Development of the University's Library Information System Model as an asset of the e-Society

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Abstract -Information society (e-Society) as new society base on networks, computer and communication capabilities, transforms the way that information is viewed and managed, and change the way the organizations manage their business processes. In this society the need for data integration in one place has been present more than ever. The key of success lies in creating appropriate information system based on new technology and network capabilities that will support the processes of the organization. The universities represent specific organizations with the highest priority of accessing to scientific knowledge. As academic institutions which produce knowledge, universities use and manage information from both: internal and external sources. e-Society offer a new dimension for communication between the students, professors and administrative staff by allowing quick access to information from an unlimited number of users from different locations at any time, with the possibility of further processing and use thereof. The existence of library information system (LIS) is a predisposition for quality assurance in universities. The purpose of this paper is to propose a model for University's Library Information System (ULIS) that integrates information in a simple way, and allows quick access to books, electronic materials (internal books, lectures, manuals, presentations etc.), articles or research results from each member (unit) of the university.

I. INTRODUCTION

It is an era of social transformation where information and knowledge are the most important resource in the economy, and their security, processing and distribution are the fastest growing sector. The development of information and communication technologies (ICT) and the occurrence of the Internet and wireless devices, contributed to the emergence of the new society so-called Information Society (e-Society). The potential of this new society was described many years before its emergency: Lancaster [1] argued that the effects of technology occur in three stages: first, it enables us to do what we do now, but faster and cheaper; second, it enables us to do what we cannot do now; and third, it transforms our lives. e-Society refers to a system where cultural, social and political centre of existence revolves around the production and distribution of information through the use of ICT. The need for quick transmission, reception and global exchange of information with digital assets, regardless of the distance, is the dominant feature of e-Society. Hence, the key to success in this society lies in creating additional appropriate information systems (IS).

Information systems represent a set of integrated components for collection, storage and processing of data and delivery of information, knowledge and digital products. IS is a system composed of people, organization and ICT whose main task is collecting, processing and/or interpretation of information for the sole purpose to provide effective and efficient services [2]. The existence of IS is associated with mutual activity of six major components: hardware, software, network, data, procedures and people. The concept of an integrated information system based on new ICT and network capabilities has been adopted in all sectors in the society, including libraries.

The place where information is stored, kept, issued and used traditionally is called library. Braude [3] recommended six functional responsibilities for the library; one is that the library should serve as a broker of information from both internal and external sources. The term library most commonly associated with intellectual activity so in the world of education (especially at the universities) it is perceived as a centre of networked information necessary in the process of lifelong learning, researching and creating new knowledge. According to Braude [3], library is already viewed as an institutional resource that seeks support not for itself, but for its users.

As "information agency" in terms of e-Society, library is facing with dramatic change in the way of it works [4]. Observed as place of collecting, storing and publishing, but also researching and creating of new knowledge, the library is directly related to the need for adequate Library Information System (LIS). Matheson and Cooper [5] mention two types of libraries: the academic information resource services (AIRS) library, and the academic information management (AIM) library. Both are stage-I libraries in the evolution of an integrated academic information management system. The AIRS library will have fully developed library-to-library and library-to-user capability. ICT in relation with the possibilities offered by the Internet enables the creation of effective LIS, which modern libraries transform into virtual organizations – digital libraries.

Although the university libraries do not always play a direct role in the creation of on-line resources, they offer access to resources and have responsibility to made available to users. The use of LIS provides integration of classical and electronic libraries, offering access to

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resources and services to support learning (e-learning), teaching, and research in the classroom and at a distance. In this way both students and teachers can learn and explore databases without being physically in the library and its satisfaction often depends on the functionality, effectiveness and efficiency of LIS.

According to Kokorceny and Bodnarova [6] some of the typical disadvantages of digital library system are: not enough flexible architecture, tight coupling of application components (instead of loose coupling architecture), higher costs of customization of a digital library system, digital libraries usually cannot share application components with other information systems, difficult integration of a digital library system with other information systems and applications in an institution, higher costs of this integration, usually there is not process based approach.

