

Developing a Personalised Medical Library Portal

Anamarija Rozic-Hristovski¹, Iztok Humar², Dimitar Hristovski³

¹ *Central Medical Library, Medical Faculty, University of Ljubljana*

² *Faculty of Electrical Engineering, University of Ljubljana*

³ *Institute of Biomedical Informatics, University of Ljubljana*

anamarija.rozic-hristovski@mf.uni-lj.si, iztok.humar@fe.uni-lj.si,
dimitar.hristovski@mf.uni-lj.si

Abstract

The Central Medical Library (CMK) at the Medical Faculty, University of Ljubljana, Slovenia created its website in 1997 and since then has been actively involved in its maintenance and improvement. Its digital library is under rapid development, with permanently growing number of full text journals and databases. The analysis of our website usage revealed an increasing interest among the Slovene biomedical community especially for full text resources. By using data mining methods we discovered user navigation patterns, some of which were quite unexpected. Patrons have often complained to librarians about information overload and difficulty to follow all websites enhancements. Such a situation demanded for a dynamic restructuring of the CMK website. Often such problems are solved with customisable and personalised library portals because they address the modern library role directly by being customer focused, responding to customer needs, and empowering users to create personal information systems that are responsive to their individual needs. That is why we started to develop a personalised medical library portal. As we have limited financial and human resources, we decided to customise and extend an existing library portal software solution. We were especially interested in portal software from the higher education community and libraries as these solutions are usually being distributed under GNU Public Licence as open source code. We selected the MyLibrary library portal software from the North Carolina State University because it is the best documented of such projects, and has a well-developed and fairly intuitive interface for both users and administrators. We not only customised the MyLibrary portal for our library, but we also added some important new functionality, most notably multilingual support. Multilingual-support means that the user can select a language in which the portal interface is presented to her/him. Our extensions to the MyLibrary portal required changes both to the underlying data model and to the corresponding CGI Perl scripts which deal with the user and administrative interfaces. We would like to share our experience with developing a personalised medical library portal because we believe it is applicable to other European libraries, most of which usually offer information in at least two languages.

1 Introduction

Academic medical libraries provide information resources and services to students, faculty, health professionals and researchers in an environment that supports learning, teaching, health care and research. The rapid development of information technology is transforming library service at a spectacular rate. By connecting to the Internet and World Wide Web, the academic library expands its access to information resources, some of which appear as a digital library.

Due to technology advances and the wide dissemination of information, users suffer from information overload and expect their library to select the best and organise it effectively for their personal consumption. Top LITA experts identified a number of important future trends for technologies in libraries.¹ They identified Trend 1 as “library users who are Web users, a growing group, expect customisation, interactivity, and customer support.” They stated that approaches that were library-focused instead of user-focused would be increasingly

irrelevant and mentioned The University of Washington's [MyGateway](http://www.lib.washington.edu/) (<http://www.lib.washington.edu/>) and North Carolina State University's [MyLibrary@NCState](http://my.lib.ncsu.edu/) (<http://my.lib.ncsu.edu/>) as examples of customised library portals.

Library portals bear upon two of the three Keystone Principles identified by a group of leading ARL library directors: (1) "Libraries are responsible for creating innovative information systems for the dissemination and preservation of information and knowledge regardless of format" and (2) "The academic library is the intellectual commons for the community where people and ideas interact in both real and virtual environment to expand learning and facilitate the creation of new knowledge."²

A Web portal or gateway is now the standard interface to aggregate library resources and services through a single access and management point for these users. The concepts, called personalization and customisation gain interest among librarians, especially those at universities and institutions with large collections, growing numbers of online resources, and user populations with varying levels of computer and research expertise. Customisable and personalised library portals tend to be customer focused, responding to customer needs, and empowering users to create personal information systems that are responsive to their individual needs.³

A library portals has been defined as "systems which gather a variety of useful information resources into a single, one stop Web page, helping the user to avoid being overwhelmed by infoglut or feeling lost on the Web."⁴ Portals are user-centric, while home pages are owner-centric. Portals allow the user to customise their Web information based on personal preferences or for librarians to develop customised gateways to specialised resources of value. Customised Web portals can bring to light the suite or resources being offered by a library and will allow the patron to create a personalised service.

