

System for publicly accessible Register of educational, cultural and health-care institutions

Zari Miroslav¹, Penca Valentin¹, Paroški Milan², Bulatovi Rajko²

{miroslavzaric, valentin_penca}@uns.ac.rs; {milan.paroski, rajko.bulatovic}@vojvodina.gov.rs

¹University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia

²Provincial government of Autonomous Province of Vojvodina, Novi Sad, Serbia

Abstract – A comprehensive Register of institutions in the fields of culture, education and health is an essential tool for policy and decision making in those fields. Institution can be either completely or partially owned and financed by local, provincial or state government. Therefore, those governmental levels can have various responsibilities in the process of decision making regarding further development, financing and planning in those institutions. In order to successfully perform their duties and exercise their rights in governing those institutions, comprehensive and up-to-date information about those institutions must be available. Appropriate form for storing potentially large amounts of data about those institutions is to build a specialized registry. By opening parts of such a registry to public access, the level of e-government service that local, provincial and state government is providing to citizens can be largely improved. Such an open access can be beneficiary to both citizens as well as professionals in those fields. This paper presents a pilot project of such a registry, developed for Provincial Government of Autonomous Province of Vojvodina. This paper presents overall data model necessary to support such a registry, as well as an implementation of one specialized registry - Registry of health institutions. The presented implementation is entirely based on open source software systems.

1. INTRODUCTION

Some of the most important activities of a government (be it a local, provincial or at country level) are in the fields of health, education and culture. Usually, on their cover region, they have the responsibility to fully or partially finance, manage and promote those institutions. Since the number of different institutions is growing, as well as their inner organizational complexity, and the duties they had to perform, it is increasingly hard to perform even just an oversight task on all the institutions, and managing their needs and resources is becoming even harder.

On the other side, for the general public, increasing number of different institutions is providing more and better options (for example different education profiles, more cultural events, or more options in health treatments) and better service, but can also lead to confusion and problems while trying to

determine the right institution for handling specific problems.

Existence of one easily accessible and searchable register of institutions can significantly improve everyday tasks for administrative employees (such as status reporting, managing and resource allocation) and also for general public.

Easy accessible administrative registers for different purposes are becoming the access point to eGovernment services. As stated in [1], “Administrative registers are the entry point for citizens’ or companies’ requests and applications. As such, they are one of the nerve centers of public administration.”

In the course of expanding its eGovernment services, the Provincial Government of Autonomous Province of Vojvodina has started a project to design and deploy the Administrative Register of Health, Educational and Cultural Institutions. While the project aims to develop a comprehensive register, and basic data for all types of Institutions (regarding type of ownership, legally required data – as registration with Chamber of Commerce etc) are common, the Register of Health Institutions in the Autonomous Province of Vojvodina is chosen as a pilot implementation.

2. BASIC REQUIREMENTS AND CONSIDERATIONS

Basic requirements and tasks for the project are stated as follows:

- Perform analysis of existing conditions in the area of interest;
- Define the appropriate common data set for all institutions;
- Define specific data required to efficiently describe different types of institutions and resources they have at their disposal (human resources, technical resources, sources of finances etc);
- Identify and model common business processes for reporting and planning purposes;
- Design the model of the software system for the Register of Health, Educational and Cultural Institutions located in the Autonomous Province of Vojvodina;

- System should use free and open source solutions whenever it is possible. Also system should be modular, to allow future expansions;
- System should provide an easy way to maintain data about institutions, as well as to track relevant documents, and where necessary to support business process logic;
- System should allow different level of access for government employees, employees from each of the institutions and general public;
- Implement one register (decision was made to implement the Register of Health Institutions) as pilot installation.