Good planning is necessary in the process of creating system architecture for an IS to be effective. Hence, a key factor for the success or failure of an IS, is the architecture of the system that provides the necessary functionality and its quality attributes.

In this paper we propose a model of information system for University library that integrates information from individual libraries placed in different locations. This ULIS will allow the users (students and staff) to use the resources in the process of teaching and research in a simple and fast manner, regardless of their location.

Next section gives a theoretical view of digital libraries. The proposed ULIS model is through diagrams, explained in the third section, while the fourth section concludes the paper.

II. DIGITAL LIBRARY

The term "Digital Library" is currently used to refer to systems that are heterogeneous in scope and yield very different functionality. These systems range from digital object and metadata repositories, reference linking systems, archives, and content administration systems (mainly developed by industry) to complex systems that integrate advanced digital library services (mainly developed in research environments) [7].

As an integrated set of services for capturing, cataloguing, storing, searching, protecting, and retrieving information, which provide coherent organization and convenient access to typically large amounts of digital information. Digital libraries are realizations of architecture in a specific hardware, networking, and software situation, which emphasize organization, acquisition, preservation, and utilization of information [8].

Digital libraries provide information based on technology and services at any time in any place, and encouraging innovative learning throughout life. According to Dhiman [9], the digital library (e-Library) serves mainly as a facilitator in organizing and providing knowledge and resources to its users. Krishnamurthy [10] defines digital libraries as electronic libraries in which large number of geographically distributed users can access the contents of large and diverse repositories of electronic objects. Unlike of traditional (classical) libraries that collect, store and manage information in hard copy, digital libraries content can include "virtually any kind of electronic material, such as various kinds of electronic media (images, video, etc.), licensed databases of journals, articles and abstracts, and descriptions of physical collections' [11]. Electronic resources include online catalogues, databases, multimedia, online journals, digital repositories, electronic books, electronic archives, and online/electronic services [12].

III. UNIVERSITY'S LIBRARY INFORMATION SYSTEMS

Library Management as a sub-discipline of institutional management, focus on specific problems faced by libraries and the professionals who manage libraries. Library Information System (LIS) are used to track items that the library owns, rental of books and its' users. Basic tasks in library management are: planning and gathering materials, renting books, documents and other e-content, membership and human resources management.

Primarily, LIS incorporates basic concepts typical for public libraries. In fact, most public libraries that own printed books and articles use decimal classification system, based on unique identifiers, as their method of marking, preserving and collecting artefacts. The use of such systems contributes in the development of common structures that function as tools for librarians and library users. These structures include: Master catalogues, Indexes, Unique identifiers, Tokens of unique identifiers, Artefacts.

Universities as complex institutions composed of multiple units (faculties and associate members) need information systems to easily share information, coordination and decision making. The implementation of information systems in university libraries, improves communication between all stakeholders and the speed with which users come to certain data. One type of information system that can be used by the university's library is the information system ULIS presented in this paper.

The purpose of the proposed model is managing the university library, i.e. libraries within different units and their integration into a single system. The implementation of such a LIS will integrate all faculty libraries in one, and students, teachers and all other staff will be able to access, search and rent books, download and/or use electronic materials (internal books, lectures, manuals, presentations) etc. One of the main challenges in the creation of the proposed library information system is to overcome the problems associated with the functioning of the faculty libraries.

IV. ARCHITECTURE OF THE LIBRARY INFORMATION SYSTEM MODEL (ULIS)

A library information system usually contains relational database, software and graphical interface. Mostly, these systems divide software functions into modules, where each module is integrated with a single interface. Taking into account all the specifics and needs of a LIS, the architecture and functionality of the

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proposed model ULIS will be presented by a few different types of diagrams.

