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THE *ETERNITAS* WEB APPLICATION – IMPLEMENTATION STEP OF THE MUSEUM INFORMATION SYSTEM OF SERBIA

Abstract. Complex and multi-functional museum web application *Eternitas* was presented in the paper. Highly user-oriented to museum professionals, primarily to curators, documentarians, and managers, this software presents an integral part of broader information system *MISS*, developed at the National Museum in Belgrade, Serbia. In last two decades that museum information system has successfully gathered data on nearly 250,000 objects from entire Serbian museums' fund.

In the beginning of attentive state ministry supported project in 1996, strategic development study of the *Museum Information System of Serbia (MISS)* had identified 11 subsystems, e.g. implementation modules. Subsequently, the very first module, *Central Register of Movable Cultural Goods of Serbia (CR)*, had been introduced into almost 50 Serbian museums' practice. In the second stage, starting from 2007, a contemporary relational database has been created, in the scope of basic processes of two *MISS* subsystems – *Museum Fund Acquisitions*, and *Scientific and Expert Processing*. Furthermore, new developed application *Eternitas* enables not only complex professional data managing, but their public web presentations, as well. Through a museum professional practice case study its functionality and distinctiveness are briefly illustrated.

Keywords. museum, museum information systems, databases, web applications, museum software, *MISS*, *Eternitas*, Serbia, western Balkans.

Introduction

According to one of the most frequently cited definitions, information system presents an integrated set of components for collecting, recording, storing, processing and transferring information.

Today, talking about information systems (IS), it is understood that components mentioned above are based on modern information technologies and methodologies, as well as on the use of computers and related equipment. However, in business systems it is common that some data are still stored on traditional media and managed in traditional way.

One of the basic business tasks of modern museum is data storage and processing of museum objects that it collects, takes care of them and presents them. Items are the source of direct information stored in different, archetypal data carriers, such as various forms of cards and books, and, prevailing in the last two decades, in the form of different electronic databases.

The 90ies of the last century are characterized by the rapid development of PC technology, so that computers are increasingly entering into various business systems, so they are used in almost all business processes. During this period internet had appeared in a form that still exists today, influencing in many fields' different mindset, organization and management. New concepts, more powerful relational databases and managing systems have emerged on database market. New standards and rules are defined in order to achieve better adaptation of business systems to new technological solutions.

In the scope of this context, the National Museum in Belgrade, as the central state institution for protection of movable cultural goods, had created the idea to build a modern information system that is going to unite all the data about the museum fund in Serbia and remarkably increase the efficiency of its use.

MISS – its concept and history

Practical use of this idea began in 1996. The National Museum has formed a team in order to plan the creating of unified Museum Information System of Serbia – MISS. This led to the development of MISS Strategic study, presented in the museum in 1995. The study was made using the BSP (Business System Planning) methodology, developed at the IBM company and should be used for the business system analysis, whose structure is mapped on the structure of IS. The classes of data have been identified, as well as the business processes which create them or use. On the basis of this correlation between processes and the classes, 11 subsystems of MISS were identified:

1. Documentation and Information Center
2. Museum Fund Acquisition
3. Scientific and Expert Processing
4. Museum Fund Storage
5. Presentation of the museum collection
6. The use of museum collection
7. Museum library
8. Publishing
9. Technical protection
10. Cultural and educational activities
11. Museum Archives

Subsystems 1-5 and 9 represent the activities of museums in the narrow sense, so as the priority of development. Each of the subsystems also presents a module for implementation. The study did not contain details of the implementation, so it was independent from applied information technologies.

The Central Registry of Museum Fund of Serbia

Central Registry of movable cultural goods (CR), the main process of subsystem Documentation and Information Center, was introduced in 1996. From the museum point of view, then created database covered the minimum data needed to describe museum objects by MDA (Museum Documentation Association) standards.

