Cadastral Information System of Sofia

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Key words:

ABSTRACT

A new Cadastre and Property Register Act (CPRA) was passed in April 2000, setting up rules for the maintenance of these two registers.

Funded by the Municipality of Sofia through the GIS-Sofia Ltd., the development of an Information System of the Cadastre (ISC) has started for the territory of the Sofia Capital City. Work on the project is carried out jointly with the Registry Office at the Sofia district court, and a system for the exchange of data between the two offices and between the cadastral and the court registers is being implemented. A prototype of the ISC has been developed to assist the main function of the cadastre – the current registration of real property ownership. The development of the real operative ISC has been contracted out on the grounds of the assessment of the performance of the prototype ISC.

The prototype of the ISC was developed within ArcView environment. The whole functionality of the applications was developed also in AutoCAD MAP R 4.0. environment. The data bases are maintained in an SQL Server. It is envisaged that the real ISC will be realized within SQL Server environment, and the link with the graphic environments of Arc View and Auto CAD MAP is to be realized through ESRI SDE. The ideology of the ISC development will be based on the principle of modularity, and for each module different basic software products are to be used without imposing any changes to the rest of the modules. It is expected that parts of the ISC will be operative by April 2002.

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1. PREREQUISITES FOR THE PRODUCTION OF THE CADASTRAL INFORMATION SYSTEM (CIS)

A new Law on Cadastre and Property Register (LCPR) was passed in April 2000, setting up rules for the maintenance of these two registers and data exchange between the registers already established in Bulgaria – such as the property register of the Ministry of Finance, the register of natural persons, the register of firms, etc. The by-laws and regulations under this Law are being drafted at the moment, as well as the design of the information system (IS) supporting these registers. The experience we gained in the development of the cadastre IS of Sofia is very useful in setting up the national system.

Work on developing the cadastre IS started in 1987, with digitisation of the cadastre effective at that time. Unfortunately, the level of computer technology and work methods at that time did not allow the establishment of a real information system. Also at that time, surveys on site and a database about the building assets in Sofia were initiated. The works on first digitisation and establishment of building assets database were completed in 1993. Only the part of the compact city was digitised then, without the surrounding settlements. In the period from 1993 to 1996 the work on the IS went on with great difficulty. Bulgarian economy went through a very harsh crisis.

The territory of the compact city of Sofia is 180 000 000 sq. m. Apart from the compact city, 4 more districts with a total of 42 settlements – 39 villages and 3 towns – lay within the jurisdiction of the cadastral office of Sofia.

Cadastral mapping in Sofia is maintained in two scales: 1 : 1 000 for the whole territory of the city and its satellite settlements, and 1 : 500 for the compact city only. For practical convenience, a local coordinate system was established with known linkage to the state co-ordinate system. About 1 200 cadastral map sheets in 1 : 1 000 are maintained in the cadastral office. So far, the data maintained in the cadastre was predominantly about urbanised and developed zones. The farm lands restitution was completed in 2000. Starting in 2001, we maintain data about rural properties and properties in the territory of the forest domain, as well. Thus, we will achieve full cadastral data coverage of the territory of the Sofia Municipality.

We started again active work on the IS in 1996, when the Sofia Municipality invited tenders for normalisation of the data captured by 1993, and their input into Windows ArcInfo 3.5 environment. The task was completed and handed over for maintenance to the Municipality by the end of 1997.

In 1998, the GIS unit at the cadastral office of the Sofia Capital City Municipality was assigned with the task to start up-dating the digital mapping, to cover the whole territory of the municipality with digital data and to create an IS for its maintenance. This unit was transformed into the *GIS – Sofia* firm in 1999. The newly established firm keeps on working on the development of the geographical information system (GIS) of the municipality.

2. DIGITAL MAP BASE

Digitisation of cadastral plans containing elements of properties and buildings was completed in the summer of 2001 by introducing the unique identifier for each cadastre object. The basic digitisation work was performed in ArcView 3.2. environment. A number of applications were developed in this ArcView environment, which considerably facilitated the work with the product for digitising raster images. Under the previous maintenance procedure for paper based cadastral mapping, there were about 250 areas for the territory of Sofia, where the property identifiers were unique. Very frequently the boundaries of these areas were not well defined and there were flaws in the uniqueness of property numbers. This imposed a very detailed verification of each property and its unique identifier. This activity was done within administrative wards. So far, the verification has been completed in one pilot area. At that, we developed a technique for this verification and the procedure of error correction.