A. Deployment Diagram

A deployment diagram (Fig.1) shows the physical organization of ULIS, which explains how the individual parts of the system are distributed. Client through communication link (http/Internet) access the client application - Library Information System, which is a node (basic element) of the diagram. Client application via a communication link (a local computer network) is associated with the web server. Web server contains web application for the distribution of a collection of Java Servlets and classes, xml files, static web pages (HTML) and other resources which together compose the web application. Web application is located on the web server and via http/LAN communications link connects the server (containing the database) in order to facilitate the operation of all functions of the application.

B. Class Diagram

In the class diagram of ULIS shown in Fig.2, the types of objects and relationships between them are described. Overall the system consist seven classes. Composition *Database* contains three main classes, of which four more classes are derived.

C. Activity diagram

We use activity diagram in order to show the functionality and to describe the logical procedures and flows in ULIS.

Activity diagram of students. When a student accesses the application he/she has two options: to register or log in the system. Once the user successfully registers/announces several options are available: browse books, choose professor (in order to review and download materials) or review all current reserved/rented books. After the student completes all activities should log out. Activity diagram for students is shown in Fig.3.

Activity diagram for teachers. Activity diagram for teachers is shown in Fig.4. The initial actions for entry and registration in the system are the same as for students, but teachers could also upload documents (scripts, lectures, exercises, results). The teacher can attach a new document, modify or delete a document previously upload in the system.