In 1996, DOS Clipper CR program had been installed in 46 museums in Serbia, having got early computer equipment, on the initiative of the Ministry of Culture. The training of museum professionals to learn how to use the program, as well as permanent technical support for the museums in Serbia, were carried out by a team from the National Museum in Belgrade.

CR program was in use until November 25th of 2009, when a process of preparing for data import entered into a new MS SQL Server MISS database began. By using this program, 135000 records concerning museum objects were entered in 33 museums in Serbia. The data have been separately entered into each of individual museums, and then, as archived files, they were brought into the National Museum in Belgrade, to be administered and unified in a single DBF (Database File) format.

The program named “**Clio**” was developed in the National Museum in Belgrade in 1993 and was used in various versions until 2009. By using this program, the data on nearly 90,000 objects of the museum fund were processed.

MISS and a unique museum database

The development of MISS was continued in late 2007, with the support of Serbian ministry of culture. Implementation scenario was created in the National Museum, as the heading institution on the project. As an external partner, the company "Software Information Systems" from Belgrade was hired.

By April 2008, a modern relational database was designed and created, and that has been major to the further development of IS. In the sense of museology, the basic set of data about museum objects, which had previously been included in the Central Registry, has now been extended to data relating to: a) acquisition, b) expert and scientific research, and partly, c) storage of museum objects.

In the sense of technology and informatics, a new database presents the way of storing and using data. MISS database is MS SQL Server 2008 r2 relational database and applied development methodology is ORM (Object Role Modeling). The project team has been established in accordance with this methodology.

Database MISS is a central component of our information system, which will be further built and will make the basis for various types of research, the development of various user applications and dynamic presentations.

The very first software solution based on the usage of new database was the web application „**Eternitas**“, a system of museum data management. The aim of this paper is to present major points of the application functionality, basic elements of its design, and its physical organization. By choosing several practical examples as a case study, we are going to demonstrate significant advantages of this highly user-oriented application, already utilized by the museum experts on their every day's work.

Data management system Eternitas

The functionality and structure of the system. The creation of the system Eternitas scenario, in terms of application functionality, was determined by a few basic business requirements:

1. **Gathering all data about the museum's fund in Serbia in one, unique information base.** Permanence of data processing within the MISS, which was established by implementing CR, is provided by import of all previously entered data in this program in the newly created unique database MISS. The data from the National Museum in Belgrade and Požarevac, including photographs of items, earlier entered by using the program Clio, were imported in the new database, as well.
2. **Professional museum catalogs editing.** After collecting all data entered in various museums in Serbia, it became evident that in museum practice there are no uniquely defined terminological rules and the unified methodology for describing museum objects.
3. **MISS database administration.** Part of the permanent organization structure of IT jobs, including various IT specialties needed for the effective administration, maintenance and further development of the system were yet not been established at the National Museum in Belgrade. That is the reason why the one of basic ability of the system Eternitas enables execution of basic informatical tasks on system administration through a user's application.

In addition to these basic functional objectives of Eternitas system, we shall mention several important programming features. Many objects of the system (for example, museum objects, sites, professionals, museums...) have their own multimedia instance. Organized records of all multimedia objects within the Eternitas system are called "**Mediatheque**". Currently, there is possibility for digital images in JPG format, as well as PDF documents and video sequences in FLV format, to be stored in media library. Web application Eternitas supports the usage of Google Maps service, which greatly increases processing capabilities.

During the processing of a record or catalog included in the database, users could use complex searching forms with one or more criteria specified. Also, standard reports that can be printed or redirect to different file types (Excel tables, PDF or Word documents) are integral, functional parts of the application. In this way data can be downloaded at the local, user's computer, enabling museum professionals to use it every day in operational work.

Access to museum object data could be restricted by curator in charge who is able to change object status, making it "invisible" for all other users.

Functional requirements of the Eternitas system are performed through two different applications, using the same MISS database:

- A) Microsoft Access 2003-based desktop application for administrator's work
- B) Web application Eternitas for museum professionals.

