

# Development of Cultural Heritage Digitisation and Access: Lithuanian Approach

Regina VARNIENĖ<sup>1</sup>, Giedrius DAUGIALA<sup>2</sup>

*Martynas Mažvydas National Library of Lithuania, Gedimino ave. 51, LT-01504 Vilnius, Lithuania*

*Tel: +370 5 2398646, Fax: +370 5 2496055, Email: [r.varniene@lnb.lt](mailto:r.varniene@lnb.lt)*

*<sup>2</sup>UAB "Sintagma", Kalvariju St. 125, LT-08221 Vilnius, Lithuania*

*Tel. +370 5 2102420, Fax +370 5 2102433, Email: [giedrius.daugiala@sintagma.lt](mailto:giedrius.daugiala@sintagma.lt)*

*Department of Software Engineering, Faculty of Mathematics and Informatics, Vilnius*

*University, Naugarduko Str. 24, Vilnius LT-03225, Lithuania*

*Tel: +370 5 21930 64, Fax: +370 5 215 15 85. Email: [giedriusd@gmail.com](mailto:giedriusd@gmail.com)*

**Abstract:** This paper outlines our approach and describes lessons learned from creating a methodology of cooperation among memory institutions in Lithuania developed in the creation process of the Integrated Virtual Library System. The proposed methodology includes the agreement by memory institutions on common technological platform and standards for technical file management and metadata, methods of numbering, thesauri, and other classification systems. The paper also presents organisational functional structure of the system, and software products developed and benefits gained from the project. The experience gained from joint work of different memory institutions serves as an important foundation for the development of cultural heritage strategy, cooperation among memory institutions in creation of digital content of cultural heritage and providing free and efficient electronic services for users in Lithuania and worldwide.

## 1. Introduction

With a new strategic framework *Communication of 30.09.2005: i2010 - A European Information Society for growth and employment* [1], the European Commission launches a new integrated Information Society policy approach. From the viewpoint of the objective of *i2010 European Information Society - Single European Information Space offering affordable and secure high bandwidth communications, rich and diverse content and digital service* - cultural heritage plays an important role in the whole program.

The *Communication of 30.09.2005: i2010: Digital Libraries* [2], The *Communication of 14.02.2007: on Scientific information in the digital age: access, dissemination and preservation* [3] and the *Directive of 29.03.2007: On Audiovisual media services without frontiers* [4] the European Commission identified the principal spheres to be involved and efforts to be pursued for long term preservation and access of digital cultural heritage and scientific knowledge. The Communications outline the vision of long-term preservation and online accessibility of cultural heritage and scientific knowledge, highlighting the initiative and role of digital libraries. Those initiatives aim at making European information resources easier to be accessed and more user-friendly in an online environment. They build on Europe's rich heritage combining multicultural and multilingual environment with technological advances and new business models.

The above-mentioned documents encourage memory institutions to consider a new paradigm "Integration of memory institutions" defined in major European research projects: Minerva, Minerva Plus, Digicult, Michael etc. This new paradigm requires cultural policy convergence and willingness to adapt new regulatory framework within the European

countries in order to increase access, to improve services and reduce the handling and use of fragile or heavily used material and create a "back up" for endangered material.

Concerning the policy of integration of Lithuanian cultural heritage into the single digital European information area it has to be admitted that the project of the National Library of Lithuania - "The Creation of the Integrated Virtual Library Information System" which in 2005 received the financial support from the EU Structural Funds has brought the attention of state institutions to the problems of long-term preservation of national digital cultural heritage, the necessity to form the national viewpoint on cultural heritage management and the benefits of memory institution integration. It has encouraged the Ministry of Culture and other institutions to initiate legal validation of the Concept of Digitisation of Cultural Heritage and invent a strategy for its implementation [5].

On the basis of results of different European projects as well as national and international projects dealing with cooperation of memory institutions in the field of long-term preservation of digital cultural heritage, the main national memory institutions participate in the creation process of the Virtual Library System of Lithuanian digital cultural heritage.

The Virtual Library System is also based on the already established theoretical models of Virtual Libraries [6-7]. We used them for defining specific procedures and standards relying on the already functioning Lithuanian Integrated Library Information System - LIBIS and LIBIS Software.

