and accuracy of cadaster data and preparation of necessary information by cadaster engineers. In the market economy conditions the cadaster information produced because of cadaster activity creates in a given state and community a basis for establishment of innovative climate implemented through innovative technology. According to current legislation the main output documents of cadaster engineers' activity are delimitation plan; technical plan; map (plan) of land management objects; parcel plan; land parcel layout on cadastral territory plan (CTP) and inspection report.

These documents have to be produced in printed and electronic format (XML-file). In order to do this a cadaster engineer needs special software packages. Lately there have been technological advances in automation in the field of cadastral activities, particularly, there appeared new innovative technology of collecting, processing and provision of information. One of the key innovative trends in real estate cadaster is current cadaster engineer programming support, with the help of which they can not only significantly reduce working time for performing cadastral work, but substantially lighten the work of cadaster engineers [9].
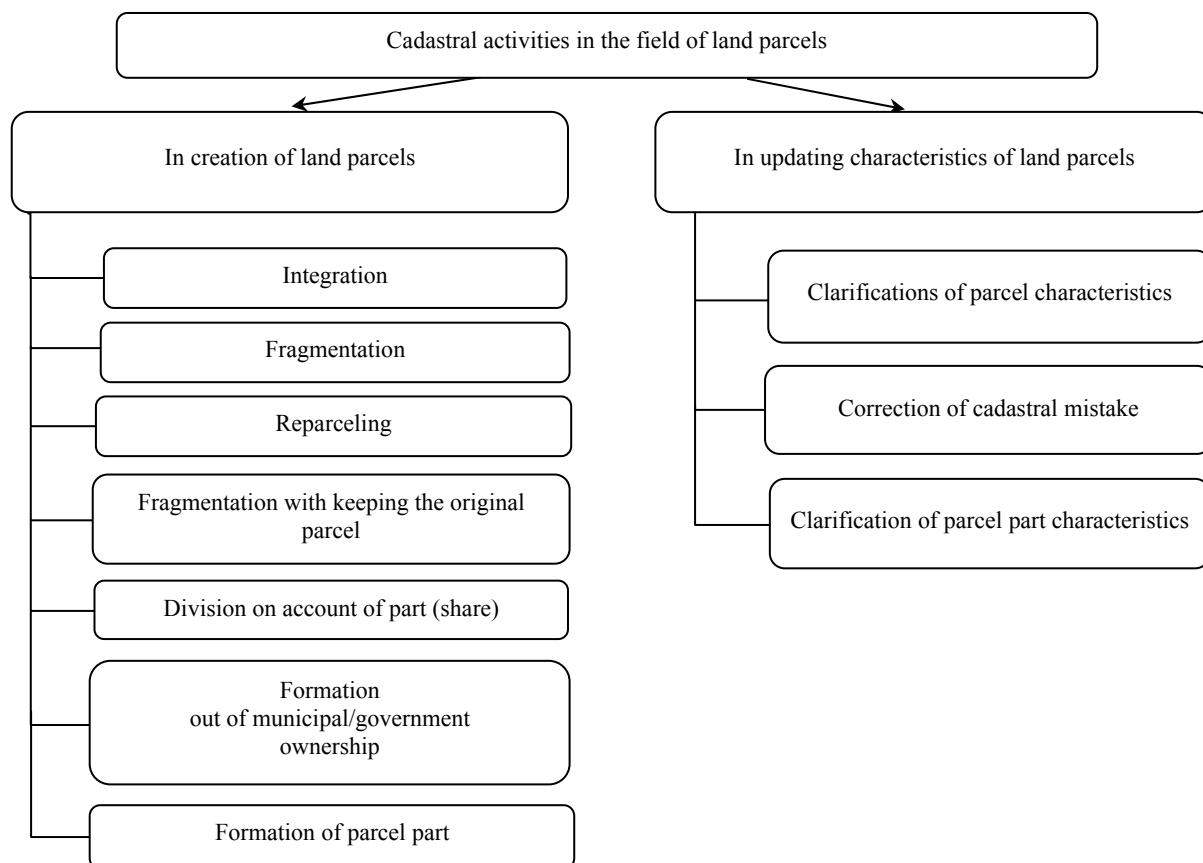
Fig.1. Types of cadastral activities resulting in delimitation plan

Research methods. Within the framework of this paper the authors have used such methods of scientific investigation as analysis of legislation and regulatorily framework, examining of software packages and analytical method.