A) Microsoft Access-based desktop application. The administrator can use this application layer by remote access to perform the following tasks:

- **Creating and maintaining user accounts.** A prerequisite for web application Eternitas usage by museum professionals is to define the access parameters – a user name and password. Each order or application user belongs to a particular group that has appropriate permission in using data within the application. Nowadays, there are three basic groups in system: documentarians, curators and directors.

- **Maintaining of the system's catalogs.** System catalogs, for example, museums, collections, places, states etc. are maintained by the administrator, but all of them are available to other users of the system.

- **Maintaining of professional museum catalogs.** This part of the application is designed for syntactic and semantic database ordering. Administrator in co-operation with specialized museum professional team updates museum catalogs or puts marks of value status at appropriate place by using this program module.

B) Web application Eternitas for museum professionals. Web application Eternitas is the main functional unit and the central part of the system and it supports some of the basic business processes performed by museum professionals. Technological framework is Microsoft .NET Framework 4.5, while Microsoft Visual Studio 2011 was used for development of application, and C# was applied as programming language. The basic environment required for application operation is: standard computer, a newer version of web browser and a solid internet connection.

This part of the system was created in 2008 and 2009. Application and functional tests were organized during the period 2010–2011, in which museums were in position to use a draft program only. In this period, around 300 users (museum experts) have been trained in Serbia. Training workshops were organized in Niš, Kruševac, Valjevo and Belgrade.

The application is officially available to all museums in Serbia from November 1st of 2011 at the www.app.eternitas.rs. Information sets on how to apply the system are

located within the site, which monitors the implementation of the MISS, and that site is located on www.eterinitas.rs, starting from 2008.

From the May 10th 2012 the application *Trezor* (Treasury), enabling public access to the part of MISS database through its replica, became available. Master database MISS and its replica are dynamically linked. Access to the application is at www.trezor.eterinitas.rs.

Master Database and its replica, program administrator module, web applications Eternitas and Treasury applications are physically located at a separate server that belongs to a hired provider (Figure 1). Project development and database administration are located in the National Museum in Belgrade.