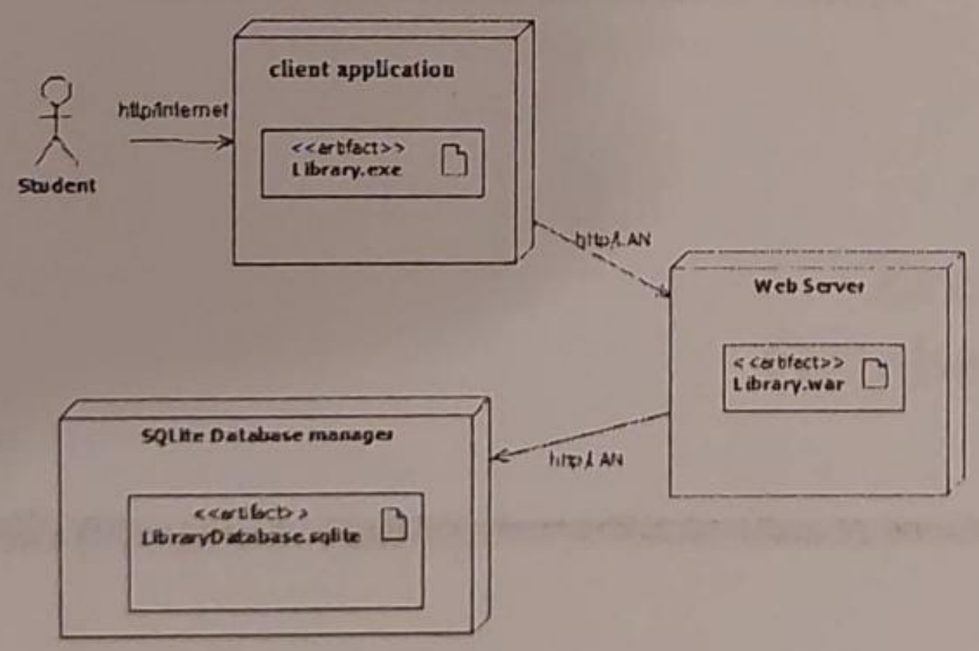

Figure 1. ULIS deployment diagram

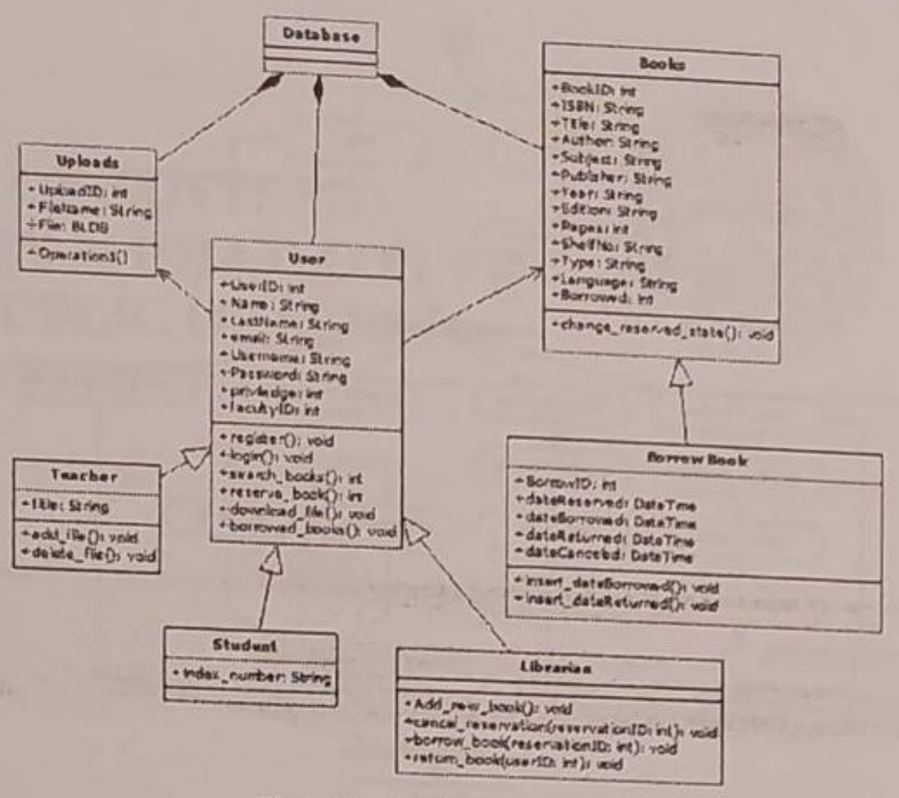

Figure 2. ULIS class diagram

Activity diagram for librarians. The activities in ULIS, that can perform librarian, fully contain the activities of the student and partly of the teacher (librarian cannot upload and delete documents). Additionally librarian can add a new book to the system, update data related to the rental of books, and make the changes to the book status (rented/available). The activity diagram of the librarian is shown in Fig.5.

V. Conclusion

In the last decades digital libraries play an important role in knowledge sharing. The application of LIS at universities provides an integrated platform for students and teachers on which they could easier and faster exchange information and materials.