Discussion. The innovative technology become of particular concern during times of transition and crisis (this is the period we are in now), when production technology is being changed almost completely and there arises an acute need in modernization of cadastral and other types of production and all public spheres management activities, their transformation to a new condition matching national purpose (shift to innovative economy).
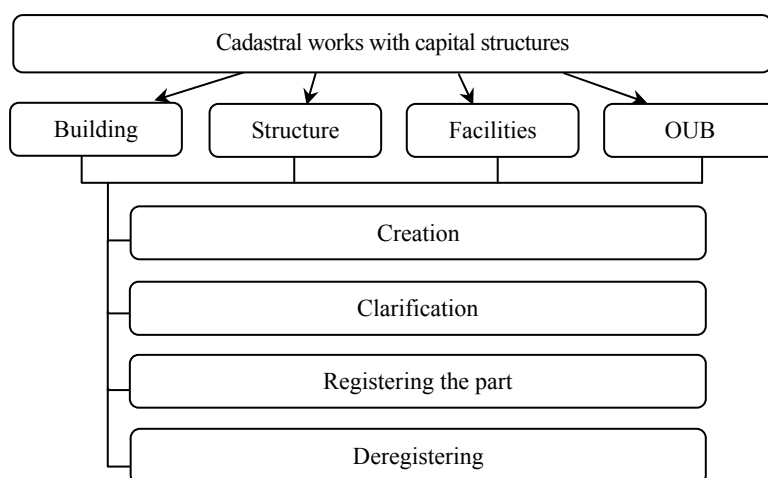
Different types of cadaster activities have specific output documents. For example, cadastral work with land parcels (LP), according to our opinion, can be divided into two large groups: activities connected with creation of land parcels and activities related to introduction of amendments to existing characteristics of land parcels, which depending on used tools and peculiarities of processes of cadastral works can be subdivided into specific types (Fig.1).

Cadastral works with capital construction objects differ depending on types and mode of interactions

Fig.2. Types of cadastral work resulting in technical plan and inspection report

with this object (Fig.2). The output documents can be the following ones: technical plan and inspection report, the aim of the last one is to provide information for cadastral derigestering of a building, structure or object of unfinished building (OUB).

The document representing main information on land management objects and required for making entries in State Real Estate Cadaster is a map (plan) of land management objects. The peculiarities of creation of this document also depend on a type of an object for which this document is issued (Fig.3).

Fig.3. Types of cadastral activities resulting in a map (plan) of land management objects

It should also be noted that for preparation of delimitation plan for division of a land parcel on account of a part (share) it is necessary to create a delimitation project, which is also considered to be a cadaster documentation though it has only a printed approved version.

The last type of cadaster documentation, which can be prepared by cadaster engineer, is a layout of land parcel on cadaster territory plan. This type of document is required to form a land parcel out of municipal or government owned lands, it is approved by executive authority or local government institution.

From July 1, 2016, cadastral engineer must submit a printed copy of act of accommodation of land plot borders together with a covering letter to a government authority performing cadastral registration. The covering letter for an act of accommodation of land plot borders compiled during clarification of land parcel boundaries must be in XML-format.

The main goal of existing software packages for cadastral engineers is to create documents in electronic format, which significantly simplifies the interaction process with government authorities working in the field of cadastral registration. The amount of special purpose applications has now reached the number of more than 20 software packages, but according to our point of view among them there are undisputed leaders in this professional field. Let us have a close look at some of them: «TechnoKAD-Express», «ARGO», «PKZO», «Poligon» and «ProGeo».