By joint efforts of libraries, museums and archives on this project a methodology for cooperation was established which includes: selection criteria for the material to be digitised, preparation of originals for digitisation, handling of originals, metadata, management of digitised objects, access to digitised objects.

The experience gained from joint work serves as an important foundation for further cultural heritage strategies and cooperation among memory institutions in: promoting the digitisation of cultural and scientific heritage in a sustainable way, implementation of the developed model by other national memory institutions and similar institutions abroad. As it is determined by the project, objects with copyright restrictions are not selected for digitisation, therefore issues on copyright law are not discussed in the paper.

## **2. Objectives**

This paper outlines our approach and describes lessons learned from creating a methodology of cooperation among memory institutions in Lithuania developed in the creation process of the Integrated Virtual Library System, presents organisational functional structure of the system, software products developed and benefits gained from this project.

As it was stated before, one of the most important requirements for cultural infrastructure improvement is to create a solid network of memory institutions capable to create digital content of the deposited cultural heritage objects and improve access to it.

The state-of-the-art analysis through literature overview and Internet search in order to provide the most extensive insight involved the following relevant aspects: selection criteria policy that can be used by memory institutions, conversion management to support maintenance of digitised objects, access to them, legislation issues; human resource planning, development and maintenance of Web interfaces, preservation of Digital content.

Although the main of those issues had been covered by the Guidelines developed by international projects and respective standards and technologies had been available on the market, the results of the analysis of the state of the art revealed that a common policy and practical implementation of the new cultural paradigm - integration of memory institutions into single cultural heritage digitisation process had been missing in Lithuania. That was the reason why NLL, being one of the principle national memory institutions, during the period of 2003-2004 carried out some planning activities on the preparation of strategic documents

on digitization of cultural heritage, integration of memory institutions and fundraising. The result of those activities was the project of National Library of Lithuania "The Creation of the Integrated Virtual Library Information System"(IVLIS) which aims at forming a solid network of libraries, museums and archives in digitising cultural heritage and making it available for public and free access to all users in Lithuania and worldwide. From this follow the goals of this project:

- creation of common digital information environment of Lithuanian cultural heritage with the assistance of memory institutions and other bodies responsible for cultural heritage;
- digitisation and distribution of the Lithuanian cultural heritage on the basis of the Integrated Virtual Library Information System;
- formation of an efficient infrastructure for digitisation of the Lithuanian cultural heritage in order to help memory institutions - libraries, museums, archives and other bodies responsible for the preservation of cultural heritage - to fulfil their obligations.

### 3. Methodology

The state-of-the art analysis through the literature overview and European research projects BRICKS, PRESTOSPACE, DELOS, EPOCH, Minerva, Minerva Plus, DigiCult, Michael, national and international projects, f. i. examples as: Biblioteca Virtual Miguel de Cervantes (Spain, [www.cervantesvirtual.com](http://www.cervantesvirtual.com)), BAM Portal zu Bibliotheken, Archiven, Museen (Germany, [www.bam-portal.de](http://www.bam-portal.de)) has revealed that the most efficient way is the creation of the Virtual Library System, performing the traditional functions of storage, preservation of information and providing access to it. It also functions as a shared system distributing any available information as well as positively promoting and maintaining creation of such information.

ISO 14721: 2003 Space Data and Information Transfer System - Open Archival Information System - Reference Model (OAIS) standard was chosen as the foundation for the methodology of the Virtual Library System.

The initial concept of IVLIS was very much influenced by one of the most remarkable initiatives, namely, NCSTRL (Networked Computer Technical Reference Library) [6], a networked server system providing three types of services: preservation, indexing, and user links. However, in the development process this rather successful conception had to be adjusted to the already established LIBIS infrastructure. Besides, the potential of the project partners as well as their diverse software versions had to be considered.

The current LIBIS system, an organisational infrastructure of 83 institutions, including 73 libraries and 10 museums, was supplemented with a depository for storage of digitised documents without disregard for the existing LIBIS standards, software and functional structure and a new central databank linking all the three types of the above-mentioned institutions as well as public online access to it was established.