The MyLibrary option appearing on many library portals is part of a larger trend toward customisation and personalization. Consumers are being trained to expect that the world will be focused on their needs, wants, and desires. This expectation translates into MyThis and MyThat on the Web. Implementers of MyLibrary projects seek to provide a customised view of the library that reduces information overload and administrative overhead. Some early adopters of MyLibrary concept are The University of Washington, North Carolina State University, Cornell University, University of Utah and New York University. Many developed a system in direct response to cries of information excess by users encountering a megalibrary with thousands of resources. MyLibrary appeals to individual user to create a personally relevant library.⁵

Customisation is only one part of MyLibrary trend. A library portal must be more than a method to select from a set of links; it must also include databases and applications windows.

2 Scope

The Central Medical Library (CMK) is a department of the Medical Faculty of University of Ljubljana, Slovenia. It is the main biomedical library in the country and serves students, faculty, health professionals, researchers and laymen. CMK started to build a library website (<http://www.mf.uni-lj.si/cmkl/>) which included a guide to library services and resources in 1997.⁶ Since then the contents of the website have doubled, patrons became more aware of its importance and, users' computer literacy, computer equipment and Internet connections have improved significantly.

The planned content of the website had crucially influenced the decisions regarding its structure. The CMK website is built as an information entity embedded in uniform graphic design that encompasses three levels of menus, two levels of headers, the footer and background. It is possible to choose between eight sub-menus that provide some key information needed for effective use of CMK and access to information resources.

Functionality is reached by a menu/hypertext link structure with two frames displaying the current menu and active text, where information screens and hypertext links allow cross-menu navigation. It is possible to scroll each frame independently of the other. That enables the user to quickly change between different options inside a menu.

In 1998 and 1999 CMK performed the analysis of website usage behaviour to obtain concrete knowledge about the way that visitors navigate the website.⁷ The website access evaluation was conducted by analysing the CMK Web server log files. The results revealed that the visitors most frequently started and ended their visits on the CMK home page. Reference pages with lists of print and electronic information resources were also significant starting and ending points in exploring the website. It seemed necessary to ensure greater visibility of these pages and a more convenient navigation path to them. A more intuitive design for some directional pages was needed as well, consequently visitors would be able to access information more quickly and easily with less clicks. Log file analysis adequately revealed overall usage patterns, but could only provide estimates of individual user characteristic. Because of the problems with log file analysis we were not able to discover the identity of many frequent users.

In 2000 we decided to discover user navigation patterns in the CMK website using a Web usage mining tool WUM⁸ (Web Utilisation Miner). We found several interesting patterns, some of which come as a surprise to the web site designer because they were unexpected to him.⁹ The discovered navigation patterns gave us a better understanding of our users and their needs and opportunity to redesign and optimise our site according to the users preferences. Unfortunately very frequent requests for links to external websites such as electronic journals, databases, search engines were not recorded in the web log file. Thus, we were unable to analyse the paths to these links.

Results of our studies revealed that patrons had different interests. The most visited webpages were dispersed among different sub-menus and subject categories. Therefore the users probably found the whole website to be of potential interest. Today the patrons have to cope with the rapidly expanding digital library and continuous improvement of library services. Such a situation demanded for a dynamic restructuring of the CMK website because of limitations of a static Web design. Often such problems are solved with customisable and personalised library portals because they address the modern library role directly by being customer focused, responding to customer needs, and empowering users to create personal information systems that are responsive to their individual needs. That is why we started to think about a personalised medical library portal. As we have limited financial and human resources, we decided to customise and extend an existing library portal software solution.

We started a pilot project with the aim to select the most appropriate portal software from the higher education community which is being distributed under GNU Public Licence as open source code and customise it to the needs of MyLibrary CMK.

3 CMK portal design

The number of the CMK website visitors is steadily growing and it is coming near 10.000 per year. The majority of them are from Slovenia and some from abroad as well. The patrons from the Faculty of Medicine usually use our website most heavily. At the moment the website disposes with a great number of webpages considering general information and services, more than 1500 electronic journals and about 500 links to internet resources by topic. Website maintaining and development is supported by a part time electrical engineer and two librarians in occasional collaboration with other staff who simultaneously take various other responsibilities.