One of the most popular software packages is «***TechnoKAD-Express***» (a package of software and services of TechnoKAD-Express // technokad.ru: official website of «Techno-Kad» company. URL: http://www.technokad.ru/productes/technokad-express/ (date of access: 17.02.2016)). This software package has three modules: «Delimitation plan», «Technical plan» and «Information inquiry». There is a possibility to purchase the whole set of modules or some of them (separately). This feature helps «TechnoKAD-Express» to enlarge its circle of customers. For example, the «Information inquiry» module is very popular among real estate agencies and design companies. The graphical part of cadastral documents is not created in «TechnoKad-Express» but for this purpose you could use a separate software «TechnoKad-Geo» or any other special purpose software. With «TechnoKad-Express» one can create such documents as delimitation plan, technical plan, map of land management objects, inspection report and different types of application forms.

Let us consider the distinguishing features of «TechnoKad-Express» software package in the area of creating text part of delimitation plans. When using «TechoKad-Express» the defining point is a type of performed activity, after that a user inputs information on unique characteristics of land parcels. The autocompletion function is not fully developed, so some data should be entered manually. The creation of template forms is also not a strong side of this software.
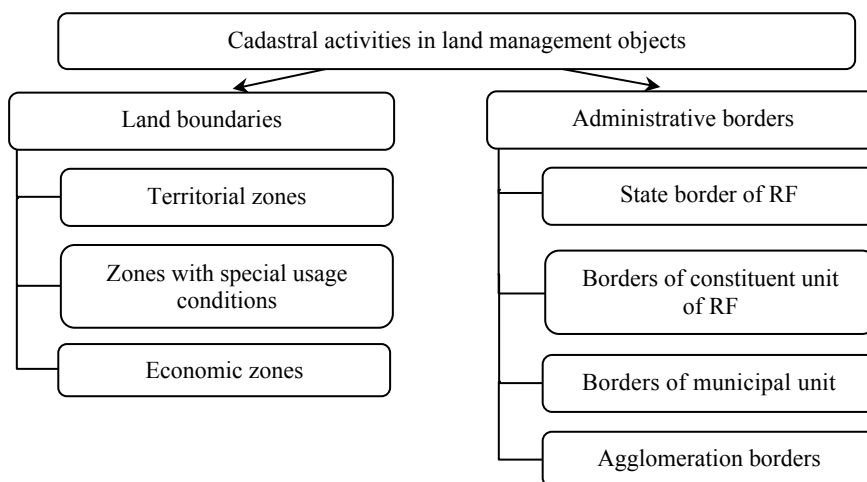
315

The coordinates of land parcel can be produced only in two ways: by importing them from a file with mif extension, which is a feature of MapInfo files, or from a file with txt extension, which creates some requirements to additional software.

The developers of «TechnoKad-Express» closely work with representatives of cadaster registry office, which has positive effect on quality of this software package and provides quick update of information in accordance with current cadaster legislation changes and requirements to cadaster documentation. This software enables checking the prepared documents before sending them to cadaster registry office.

«TechnoKad-Express» is a unique software package providing a cadaster engineer with an opportunity to have a qualified electronic signature (hereafter QES), which is needed for approval of output electronic documents. Another not unimportant advantage of «TechnoKad-Express» program is a technology of submitting application forms on cadaster data changes with a unique service of issuing applicant QES.

Within the framework of software functionality, a user have a possibility not only to order the desired information from Unified State Register of Rights to Real Property but to pay for this service with upfront credit payment method.

The developers of «TechnoKad-Express» conduct workshops and webinars in different parts of Russian Federation.

According to our point of view, one of the disadvantages of this software is payment for submission of electronic documents for all types of cadastral activities to cadaster office through Internet. Besides this a user also should pay for annual license renewal to continue using the modules of «TechnoKad-Express» software.

A very special popularity among cadastral engineers has gained the **«*ARGO*»** package (Software package ARGO // new.argogeo.ru: official website of ARGO software. URL: http://new.argogeo.ru/ (date of access: 17.02.2016)). Its key advantage, according to its developers' point of view, is absence of need to use additional software since this package has all necessary features and functions for creating text and graphic parts of cadaster documents. The software has so many functions and possibilities, that it is a little bit difficult to use it without additional examination of guidelines.

This software package gives a cadaster engineer an opportunity to create such documents as delimitation plan, technical plan of a building, structure, object of unfinished building and a room, delimitation project, printed copy of a map (plan) of land management objects. There also a possibility to create electronic versions of these documents in XML format. The information on coordinates of land parcels boundaries for layouts of land parcels position on a cadaster territory plan can also be exported for electronic document flow.