However, to warrant protection of digitised objects, implementation of the NCSTRL prototype has not been fully achieved in Lithuania. The idea of the NCSTRL prototype had to be dismissed for data protection safety and economic reasons. After the analysis of the partners' current technical environment and evaluation of upgrade and further development costs of each partner's system, the approach of a centralized database with a large data storage capacity was chosen. Such a decision was made for cost-minimizing reasons and for sustaining availability of the IVLIS system independent of the partners' local servers. Metadata (including bibliographical descriptions) are created in local catalogues and transferred to IVLIS together with images. Images are stored exclusively in IVLIS. The cost-effective analysis of the project has revealed the above-mentioned model to be the most inexpensive. However, the project partners have not abandoned their intentions to

accumulate digital master images in the TIFF format in their repositories for special usage in case users need images of superlative quality, e.g. for research purposes.

The Architecture of the Virtual Library System consists of 3 parts: the Lithuanian National Library, the Lithuanian Museum of the Arts and the Lithuanian Archives Department (together with the subject institutions), each operating on the platform of different software: LIBIS (Lithuanian Integrated Library Information System), LIMIS (Lithuanian Integral Museum Informational System) and LAFS (Digest of Lithuanian Archival Collections) as depicted in the following chart:

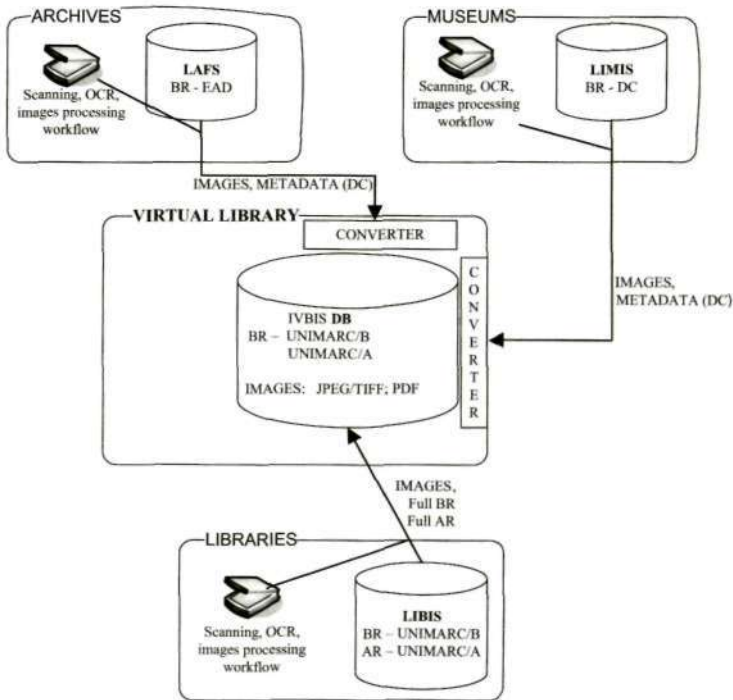


Figure 1: Organisational Structure of the Virtual Library System

#### 4. Technology description

The created infrastructure enables access to existing bibliographic data and systems.

The workflow of the processes within the Virtual Library System is common for all partner systems. Manual creation of bibliographic and authority records is not enabled within the Virtual Library System. The digitised images are assembled into a single entity and linked to the bibliographic records stored in the original catalogue. The main objective underlining the design process and realization of the Virtual Library System was to guarantee the largest interoperability between the newly created system and the original catalogues. All bibliographic records maintain links to the original bibliographic records stored in partner systems, and updates made in the partners systems automatically are transferred to the common Virtual Library System.

One of the challenges at the start of the project was the fact that all the three partners were storing their data in different formats and were using different classification systems

and different approaches for the same data. Therefore it was decided to look for a universal solution and create a system best adapted to the users' needs and perception with a single search framework for retrieval of objects from museums, libraries and archives. Unanimous treatment of metadata was achieved and a way was found to store them in a common database. Because of the fact that data stored in the Virtual Library System had been initially generated in various formats, the new Virtual Library System supports the following import formats: UNIMARC, EAD and DublinCore. Data to be imported into the Virtual Library System must be initially packed in METS - Metadata Encoding & Transmission Standard package. The bibliographic data in the Virtual Library System itself are stored in UNIMARC format. Data in EAD and DublinCore formats are converted into UNIMARC during the import process.