Starting from these requirements, the first phase of project was aimed at information gathering from relevant sources. In this case, a series of meetings is held with employees in provincial government, to discuss and determine the services they expect the register will be able to provide to them and to public. During this phase, a basic data model necessary to support register has emerged. In the next phase, in subsequent series of interviews, the more specific data set is discussed for each field of interest (health, education and culture). In the third phase, the complete model of the system was developed and discussed, and in the final stage of the project – an agreed pilot implementation (Register of Health Institutions) is installed.

3. SYSTEM COMPONENTS AND IMPLEMENTATION

Also based on project requirements, the system components were discussed. Basically, the software system for the Registers should allow for

- Easy expansion of its functionalities and underlying data model
- Support document management natively
- Support business processes where necessary
- Support different types of users and their respective roles

In previous years different types of administrative registers [2,3] were implemented as Intranet applications in IT sector of the Provincial Government, hence there is prior knowledge and skilled technical staff, and the decision was made to consider the similar system configuration for this purpose.

The core part of the system is module for storing and accessing register data, i.e. data describing each of the institutions. Since registers should allow for flexible data model, one that could easily be expanded and/or changed, to accommodate all currently defined and any future type of the institutions, the data storage system should not be “locked” in predefined data structure.

As many different types of documents can be in circulation, convenient access to document

management system is crucial for efficient work in such a registry. Therefore the core component must have some interface that would allow easy interconnection between data storage and associated document repository.

Additionally, the core data storage system should have an interface to easily interconnect with some kind of process management system. This would allow administrative users to use well defined business processes to steer critical tasks, and to easily manage user responsibilities in such processes.

Taking the aforementioned previous experience, after discussion with IT sector, following open source components were chosen to implement full scale system of administrative registers:

- CMDBuild [4] – an open source CMDB [5] system. This system enables users to define appropriate data models, with only a few basic classes as a common core. This allows for creation of arbitrarily complex data models, with specific classes and specific data types. Therefore, this system is ideal for implementing in environments where later upgrades and major expansions of data model is expected (as is the case with Registers). In addition, this system has built-in support for connecting to DMS system Alfresco [6], and workflow management system Enhydra Shark [7]. Additionally, it supports location based services, through access to publicly available services (GoogleMaps, YahooMaps, OpenStreetMaps) or locally implemented GIS services (through support for connecting to GeoServer instance).
- Document Management System (DMS) Alfresco – open source DMS system. Enables creation of separate workspaces for different purposes, access control through users and groups, and definition of documents metadata that will be used to search and locate document in the repository. Connected to CMDBuild, Alfresco is used as document repository, and all documents stored in workspace associated with CMDBuild are displayed as attachments to data objects in CMDBuild interface. This combination allows users to add and access relevant documents related to any object defined in CMDBuild.
- Workflow Management System [8] (WfMS) Enhydra Shark – open source WfMS enabling easy deployment of process workflows defined in XPD [9] or BPMN [10]. CMDBuild has built-in support for interconnecting to this WfMS. Importing process definition to CMDBuild creates an instance of process object in CMDBuild environment. This instance can be executing, governing the tasks needed to fulfill some predefined business process.