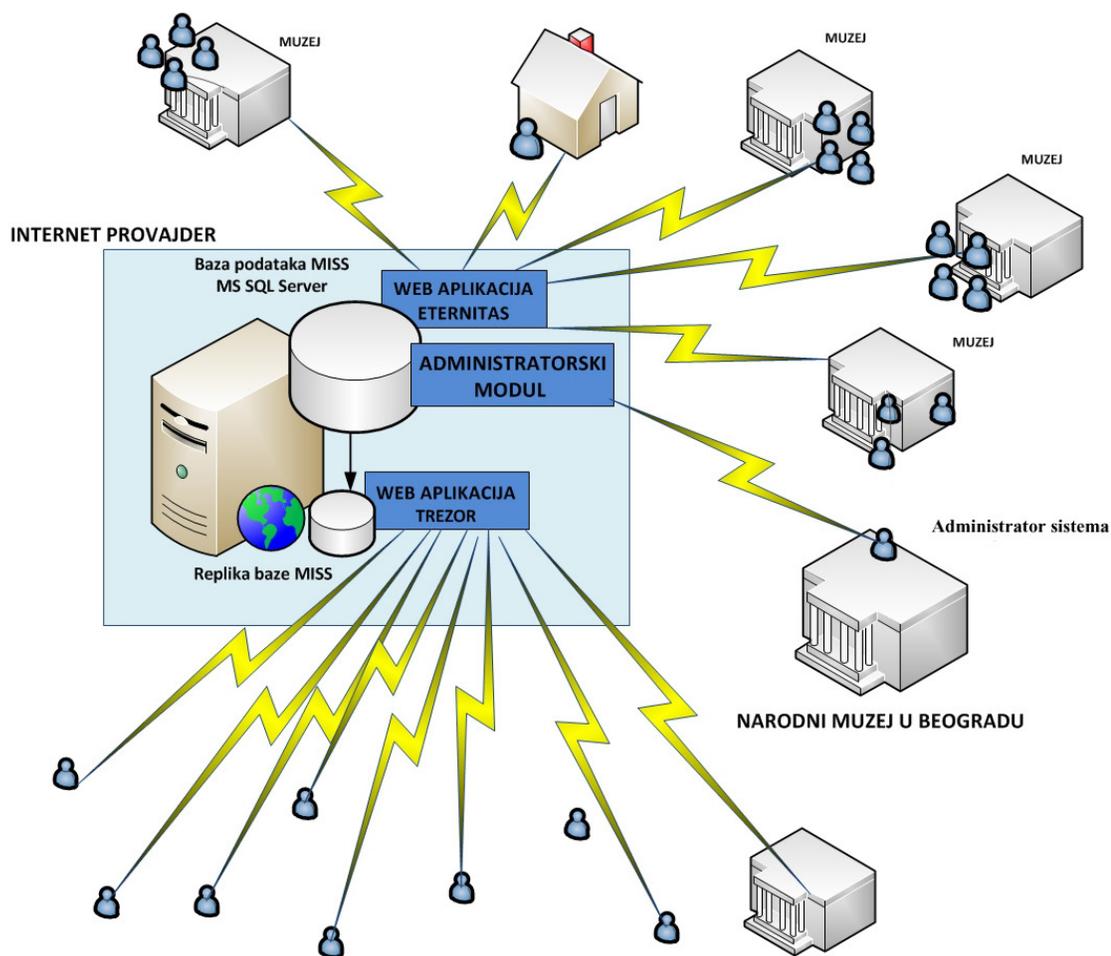


Figure 1: Pattern of the Eternitas physical organization

Case study: Eternitas and Archaeological Objects Data Processing in Museums

Acquisition – Museum Fund Improvement. Information, relating to the objects entries in museum, is included by MISS subsystem – Acquisition –Museum Fund Improvement.

Some of the basic Eternitas web capabilities is going to be illustrated through the example of an archaeological object found by chance during fishing and offered for trade to the National Museum in Belgrade. Requiring data had been entered in the *Demo museum Archaeological Collection*.

The following text briefly describes basic methodological steps and processing elements, which illustrate Eternitas application possibilities in a summarized way.

Record item details, from the time of first appearance in museum until it becomes part of the museum collection, have been developed through a number of museum business processes: reception recording, professional expertise, the entry in ledger, authority's procurement decision, creating appropriate contracts and registration in the entry book. These data are recorded in database segment named "Acquisition Documents":

1. Reception book
2. Ledger
3. Formal act of authorities
4. Contract
5. Entry book

Within these records, there are some "functional dependency" relations determining order of data entering, from the users' aspect of view.

First of all, the acquisition data of objects are recorded in the Reception book. All potential museum objects are recorded in it, and these objects are treated as candidates to become part of the museum fund at some moment. This applies to cases when, as in our example, objects had been immediately offered to the museum for acquisition, as well as for objects interesting for museum, but their acquisition for certain reasons cannot be performed immediately. By their recording in Reception book, information about these objects is permanently stored and always easily available.

By the same principle, all acquisition documents are handled, as well.

In our example, previously prepared images of objects in JPG format, as well as written proposal for acquisition (photographed and transformed into PDF format) are loaded into the media library (Figure 2).

In Ledger book the documentarian creates new record which shall include basic information about new acquisition ledger item that is going to unite all documents related to a particular acquisition.

In order to illustrate this, we can offer a clear example: since 1957 until today, several fibulae of a distinct type has been found on territory of the municipality of Sečanj (central Banat, Vojvodina); four of them have become a part of the museum fund in Zrenjanin, one has arrived to the National Museum in Belgrade, and three others are still in a private collection. If we suppose that all of those fibulae have been registered in the manner described above, at the level of individual museums, it comes to be obvious that the data are readily and available to future users, who are authorized to review entire Reception book. Using this example, we can demonstrate how the system Eternitas could combine all data about museums' acquisitions, on entire territory of Serbia.