Despite the high level of technical support, the software is not always able to perform well in non-standard situations. For example, the lack of ability to edit the text part, namely the act of accommodation of land plot borders, can hinder the work of the cadastral engineer, and thus a need to use advanced text editors arises.

The user interface of the program is similar to interface of the latest versions of AutoCad software, which makes it easily understandably for most experienced cadastral.

Compared to majority of similar programs, «ARGO» gives you the opportunity to work directly with the public cadastral map, namely: to search for real estate objects, to look through not only the boundaries of real estate objects, but their main characteristics. There is also a possibility to import rasters surfaces (layers) into a drawing directly from the public map, which greatly facilitates and simplifies the process of creating clear layouts of land parcels. The software package will recognize such formats as dxf, mif, and xml, the output data can be in the same formats, and in rtf, xls and pdf as well.

The ability to create different layers in the graphics part of the «ARGO» software allows you to simultaneously create all kinds of graphic documents for a specific object, but it also hinders

their correct representation when you select different scales for various documents. The «ARGO» software works not only with imported objects. Using the program tools, you can create your own objects with the specified areas and configurations.

The software package supports parallel work on the same object from different computers, that are connected into one workgroup. The check of output documents is carried out only for accordance to the actual xml schema of Federal Service for State Registration, Cadastral Records and Cartography (FSSRCRC).

The program «***PKZO***» (Program of PKZO // pkzo.ru: official website of PKZO software. URL: http://www.pkzo.ru/product/ (date of access: 17.02.2016)) consists of three modules: «Delimitation plan», «Technical plan» and «Survey map». The program is based on GIS ObjectLand, despite that it supports both the import and export of other formats, such as dxf, mif, csv and shp.

The installation process and initial settings of the program requires both time and expertise. The ability to use one key for multiple workstations, on the one hand, reduces the cost of using this program, on the other hand, it leads to difficulties in work process, because you need additional software for setup procedures. For professionals working in GIS ObjectLand, the interface is simple, intuitive and familiar. «PKZO» provides broad opportunities for the formation of the graphic part of cadastral documents.

Unfortunately, the software does not have a possibility to directly interact with Federal Service for State Registration, Cadastral Records and Cartography, but it has a great advantage, which can be considered as a function of verification of documents on compliance to the relevant xml schema of Federal Service for State Registration, Cadastral Records and Cartography and checking of geometric correctness and the fact of crossing borders.

Another representative of software systems created for cadastral engineers, is a «***Poligon***» package (a series of Poligon programs // pbprog.ru: official website of the programmatic center of «Help to education». URL: http://pbprog.ru/products/programs.php?SECTION_ID=99 (date of access: 17.02.2016)). This name combines a number of different independent programs that are capable collectively solve practically any task facing cadastral engineer. By selecting the desired program, you can minimize material costs for the purchase of necessary programming support.

The software of «Poligon» package has a simple interface. Like the excel file, the application space is divided into sheets, each sheet corresponds to a separate section of created cadaster document. When entering the missing information in the sections of the cadastral document, the software gives you the opportunity to select them from collection of existing templates. In addition, the user is given the opportunity to create his own templates, which significantly speeds up and simplifies the process of creating a cadastral documentation.

The software of «Poligon» package is highly standardized, in order to import the coordinates, it support all currently available formats: dxf, mif, doc, xls, csv, txt.

The software package also allows you to create a number of additional documents that are included in the application, such as: notification on the meeting on approval of location of land boundaries with the receipt, the record of the land parcel formation process, the act of submission of landmarks for safety monitoring, the scheme of landmark location, the declaration, inspection report, etc.

The «Poligon» package is based on the Word program of Microsoft Office software or a free program Writer (OpenOffice.org), so the graphical presentation is not implemented. The key feature of the program lies in the fact that generation of graphical partitions of cadastral documents is done in Word (Writer) using AutoShapes with preset collection of symbols, line types and colors, which is suitable only for small and non-complex configuration objects.

Another advantage of the software is a possibility to create automatic layer of the public cadastral map and satellite image in all graphic sections and layout of cadaster territory plan, and attach a raster basis layer.