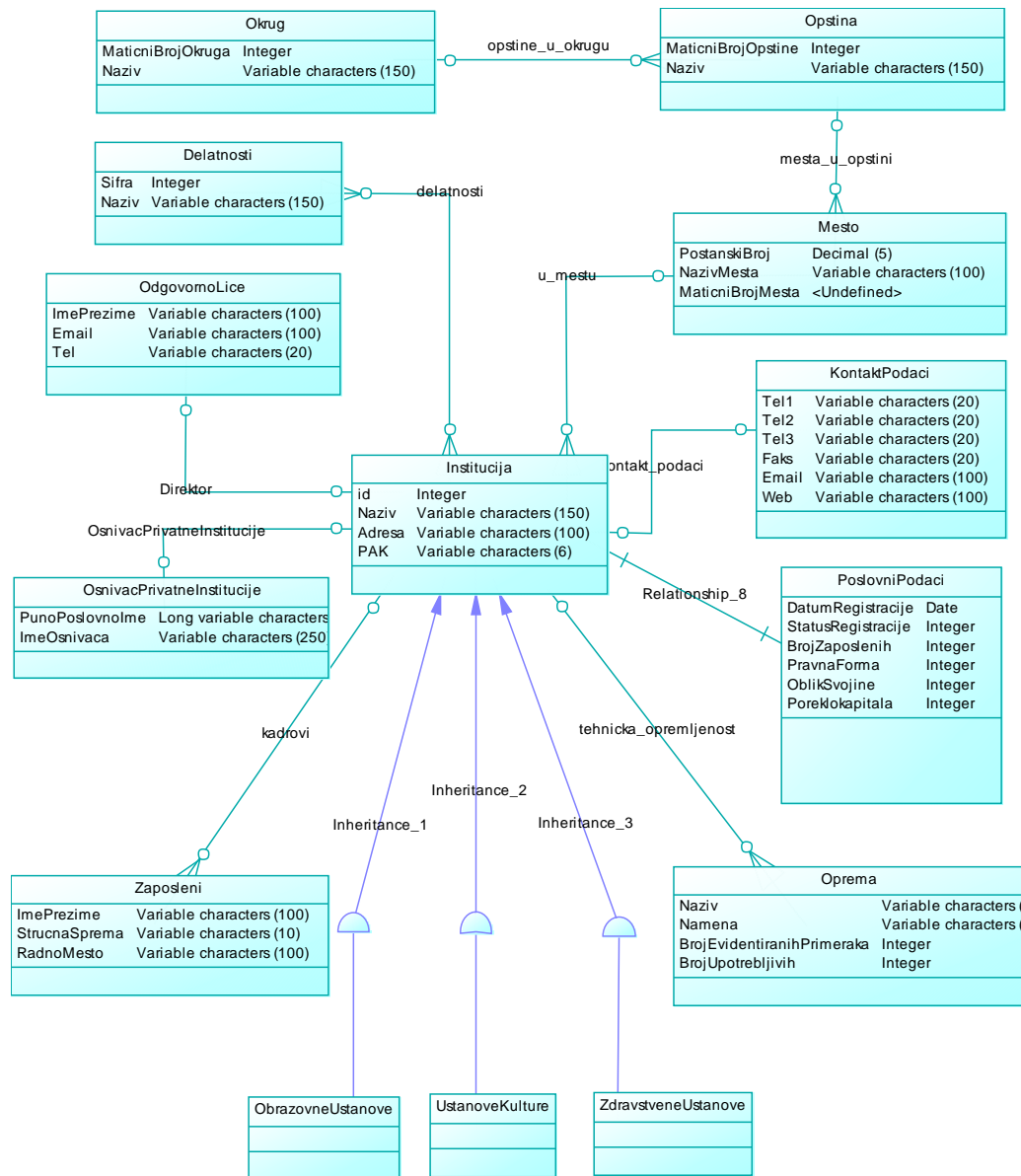


Figure 1. Basic data model for institutions

3.1 Basic data model for administrative registers of health, educational and cultural institutions

During the first phase of the project, basic data structures were defined. There is a common data set for all institutions. This data set has emerged as relevant by taking into account expected information that register will expose, as well as legal framework applicable to these institutions. Basic data set contains following data:

- Full name of the institution,
- Location of the institution, and its address
- Business data (date of registration, its status, number of employees, legal form, ownership type, origin of the capital etc).
- Information about the founder
- Information about legally responsible person
- Information about human and technical resources

- Type of activities this institution is registered for (must be taken from Chamber of Commerce)

Basic data model is displayed in figure 1. All data classes in this model, since implemented CMDBuild, are extended from its basic Class model so this relation is not displayed here.