Medijateka Dokument prijemne knjige (00004)

Ponuda na otkup arheoloških predmeta

Unos Izmeni Snimi Odustani Briši Nazad

ID: 46282 2233786

Oznaka: 002

Naziv: Fibula

Vrsta datoteke: JPG

Opis: Fibula iz Sečnja

Autor:

Originalni naziv datoteke: 06_26184.jpg

Izaberite fotografiju za unos u bazu podataka:
 Odaberi datoteku Niје oдабрано



Medijateka Dokument prijemne knjige (00004)

Ponuda na otkup arheoloških predmeta

Unos Izmeni Snimi Odustani Briši Nazad

ID: 46343 2233786

Oznaka: 003

Naziv: Predlog za otkup

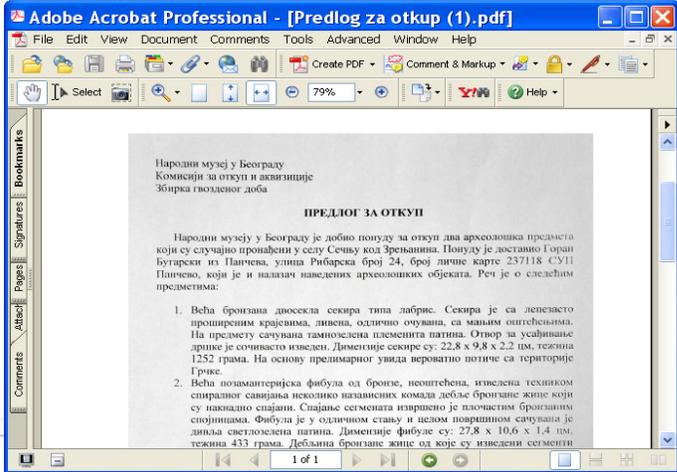
Vrsta datoteke: PDF

Opis:

Autor:

Originalni naziv datoteke: Predlog za otkup.pdf

Izaberite PDF fajl za upload:
 Odaberi datoteku Niје oдабрано



Narodni muzej u Beogradu
 Komisiji za otkup i akvizicije
 Zbirka гвозdenog doba

ПРЕДЛОГ ЗА ОТКУП

Narodni muzej u Beogradu је добио понуду за откуп два археолошка предмета који су случајно пронађени у ослу Сетњу код Зренянина. Понуду је оставио Горан Бугарски из Панчева, улица Рибарска број 24, број личне карте 237118 С/11 Панчево, који је и излазач наведених археолошких објеката. Реч је о следећим предметима:

1. Већа бронзана диосекла секира типа лабрис. Секира је са лезасто проширеним крајевима, ливена, одлично очувана, са мањим оштећењима. На предмету сачувана тамнозелена племенита патина. Отвор за усађивање дршке је сочивасто изведен. Димензије секире су: 22,8 x 9,8 x 2,2 cm, тежина 1252 грама. На основу прелиминарног увида вероватно потиче са територије Грчке.
2. Већа позамантеријска фибула од бронзе, неопштећена, изведена техником спиралног савијања неколико независних комада дебље бронзане жице који су напредно спајани. Спајачке сегмената извршено је плочастим бронзаним слојевима. Фибула је у одличном стању и целом површином сачувана је дивља светлосзелена патина. Димензије фибуле су: 27,8 x 10,6 x 1,4 cm, тежина 433 грама. Дебљина бронзане жице од које су изведени сегменти

Figure 2: Mediatheque records pages from the Reception book

The documents *Contract* and *Formal Act of Authorities* also contain information about corresponding participants – individuals, legal entities and persons in charge, date of writing those documents, date of data entries, references in the Ledger book and the appropriate entries in the media library – Mediatheque. The media library of *Formal Act of Authorities*, in our example, contains PDF documents related to the appropriate professional expertise and opinions.