In contrast to the above mentioned software systems, the main author and developer of the «ProGeo» is known – N.G.Malyutin.

The «***ProGeo***» software (Program, ProGeo // zwsoft.ru official website of «ZWSOFT». URL: http://www.zwsoft.ru/applications/programmnyi-produkt-progeo-progeo (date of access: 17.02.2016)) is an additional application to ZWCAD – a cheap analogue of AutoCad from China, so the visualization is provided by a CAD system. This innovative technology allows you to create both text and graphical parts of documents: delimitation plan, technical plan, map (plan) of land management object, the scheme of location of land plots on the cadastral plan of the territory, delimitation project, as well as related documents such as notification on the meeting on approval of location of land boundaries, the record of the land parcel formation process, and declaration.

The program allows you to develop projects both «from scratch», and on the basis of the imported data, the import is supported from both from the CAD programs and files created in specialized geodetic applications, as well as from files of arbitrary format. The software contains a set of additional tools that simplify the work of the cadastral engineer; all tools are based on the existing requirements of the cadastral documentation.

Comparative analysis of software packages for cadaster engineers

Evaluation criteria	TechnoKad-Express	ARGO	PKZO	Poligon	ProGeo
Developer	LLC «TechnoKad» (Moscow)	LLC «Buznes POiNT» (Moscow region, Odintsovo)	CJSC «Radom-T» (Taganrog)	Program center «Help to education» (Kirov)	N.G.Malyutin (Rostov-on-Don)
Types of output documents:					
Delimitation plan	+	+	+	+	+
Technical plan	+	+	+	+	+
Inspection report	–	–	+	+	+
Declaration	–	–	–	+	+
Map (plan) of land management object	+	+	+	+	+
Delimitation project	–	+	+	+	+
Layout of land parcel location on CTP	–	+	+	+	+
Additional software (besides CryptoPro)	1. TechnoKad-Geo 2. MapInfo 3. MC Office 4. Converter to pdf	–	1. GIS ObjectLand 2. MC Office 3. Converter to pdf	1. Microsoft .NET Framework 2. Microsoft Office or Open Office	1. Microsoft Office /Open Office/ SoftMaker 2. ZWCAD/, AutoCAD/, BricsCAD/, GstarCAD/ nanoCAD 3. Converter to pdf
Visual interface	–	+	+	–	+
Direct interaction with FSSRCRC	+	–	–	+	+
Program cost, rub	8000	13900	46000	25630	8000
Update cost, 1 year subscription, rub	1st year – 4800 2nd year – 3900 3rd year – 2700 4th year – 0	2560	13500	0	0
Technical support	+	+	+	+	+
Check of documents before submission	+	–	+	–	+
Possibility to create covering letter for act of accommodation of boundaries in XML-format	–	–	–	–	–
Possibility to sign documents with QES	+	+	+	+	+
Work with one object on several workstations	–	+	–	–	–

The program creates the text part in Microsoft® Office (Excel), and SoftMaker Office or OpenOffice, and the graphical one in any CAD application. And when you first start «ProGeo» software, it automatically finds the previously installed versions of necessary programs. You can check the correctness of filling up the cadastral documents only after their creation. Check of the xml file is also done only after its compilation, and the program gives information about boundaries overlapping, even if such intersections are within acceptable limits.

The program is regularly updated, the technical support is carried out remotely, either through email or through the discussion forum on the website of the distributor.

We have done a comparative analysis of the considered software complexes (see table).

Conclusion. As it follows from the characteristics of programs and their comparative analysis (see table), all described software packages to a greater or lesser degree, satisfy the needs of the working cadastral engineer. The choice of a specific program depends on the financial possibilities, personal preferences, and level of computer literacy of cadastral engineer, including the sphere of GIS-technologies. Each of these software systems is being constantly improved to simplify, modernize and optimize the work of the cadastral engineer during creation and compilation of cadastral documentation. But we should not forget that no matter how «smart» the program is, most importantly, is what kind of professional uses it, because of his qualifications, experience and skills depends not only on the accuracy and correctness of the created cadastral documents, but all his activities as well.

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