3.2 Specific data for health, educational, and cultural institutions

Since there is a great difference in fields of work for health, educational, and cultural institutions, consequently there are specific data needed to represent properly each of these institutions. Furthermore, in areas of health, there are three levels of health care (legally defined) that is provided to patients, and different institutions can belong to any of these three levels. In addition, educational institutions can be segmented in pre-school (nurseries), primary,

secondary and high school institutions. Additionally although most of these institutions are publicly owned, it is permitted by the law that they can be private. Since Autonomous Province of Vojvodina is multicultural environment with different languages in official use, an important piece of data is language that is in use in some of the institutions. All this has been taken into account throughout the process of data modeling.

Full data model for educational institutions is also developed, and data model for register of primary and secondary schools is displayed in figure 2. Data models for pre-school and high school are not shown here due to space considerations.

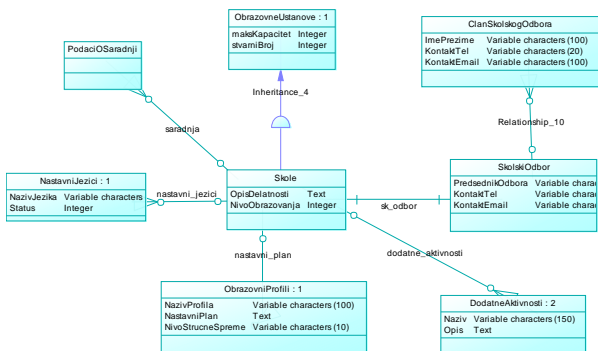


Figure 2. Data model for schools

Full data model for health institutions is displayed in figure 3.

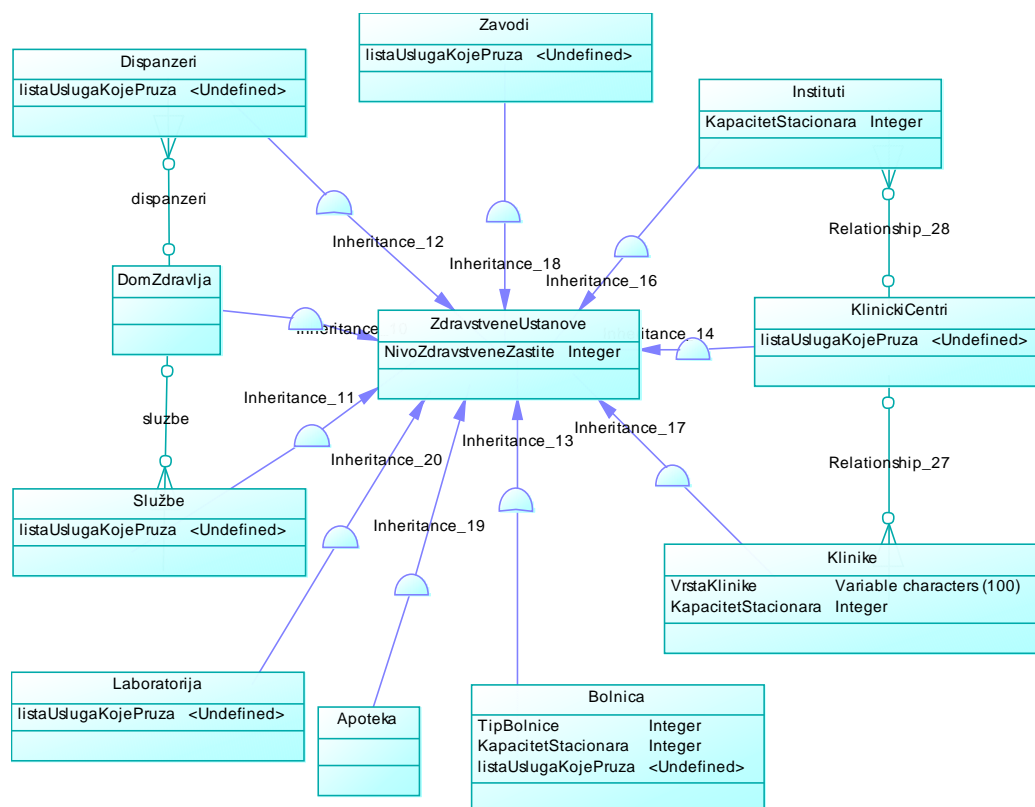


Figure 3. Data model for health institutions

It is important to note that all these specific classes representing different types of institutions are extended from basic class *Institucija*. This inheritance, for the sake of simplicity of additional diagrams, is not repeated on each of them. In addition, the names of the classes are actual names implemented in CMDBuild, and are therefore not translated to their english version.