There remains one unsolved problem concerning the usage of common authority database. It turned out that using a common database makes it fundamental to perform changes in the partners' systems and a great deal of metadata must be rearranged.

Desktop software for processing and handling of digitised objects: numbering, quality control, return for rescanning, OCR, inclusion of bibliographical records, and final import of data into the central DB has been developed. The above-mentioned functionality (except data import function) can operate without online connection with the central database server of the Virtual Library System.

Digital Asset Management System (DAMS) has been developed for management of images and other files, and related metadata (bibliographical information and administration information). Web modules have been developed for the search, presentation and visualization of stored digital cultural heritage.

At present all software is in testing mode and data is actively loaded into the system.

#### 4.1 Data Management Approach

Due to the fact that all the LIBIS data are stored in Oracle relational databases, Digital Asset Management System has been developed on Oracle DBMS 10g and Oracle Internet Application Server 10g. It allows operations with structural and non-structured information. An Oracle product, Oracle InterMedia, is used for implementation of operations with digital objects (images, text files, etc). Oracle InterMedia allows to manipulate SQL digital objects together with their descriptive attributes: SQL/MM still Image interface, which matches the ISO/IEC 13249-5:2001 standard, is used for the purpose.

One of the difficulties of the project was the necessity to store large amount of data with insufficient financial subsidies for that purpose. A technical solution of the problem has been found: we have implemented hierarchical storage management based on IBM Tivoli HSM software, which allows to use cheaper data storage media. It performs auto-migration of seldom-used files to tape storage and their backward auto-migration to a disc in case they are needed by the operating system/user. It makes no difference to the user whether the files needed are on disc or on tape. The data returned to discs are preserved there for a period of time set by the administrator and subsequently auto-transferred to tapes (caching function.) Therefore usage of inexpensive data storage media (tapes) instead of discs enables increase the amount of images stored at a lower cost.

#### 4.2 Software Architecture

Our approach is that universally accepted J2EE technologies should be used which ensure compatibility with various platforms. Components of the LIBIS system, which have been used by libraries for the last 10 years, are used in the backend. Access and data exchange functionality are implemented with the help of 3 main components:

- Application for web pages. It can be accessed at <http://www.epaveldas.lt>;

- Application for automatic data import. It performs batch import of bibliographic records with multimedia additions;
- Application for business logic. It performs all business logic functions necessary for the other two components.

Application for web pages generates dynamic HTML pages for users. It operates by the interface of the Web section of the J2EE application server and its architecture corresponds to the architectural style of Model-View-Controller (MVC). The View and controller sections are developed with the help of the Struts framework and JSP technology.

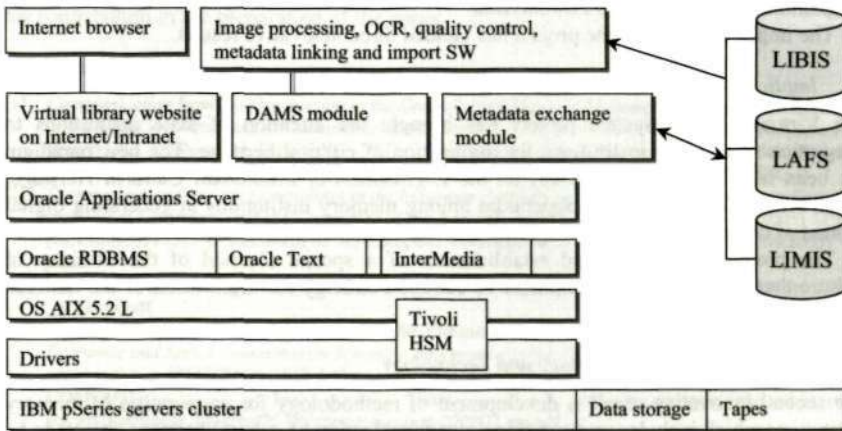


Figure 2: Software Chart of Virtual Library System

## 5. Benefits

The overall objective of the Project has been fulfilled: the urgency for a national viewpoint on cultural heritage management has been indicated and advantages of integration of memory institutions into the single European electronic space and accelerating their introduction into the cultural infrastructure has been demonstrated.