Data processing within the subsystem Acquisition is to be finished by recording individual purchased object in the item Museum *Entry book*. That record represents the first organized record of museum objects, before they become part of a particular collection. On the Entry book level, each object gets its own unique number, binding data for main business process of the subsystem Scientific Research - *Inventory of museum objects*.

Scientific and expert processing – *Inventory of museum objects*

Users who belong to the Curator group have exclusive right to enter and edit data belonging to museum objects. After entering the system (login), the curator will see introductory page at her/his monitor (Figure 3).

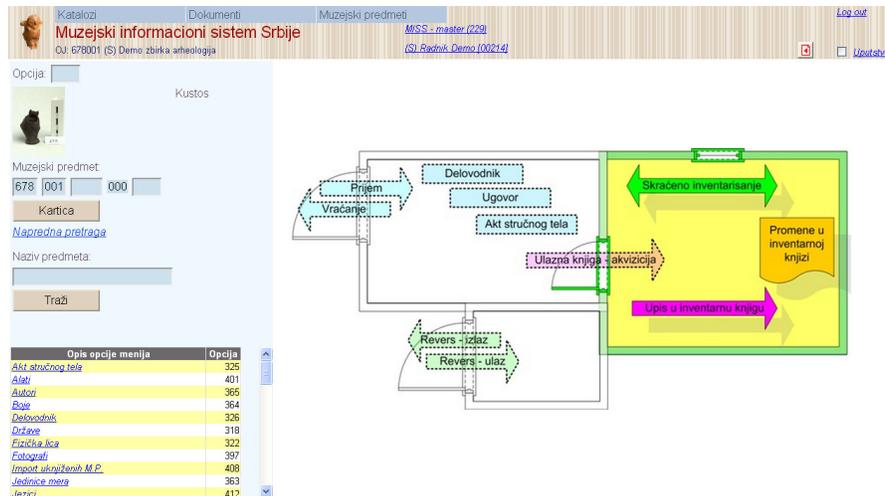


Figure 3: Covering curators' page

It is possible to select the desired option in two ways: by activating the appropriate menu option, or by clicking the command button on the screen. The curator can find the specific record on number of ways. One of them may use the page for museum objects searching (it is possible to set a complex query by entering values in appropriate fields on this page). The searching criteria include almost all object attributes, and it is allowed to combine it all in very complex queries.

For the purposes of our example, we have typed just a part of the object name "fibula", and following illustration shows that in our Demo collection of archeology, in the Demo museum, five such results exist there (Figure 4).

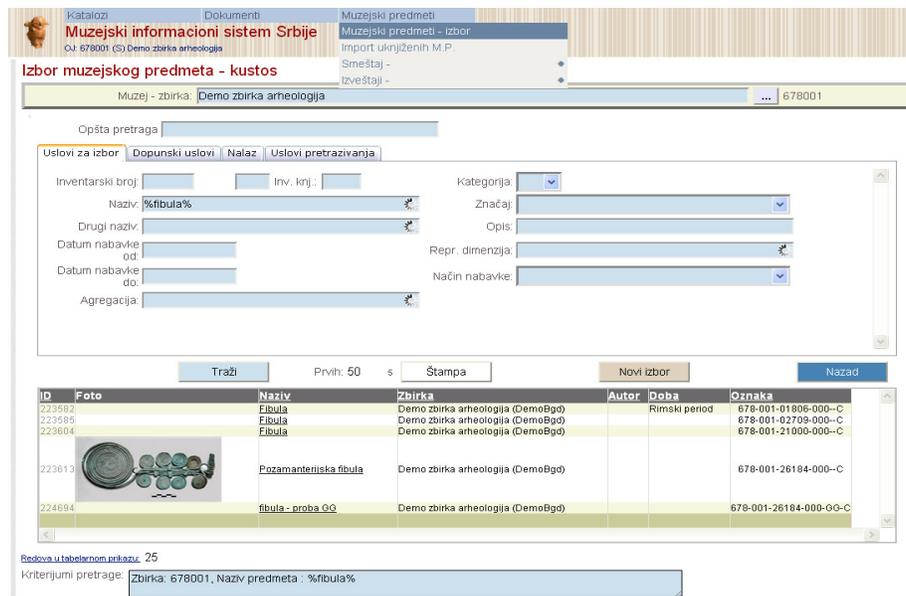


Figure 4: Searching page items

By clicking on the objects link in the corresponding table row, the user can enter in the museum object card (Figure 5).