4. PILOT PROJECT IMPLEMENTATION – IMPLEMENTATION OF REGISTER OF HEALTH INSTITUTIONS

After development of appropriate data model, and in accordance with previous decision, the pilot installation of Register of health institutions is implemented. The basic data model and data model specific for health institutions are deployed in CMDBuild database.

Additionally, Alfresco system (already existing in intranet environment in Provincial Government) has been configured to be used as a DMS system serving the Registry. Since one of crucial information for general public is a location of different institutions, a GIS support in CMDBuild has also been enabled to allow for geo-tagging of objects locations. Currently, OpenStreetMap is used as geo-service provider.

An instance of Enhydra Shark WfMS, already in use to handle processes for ICT register, has also been configured to work as WfMS service provider for this register, although no specific process definitions have

been implemented yet.

Deployment diagram of system components is shown in fig. 4.

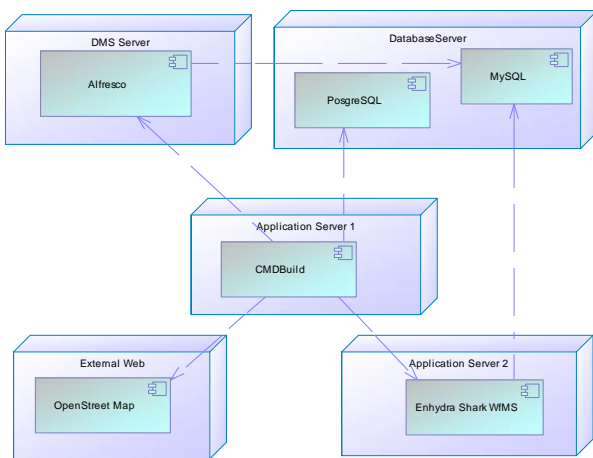


Figure 4. Deployment diagram of system components

4.1. Security issues

In order to protect sensitive documents, users are grouped in appropriate user groups with limited access rights: administrators, administrative employees, institution employees, and public users. Each group has different access level. Document management system is not publically accessible, hence no document can be directly accessed through DMS, but only indirectly, through the core system (CMDBuild) as document attachments to appropriate register data object, and this access is controlled by group and/or user access rights. The same is applied on access to deployed process workflows (if any defined). Therefore, the critical part of administration is to allow administrators and administrative employees access through local intranet and allow controlled public internet access for institution employees and general public.

5. BENEFITS FROM ADMINISTRATIVE REGISTERS OF INSTITUTIONS

Although initial effort of introducing, and later maintenance is substantial, benefits for administrative workers as well as for general public and professional users are huge.

For administrative register of educational institutions, those benefits can include:

- Instant access to information about total amount of educational institutions in certain region
- Easy overview and search on basis of their distribution among categories (pre-school, primary, secondary, high-schools)
- Easy overview of number of children (in pre-school) and students (in other) those institutions can accommodate,

- Easy access to information about total number of employees in certain positions, and technical resources they have at their disposal
- All of the above can lead to better management, better planning of future needs and requirements, better distribution of financial assets
- It can help in detecting “trouble spots” – institutions that are understaffed or that are overcrowded with students
- It can lead to better planning of educational profiles offered in certain region, based on economic demand

For health institutions, used as a pilot project in this case, benefits are:

- Easy access to information about total number of institutions providing health care in primary, secondary and tertiary health care system,
- Better planning of future needs in health sector
- An overview of diagnostic, laboratory, and other equipment that is available in certain region, and better planning of allocation of patients to the respective institutions; this will enable also better planning of future needs and allocations of equipment to the most frequently visited institutions,
- Easy overview of health services provided by different institutions in the region,
- It also enables users to easily find institution with appropriate medical staff for different types of conditions,
- Since the register is also to encompass private health-care institutions as well as publicly owned, it will represent a comprehensive and most precise database of all health-care services that are provided in the region of AP Vojvodina. This will enable (if future legal solutions allow for this, to include services of those privately held institutions when planning patient allocations).

Similar benefits are also expected from register of cultural institutions, primarily providing a full insight in cultural heritage and its status on the territory of AP Vojvodina. Making such a registry publicly available will also help promote local culture and tradition.

6. CONCLUSIONS

Administrative registers of different kind are playing increasingly important roles in current eGovernment solutions. Such registers are becoming main access point for eGovernment services both to professionals and general public. Therefore easily accessible registers with appropriate, comprehensive datasets are crucial for delivering efficient eGovernment services in different fields. The task of building comprehensive registers is not an easy one, but nevertheless is necessary one. The Government of Autonomous Province of Vojvodina has started the project of implementing administrative registries of

health, educational and cultural institutions located in the Province. The partial results of this project is presented in this paper as a cooperation between Provincial Government and University of Novi Sad, Faculty of Technical Sciences. Basic data model is discussed, as well as pilot implementation of Register of Health Institutions in the Autonomous Province of Vojvodina.

Alongside implementation issues, potential benefits administrative registers can bring to their respective areas are also mentioned.

Since the data model has common core data set, appropriate for describing different kind of institutions, this model can be used as a foundation for developing other specialized registers with simple expansion of data model. Also as a further advancement, appropriate workflows for specific processes (procurement, resource allocation, human resource allocation etc) could be defined.

Built in support for location based services enables this system to immediately provide detailed information about location of each institution. Although, in nowadays, this is achievable by other online mapping tools, it is convenient to have this information included in the registry itself.

By using open source systems, this solution for software system for administrative registers is not bringing the burden of excessive licensing costs. This solution could be implemented at different levels of public administration.

REFERENCES

- [1] *The New Generation of E-Government Common Services - Enabling the creation and interconnection of electronic and traditional registers*, Report, E-Government Observatory, Ministry of the Treasury and Public Administration, Government of Spain, September 2012
- [2] *Rešenje za upravljanje it resursima bazirano na otvorenom kodu*, Siniša Nikoli , Valentin Penca, Miroslav Zari , Zbornik radova konferencije YUInfo 2010
- [3] *CMDB Based Asset Management With Integrated Open Source Systems*, Zari Miroslav, Sladi Goran, Paroški Milan, Andri Sanja, International Conference on Information Society Technology and Management (1; Kopaonik; 2011)
- [4] CMDBuild – Open Source Configuration Management Database – available at: <http://www.cmdbuild.org/en>
- [5] CMDB – Configuration Management Database – ITIL Recommendations, available at: <http://www.cmdb.org/>
- [6] Alfresco Document management system, available at: <http://www.alfresco.com/>
- [7] Enhydra Shark, OpenSource Workflow engine, available at: <http://www.together.at/prod/workflow/tws>
- [8] *Workflow Management: Models, Methods, and Systems*, Wil Van Der Aalst, Kees Max van Hee, The MIT Press (January 30, 2004)
- [9] Workflow Management Coalition, Standards, XPDL Support and Resources, available at: <http://www.wfmc.org/xpdl.html>
- [10] Object Management Group, Business Process Model and Notation, available at: <http://www.bpmn.org/>

ACKNOWLEDGMENTS

Results presented in this paper are partially funded as the research conducted within the Grant No. III-44010, Ministry of Science and Technological Development of the Republic of Serbia