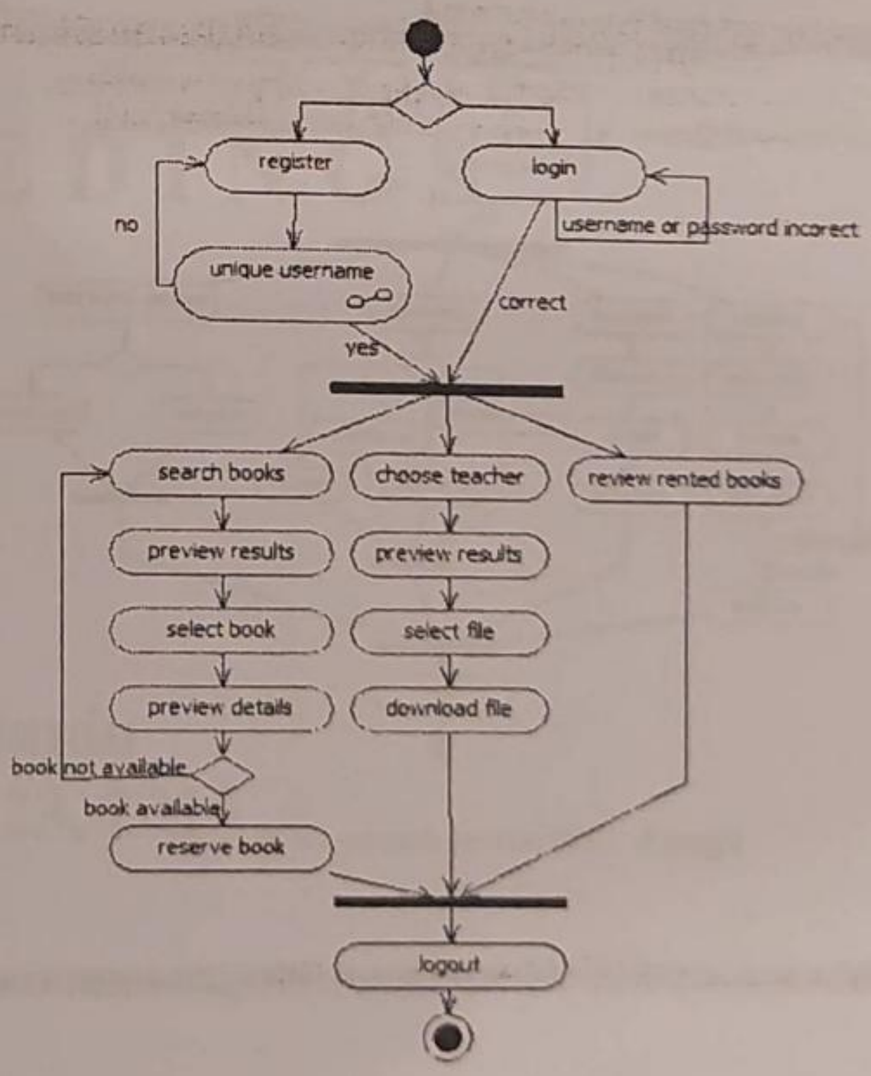

Figure 3. ULIS activity diagram for students

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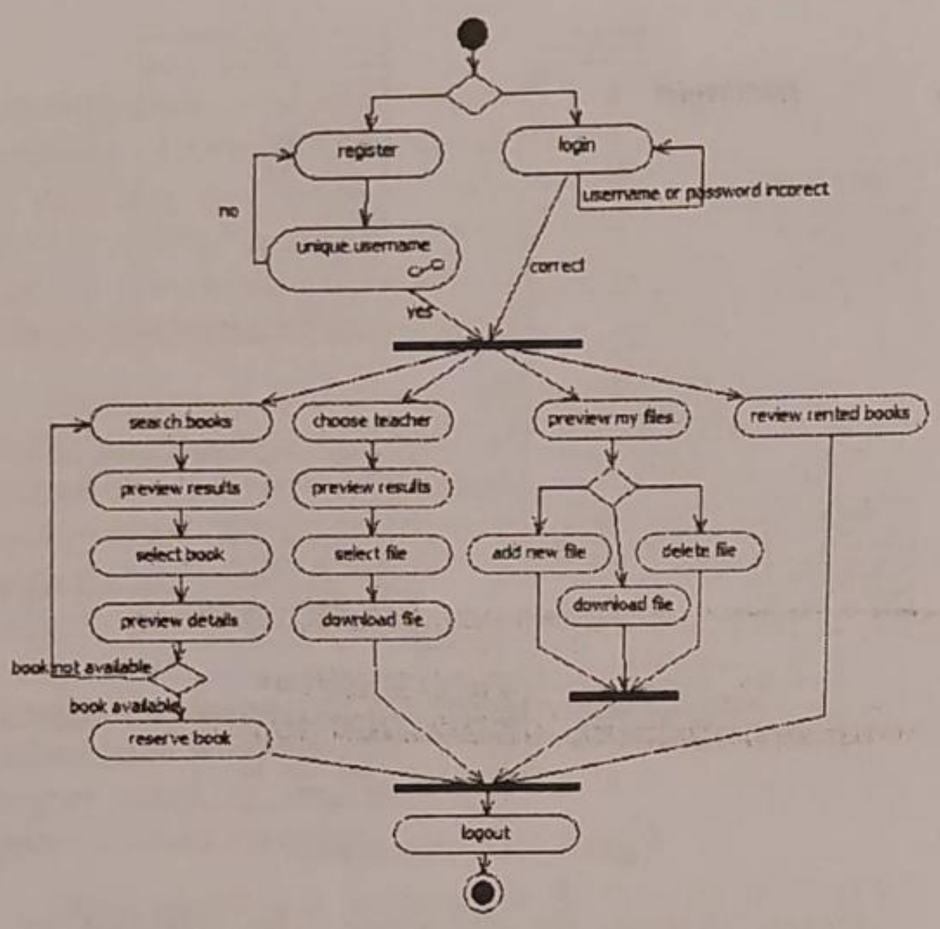