Katalozi Dokumenti Muzejski predmeti
You have gone full screen. Exit full screen (F11)

Muzejski informacijski sistem Srbije
OJ: 678001 (S) Demo zbirka arheologija

Kartica muzejskog predmeta

Demo muzej, Demo zbirka arheologija (Arheologija, Sarić Marija)

Naziv:

Oznaka: Značaj: 223613

Matični klasifikator:

Status:

Nivo publikacije:

Vrsta dela predmeta:

Deo pripada predmetu:

Stari inventarski broj:

Broj delova: Oznaka dela predmeta:

Stalni smeštaj:

Privremeni smeštaj:

Radno stanje:

Opis stanja:

Rep. dim.:

Opis: Velika pozamanterijska fibula rađena iz više segmenata od deblje i tanje bronzane žice kružnog preseka. Glava fibule je kružnog oblika, izvedena od višestruko spiralno uvijene deblje žice. Drugi kraj žice je stanjen, kvadratnog je preseka i čini osnovu za formiranje tela fibule. Stopa fibule je izvedena u obliku jednostrane opruge dobijene spiralnim namotavanjem tanje bronzane žice po vertikali. Slobodni kraj žice prelazi u osmicu, produžava do početka glave fibule sa donje strane i završava petljom za prihvatanje igle. Kao i kod prvog segmenta i ovdje je slobodni kraj žice pravouglog preseka i stanjen u delu gdje je izvedena petlja. Slobodnim krajevima od kojih su izvedena dva središnja segmenta s obe strane priključena su još po dva ukrasna segmenta od tanje bronzane žice čija su oba kraja spiralno uvijena i sa svake strane su dobijena po četiri kružno-spiralna ukrasa.

Foto: 

Podaci o akviziciji

Datum nabavke: ... 2012-678-033-00007

Način nabavke:

Prijemna knjiga: ... 2012-678-013-00004

Delovodnik: ... 2012-678-028-00004

Ulazna knjiga: ... 2012-678-023-00002

Stavka ulazne knjige: ... 524

Interni barkod:

Opis celovitosti:

Obradio:

Podaci o nalazu

Datum nalaza:

Naziv mikrolokacije: Geografska širina:

... Geografska dužina:

Mesto: Opština - (adm.jed.):

Region mesta:

Država mesta:

Agregacije:		Redni broj	Klasifikacija	Oznaka	Naziv (original)	Svojstvo	Naziv	ID
Unos agregacija		<input type="button" value="Izmena"/>	001 Materijal - opšti	00001	bronzna	Materijal - opšti	bronzna	2472086
		<input type="button" value="Izmena"/>	002 Tehnika - opšta	00001	livenje	Tehnika - opšta	livenje	2472087
		<input type="button" value="Izmena"/>	003 Tehnika - opšta	00003	iskucavanje	Tehnika - opšta	iskucavanje	2472088

Medijateka:		Oznaka	Datum unosa	Naslov medijateke	Vrsta datoteke	Opis medijateke	Na medijateku
Unos multimedija		001	04.06.2012	Pozamanterijska fibula	JPG		46347

Figure 5: Museum object card

(It could be noticed that the data on acquisition are shown at the separate frame. Details of individual acquisition document relating to the currently active object could be displayed, as well.) This example illustrates the effectiveness of distinctive database, i.e. of a unified information system. Integrated at one place, all data processed by

different users within the business system are visible. In our example, these users were documentarians and curators.