Specific outcomes of complete implementation and validation of the Virtual Library System are these: accessibility, continuity and long-term preservation:

- A databank of digital cultural heritage from libraries, archives and museums has been established with online service for national and world-wide users;
- Online public sector services which are particularly helpful to a great number of people in Lithuania have been updated and improved;
- Free and equal access to the online system has been ensured for all end-users;
- Long-term preservation of most rare and unique cultural heritage objects has been guaranteed with no access limitations;

The project has contributed to the solution of social and economical issues:

- 32 new job places have been created for digitising operators, programmers, necessary equipment has been acquired and so a contribution has been made to the national social and economical development;
- Time and travelling costs are saved because of online access to information stored in libraries, archives and museums.
- The created system has set up conditions for in-house self-education, especially for disabled persons with online access to the Virtual Library System.

## 6. Results and Conclusions

The communicative power and authentic and tangible value of old texts, historical documents, works of textile art, drawings and other artistic and historical objects of cultural heritage can be brought to their full expression in a synergism of their digital presentation. Digital format increases their access possibilities, increases their additional value and ensures their durability. This objective of considerable importance is being achieved by digitisation of the objects stored in memory institutions. The project developed by three primary national memory institutions has implemented the main concepts for cooperation among memory institutions laid down in the communications and main research programmes of the European Commission.

The implementation of the project has yielded three innovative results.

### 6.1 Implications for Cultural Policy

The Virtual Library System project has brought the attention of state institutions to integration of memory institutions for digitisation of cultural heritage. The new paradigm has been legalised by *the Concept on the Digitisation of Lithuanian Cultural Heritage*, which set the foundation for cooperation among memory institutions in generating digital content of cultural heritage on the grounds of the Virtual Library System.

The project also influenced establishment of a special Council of the Ministry of Culture that has initiated development of common strategy for digitisation of the national cultural heritage.

### 6.2 Implications for Methodology and Technology

The second innovative result is development of methodology for cooperation of memory institutions which includes uniform principles for selection of cultural heritage objects to be digitised as well as cultural heritage preservation and access to it validated by the Conceptual Framework of Digitisation. Creation of the Integrated Virtual Library System has proved practical value of the methodology used.

Memory institutions aimed to agree on uniform standards for technical file management and metadata, methods of numbering, thesauri and other classification systems, which in turn guarantee long-term preservation of data as well as efficient access to it. It allows to create a uniform and integrated search engine via all catalogues and allows to deliver digital information to the user without restriction.

The fact that several more significant libraries, archival institutions and museums have declared their readiness to participate in the project, when its prolongation for the 2007-2013 programming period had been announced, serves as an additional proof for correctness of the applied methodology and technical solutions. The conceptual project *Creation of the Digital Content of the Lithuanian Cultural Heritage* has been launched for integration of the principal national memory institutions and libraries, and for considerable expansion of the national digital cultural heritage.

The effectiveness of the methodology could be also confirmed by the recent joint research project of memory institutions on generating a single authority databank of Lithuanian personal and geographical names aiming to facilitate unification of cultural heritage content description and to improve access to it.

### 6.3 Implications for the Digital Content of Europe

The third innovative result is creation of rich digital content of national cultural heritage, which comprises: old Lithuanian books (1547-1863); press released prior to 1940; Lithuanian books in Latin of the 16th and 17th centuries; Lithuanian books in Polish of the 17th and 18th c.; manuscripts and archival documents, i.e. parchments as well as church

registers of birth, death and marriages of the Roman Catholic Church (1599-1930) and works of graphics, watercolours and folk graphics, photo negatives, positives, slides, maps, etc. The larger part of that collection is already available at <http://www.epaveldas.lt>.

The created digital cultural heritage will contribute to the improvement of Lithuania's national image abroad as the digitised content will be open for access to world-wide users.

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