In such library environment and considering the results of our analyses we decided to offer our users a personalised medical library portal. Because of limited human and financial

resources we wanted to adopt an existing library portal solution that best suited our needs and given situation. We wanted the portal to enable MyLibrary feature and a powerful search engine. The portal should support the main functions of an academic medical library and its users needs. Patrons should have possibility to select their favourite journals, internet resources and frequently used library links. The number of clicks and time needed to locate a variety library services and resources should be minimised. Identifying frequent users and reviewing their needs and preferences using registry forms and cookies was perceived as an important portal function. We expected to establish a connection between national online library catalog COBISS and lists of journals and new books which would facilitate current awareness service and save staff time.

The difference between static website, used only for delivering information via WWW, and a Portal is that the latter, also commonly addressed as a gateway, presents standard interface to aggregate a library's resources and services through a single access and management point for library's users. Using dynamic page generation, personalization and customisation portal can help users to avoid being overwhelmed with information. Technically speaking, a library portal is database application, accessible from a Web interface, and governed by the principles and practices of librarianship. The distinctive element of such system is not the technology driving it, but interactive assistance services it provides via librarians.

In the first phase of the portal design process, we had to determine how to customise the existing portal sections to the scope of CMK resources and services and which information needed to be personalised to meet the needs of library patrons. We can divide the information that library provides in two groups. Static information such as opening time, service charges, location, staff information, circulation policy etc. does not change often and can be a part of a static web page, just as it is. The second group of information are the library information resources that grows steadily and therefore changes very often. It has to be updated simply by librarian, without interaction of a system administrator. All the portal sections containing the information not interesting to all users require personalization approach.

If a library decides to provide personalised access to its resources and services, nowadays the system no longer need to be developed from scratch. Several projects of this kind software have been developed and some of them are willing to share their code. Technical infrastructure requirements – hardware, software and needs for local configuration and customisation may vary quite a lot, although when deploying already developed system, the most of the hard work is already done. Some of these projects are quite sophisticated, but unfortunately some of them are quite dependent on and linked with the library's on line catalog system, which can support different standards in different countries. Customisation of such system may require more than just an installation and employment of ready developed portal software, the development of the library-dependent intersystem interfaces could take considerable time and demand significant programming experience as well.

During our platform-choosing process we have reviewed the documentation of the bellow listed systems. MyLibrary@NCState and My Gateway were also installed, tested and reviewed.

1. MyLibrary service at Virginia Commonwealth University¹⁰
2. My Gateway system at the university of Washington¹¹
3. MyLibrary personalized Electronic Services in the Cornell University Library¹²
4. MyLibrary project at Los Alamos National Laboratory¹³
5. MyLibrary system at North Carolina State University¹⁴

3.1 MyLibrary@NCState: system description

MyLibrary system at North Carolina State University is probably the best-documented implementation of a user-centred, customisable interface to the library's collection of

information resources. It is well-developed and offers intuitive interface for both – users and administrators. MyLibrary@NCState as an entry point offers its users several information and resource collections divided into the following sections: Global message, Message from Librarian, Your Librarians, Library and University Links, Bibliographic Databases, Electronic Journals and Reference Shelf. Users have an opportunity to select or deselect items they want to have displayed in these section on the beginning screen using “*customise*” option. The last three sections are discipline dependent. This allows users quicker access to the resources from the field they are interested in. Once configured, MyLibrary@NCState can store information about user on the local computer using web cookies. This way, the user does not have to login repeatedly unless he or she wants to use previously defined settings on a different computer.

The administrative part of the system – also very important from the library’s point of view – is divided into 4 categories: functions for content providers – librarians, functions for webmasters, functions for system administrators and functions for report generation. Content management functions allow authorised librarians to review, add, delete or change the current content, such as list of disciplines, names, links and descriptions of databases, journals, libraries and universities, the names and contact information for librarians and texts provided by the system. Administrative system provides a creation of reports on broken links and is used for reviewing items of all resources linked with specific discipline. Webmasters are provided with a very strong system, which uses a proprietary scripting language for describing a data that resides in the MyLibrary’s database. Web page formation – such as changing background and text colours or selections arrangements can be also done through Webmaster part of administration system. The appearance of the system can be controlled via Cascading Style Sheet commands directly entered into forms provided in Webmaster sub-menu. The system administrators have an overall system control while setting the global preferences, define new disciplines, assign appurtenant librarians to disciplines and control the texts used for the user-system communication.