Figure 4. ULIS activity diagram for teachers

The purpose of the proposed ULIS model is to integrate the various university libraries of the units in a system that will allow all users to be able to search and rent books as well as to access and upload e-contents. Proposed model reduces the time required to search literature and also facilitates access to it. Additionally, facilitates the coordination of the overall work of the university in terms of manipulation with integrated fund of information and e-materials, and meeting the needs of users (students and teachers) for quicker and easier access to the desired information.

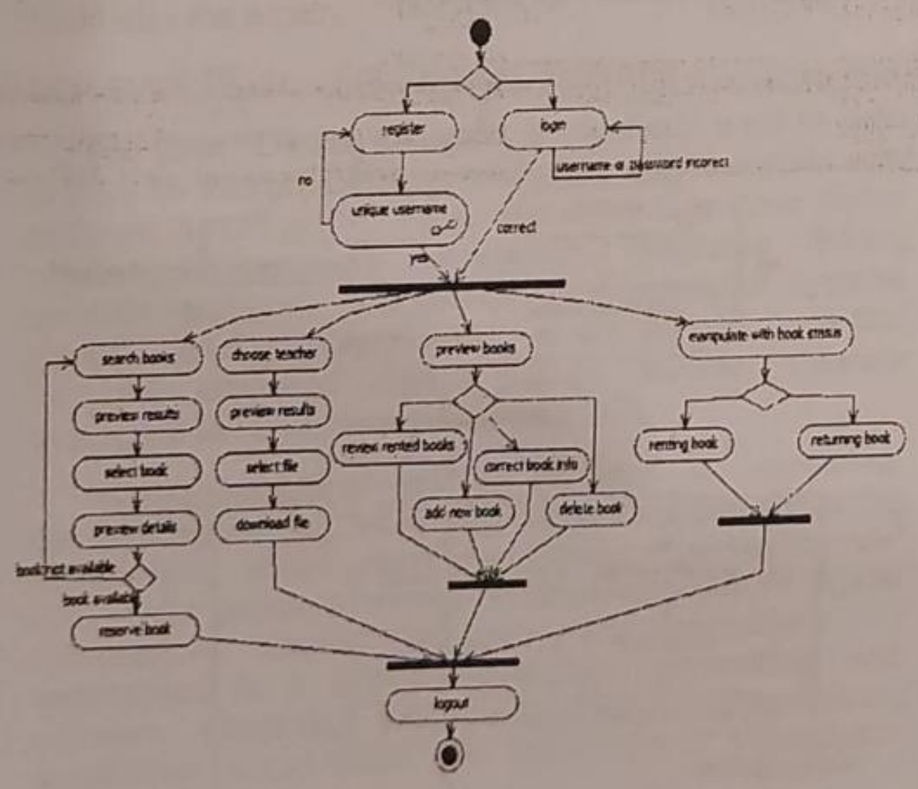

Figure 5. ULIS activity diagram for librarians

Overall, the proposed model gives equal access to all users without any administrative supervision which would control the categories of users. Categorizing the users as well as providing other benefits to different categories of users is one of the possible upgrades of the system. Software solution, based on the model presented in this paper is developed, but its implementation and testing with real users remain to be the done as further work.

The usage of the suggested information system will enable quicker access to the required materials for students, easier management of the book storage and the electronic materials for the administrative staff, but before all, it increases the level of communication between the different sides at the University.

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