Abbreviated (reduced) inventory is suitable for those objects which entered the museum before implementation of Eternitas system, because it does not require all the data of the acquisition documents.

Archaeological object subtypes data

The data processing of all museum objects subtypes, as we mentioned, is supported by the system. Subtype is a subset of the objects that are described by specific common set of attributes. In order to illustrate this, in our example, we have partially shown the data processing relating to archaeological museum objects subtypes. Typical attributes of archaeological object, which refer to the data class "finding", consists of: *microlocation, site, place, municipality, region, and state*.

Microlocation, as a term, had been introduced in the museum practice by system Eternitas, and indicates exact place where the object was discovered. The editing data page about microlocation and site could be activated by appropriate menu option. Data structure for the microlocation description is presented in Figure 6.

Mikrolokacije

Osnovni podaci | Google mapa

ID: 8435

* Oznaka: 0008434

* Naziv: Obala Tamiša - odron

Opis: Tačna lokacija je oko 4 kilometra nizvodno rekom Tamiš od centra Sečanja.

* Lokalitet: ...

* Mesto: Sečanj | Sečanj | ... 98

Opština: Sečanj

GPSN: 45,36114

GPSE: 20,79501

GPSZoom: 18

Unos | Izmena | Snimi | Odustani | Briši

Osnovni podaci | Google mapa

Mapa | Satelit | Hibrid | Terenska



Sirina: 45,36114

Duzina: 20,79501

Zoom: 16

Lociraj

Prenesi na formu

Ucitaj sa forme

Lokacija: ...

Trazi

Medijateka Mikro lokacija (0008434)

Obala Tamiša - odron

Unos | Izmeni | Snimi | Odustani | Briši

ID: 47020 | 2233824

Oznaka: 003

Naziv: Obala Tamiša - odron

Vrsta datoteke: JPG

Opis: Fotografija je nastala 18.04.2001. godine

Autor: ...

Originalni naziv datoteke: tamis.jpg

Izaberite fotografiju za unos u bazu podataka:

Одабери датотеку | Није одабрано



Nazad

Figure 6: Mediatheque records pages of *Microlocation*

Geographic coordinates are entered into the database in two ways: directly by entering values in appropriate fields or by the mouse click on correct spot on interactive map. At this point, it is also important to mention that by loading video clips in the media library at the level of microlocations, the system permanently stores the *Act of finding the subject*.

Archaeological locations in the system Eternitas are represented by the “site” records. The border consists of a set of points with their coordinates included, which can be seen in the table just below the map (Figure 7).

Prostorni okviri Nazad

Lokacija: **Demo Sečanj (GG)**

Oznaka: Klasifikacija: **Geografski** Opis:

Mapa Satelit Hibrid Terenska

GPSE: 20.7992883 1622510z
GPSN: 45.36084 123589143

Traži Novi izbor Štampaj Snimi

Oznaka	Klasifikacija	Opis	GPSE	GPSN	GPSZoom	ID
0001	Geografski		20,793	45,36251	16	124
0002	Geografski		20,79334	45,36354	16	125
0003	Geografski		20,79463	45,36339	16	126
0004	Geografski		20,79639	45,36231	16	127
0005	Geografski		20,79733	45,36192	16	128
0006	Geografski		20,7974	45,36089	16	129
0007	Geografski		20,79523	45,36101	16	130

Figure 7: Archaeological site page

Conclusion

The development of a unified Museum information system of Serbia, in accordance with approved strategy and its technological and museological standards enables an effective use of information on the museum's fund. In the domain of the business processes inside the museum, the main benefits are the ability to set up the most complex queries and to obtain quick and relevant system responses. Certainly, that significantly improves scientific and expert work, as well as high-quality permanent co-operation inside the museum network of Serbia.

Based on the author's previous experience in creating and development of MISS, any planned and well-designed information system can also provide support for making various electronic forms of presentations, starting from virtual exhibitions, to very complex dynamic websites, such as *Eternitas*.

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