The total number of digitised properties is 133 000, and of buildings – 242 000.

Cadastral registers are also maintained by the cadastral office. In order to maintain the ownership data, we have developed a data base model and specialised software for data input, correction and carrying out information searches. Using this software, all available names from the ownership ledgers were entered in the data base. During the verification of the graphic cadastral data, we link the relevant data from the ownership ledgers to each property. This activity is performed by a specialised team of highly qualified professionals.

Under the old Law on Territorial Planning the urban planning regulation schemes were administrative acts establishing new or amended private ownership rights. For the urbanised zones very frequently the property identification in the ownership documents and records was by identifiers from the urban planning regulation schemes. This entailed the digitisation of these schemes and the establishment of a graphic data base of the regulated land parcel boundaries (*i.e.* according to the enacted urban planning regulation schemes). A procedure was also designed for feeding back changes made to the urban planning regulation schemes into the database.

3. DEVELOPMENT OF THE ISC

The development of the ISC was done in four steps – development of a prototype of the system, performance evaluation of the prototype, design of complete technical specifications and terms of reference and development of the ISC.

The prototype of the ISC was completed in the middle of 2001. Modules were developed for the data exchange between the graphic environment and the data base with object attributes. The first version of the data base was within Access environment. The piling up of a considerable volume of data and the need for additional functionality demanded a conversion to SQL Sever environment. Substantial additions and alterations were made in the course of performance evaluation of the prototype. The functions for verification of the cadastral objects and their association with the ownership data base were added.

The prototype software consists of procedures developed in Visual Studio environment as libraries, scripts in Avenue for ArcView, and SQL Server procedures. Several modifications in the data base model were also made the course of performance evaluation of the prototype. The work on improvement of the prototype in the course of its evaluation lead to the realization of the ISC. The main idea of the system development is the separation of the user interface from the kernel of the system. In this way, three parts of the ISC are formed:

- Kernel of the ISC – structured data, relations which maintain the data integrity, solve specific tasks of the cadastre, provide the authorisation to access the data. The kernel of the system was developed in SQL Server.

- Library of functions – procedures and functions external for the kernel, which realize bidirectional data exchange between the kernel of the system and the interface. They were realized as DLL libraries. Part of them have their own separate user interface.

- User interface – the interface of ArcView was used. The attempts to transfer the functionality into AutoCAD MAP show a relative independence of the user interface from the other two parts of the system.

This approach brings about an opportunity for quick and efficient transfer of the functionality of the system to various graphic interfaces and for independent development of the other modules – access to the data through Internet, development of own interface, etc. A next step in the development of the ISC is the conversion to an object-relational data model. For this purpose, the resources of ArcSDE are used.

4. DATA EXCHANGE WITH THE ENTRY BOOK OFFICE

According to the LCPR, the information about the deeds of ownership is stored in the Entry Book office (EBO) under the Ministry of Justice. The EBO of Sofia had software developed for the entry of deeds in the personal registration system. As a first step for transition to work procedures under the new law, we have made some modifications to this software and have developed for this software procedures for data transfer between the EBO data base and the cadastre data. The EBO software was, and still is, in operation since 1998. Annually, on the average, 40 000 deeds are registered. In order to input deeds from previous years (before 1998) into the data base, we developed some specialised software. Apart from the information about the persons, the objects of ownership, the real rights and the relations between them, we also enter an electronic copy of the original of the deed itself. The tests of this software are already finalized. At present we prepare the working organisation for commissioning the normal operation of the software.

The big issue after the input of data from the notary deeds will be in identifying a correspondence between the deed and the property it refers to. This difficulty is caused by the varying methods of property identification in the description within the deeds – by address, by cadastral number, by number in the urban planning regulation scheme, by identifier in the restitution process (i.e. in the land reallocation scheme). Very frequently there are discrepancies between the different identifications. About 20% of the street names in Sofia were changed in the last 10 and many of the addresses and building numbers, respectively, were changed, too.

In some cases, for a certain territory there are several consecutive urban planning regulation schemes, valid just within their time frame, and the identifiers of one and the same parcel are different in the different schemes. The ownership deeds refer to the valid identifier at the time of transaction. These identification problems sometimes lead to the registration in the EBO of one and the same property as two different ones. In the course of software development, we ran a special workshop for notaries to present the identification systems, emphasising on the importance of unique identification. During the process of data matching, we envisage that a large proportion of the work will be done manually due to the wide variety of the data.

The new input software for deed data works in the data base model, which is used for the cadastral registers. This will help in the next stage for the two systems to work jointly in one environment and to use uniform information. The parallel operation of the two information systems – the ISC and the IS of the EBO – is of paramount importance to guarantee the correctness of the registers

We envisage to expand the functionality of the input software for deed data after its final completion, in order to turn it into the Information System of the EBO. A number of functions are being designed in it for the provision of services to external clients of the ownership register like notaries, real estate brokers and agents, etc.

5. SECURITY OF THE INFORMATION

For the operation of the system we created a special communication environment and a protection system against information damages. The information system is developed in Windows NT 4.0 environment and Linux Red Hat 7.1. The system of servers includes two local servers and a remote one, linked to our Local Area Network. Our local servers use Windows NT 4.0 и Linux Red Hat 7.1, and the remote one - Linux Red Hat 7.1. The master data record is kept on the Linux server, which automatically replicates the files that have changed on the second local server on an hourly basis. On a daily basis the changes are replicated on the remote server as the data exchange speed with it is considerably lower, and the procedure takes much time. The data is archived on a streamer, too, on a weekly basis.

6. TECHNOLOGY OF WORK

The realisation of the ISC kernel presents the cadastral data in three aspects – design status, current status and history. A scheme of operation in the cadastre, describing the events taking place in reality was set up in this manner. All changes of the cadastral objects that take place are first reflected as a design for a change. The transformation of the design to a current status depends on the implementation of the design, and on the legislative framework in the country. Before the change is effected, data of the current status is transferred to history. Multiple user access is ensured to all three data classes Many users are authorised to make changes in the design part. Only one single user is authorised to make changes from the design to the current status. All users are authorised to view the data in the design, current status and history classes.

The operation of transition from one status to another is based upon:

- Grounds for a change – most frequently application by an owner
- Assignment to a certain user
- Date of the assignment
- Type of the change
- Domain in which the changes are effected
- Date of completion of the revisions.

7. CUSTOMERS FOR THE INFORMATION

One of the main customers for the information in the established data bases are architects, who design the urban planning for different parts of the city. The new urban master plan of Sofia is being designed on the basis of the digitised cadastre. Digital cadastral data are used in the design works for the new underground (metro) of Sofia and the new city highways.
Our firm works closely with the Ministry of Finance IS of the fiscal property register, which is under development. We furnish current cadastral data for them, they check on site the real property declarations submitted by taxable persons and feed us back with the improved data.
We also work under joint projects with the *Water Supply and Sewerage* company in Sofia and the *Bulgarian Telecommunication* company. We are in negotiations with the maintenance firm for the electric power supply system of Sofia.

A census of the population was carried out in Bulgaria 2001. Jointly with the National Institute of Statistics we worked under a project whereby the results of the census were geo-referenced on the territory of the city. This was of paramount priority for the Sofia Capital City Municipality in order to improve the city management and to increase the efficiency of urban planning.

Our future plans for the development of our IS include the design of technology and applications for furnishing information from the data base via Internet. We have a completed software product for furnishing property data via Internet, which is our own development and is a simplified software for service delivery in the net. We are testing it on a pre-implementation stage at present. In the next stage we envisage the purchase of a geo-server for Internet and an increase of the variety of services offered.

8. CONCLUSION

The development of the cadastre system is based on:

- Maximum accelerated and adequate service delivery to the public

- Strict observation of the legislative framework of the cadastre
- Provision of cadastral data access to all interested organisatiopns and institutions
- Legal security of real estate transactions
- Return on the funds invested in the development of the ISC.

In this sense, the Information System of the Cadastre should be seen as a combination of state-of-the-art technology and people working under excellent organisation.