It is evident, that this system is much more than just a Bookmark manager. It allows users to regularly receive and search lists of new books added to the library’s collections. The user selects preferred discipline and according to that, he is referred to an appropriate librarian and a collection manager who is specialised in the given subject area. Since library patrons do not always have time to constantly hunt new and better resources, librarians can use the “Message from the librarian” service to keep patrons informed and make announces, suggestions and other way help users stay in touch with interesting information in their selected discipline.

In the North Carolina State University MyLibrary@NCState system is grounded on a computer running Unix, but for the same purpose an open source – free operating system from the Unix family, such as Linux or FreeBSD could also be used. The database application serving all the content is MySQL, also free, with the ability to run on multiple computers and an application programmer’s interface support for both the Perl and C programming languages. MyLibrary@NCState works with any (free) HTTP server which co-operates with Unix family operating system, as long it has a CGI scripts support. The application part uses Perl to extract the data from the database and dynamically format the HTML outputs according to user’s profile. Perl was chosen since it is an interpreting language – easy to debug, free, works on almost every platform and is provided with API support for MySQL.

3.2 The customisation and functionality extension of MyLibrary@NCState

The installation process of MyLibrary@NCState is straight and due to very good installation instructions a simple task for a skilled Unix/Linux administrator. In CMK, an intel-pentium based hardware was chosen to serve the application. Operating system was decided to be Linux and MyLibrary is intended to be the only application hosted on this system.

The following applications, usually shipped with the distribution of Linux, were chosen during the operating system installation: Apache as an open source, free web server also offers CGI support; scripting language is Perl, also freely distributed at CPAN; the database – as required – MySQL.

The operating system setup was followed by installation of several modules and packages, that have been - at the time of operating system setup process - left out on purpose or because they were not included in the adopted distribution of Linux. After that process, the system was ready for MyLibrary@NCState installation, that consists of configuration and testing MyLibrary SQL database and publishing the HTML content and Perl scripts on the Web.

Since the database shipped with the distribution of the system is filled with examples, the system can be tested immediately after installation.

The customisation of the portal is done by:

- Extending the database structure to enable the multilingual functionality needs
- Redevelopment of Perl scripts to support multilingual functionality for the user part
- Loading the database with the contents that CMK wants to provide to its users
- Providing portal with the appropriate design to suit the rest – already published CMK's Web site.

Most of the content we want to make available on the CMK portal is already accessible as a part of the static CMK website. It is published in a static HTML format and contains the resources needed to be loaded into the database. Not to have manually rewrite all the resources, we developed Perl tools that reformat all the gathered information and inserted it directly into the database automatically. We are also planning to develop Perl scripts, which will help our librarians to provide current awareness service using the national online library catalog system – COBISS.

The disadvantage of already developed systems is that they support only English as language for user-library communication. None of the above mentioned systems provide either possibility for the translation or multilingual support.

Since most of our web site users originate from Slovenia, but there is also a not negligible percentage of users from other countries (such as Croatia)^{6,7}, our primary goal was to add and change the functionality of MyLibrary@NCState system to support language dependence and later – multilingual support. The languages supported in the first stage of CMK portal are going to be Slovenian – for local users – and English – for the international users. The libraries in countries with several official languages could use systems with multilingual support to provide the users with access in their native language (e.g. Swiss library could be offering the library content in German, France and Italian language).

The multilingual support will be offered primarily at the user oriented part of MyLibrary@NCState system. There is no reason to add this kind of functionality to the administrative part since the content providers and the administrators are usually the people, who know the system into deep detail and do not have problems using a system in English language.

Choosing the language is an important part of the personalization process. At the time of account creation, the user provides the information about the language that he or she wants to use (i.e. selects the language from the list of languages the system supports). The information about the user is stored in the system as a user profile, and is read and reconfigured at the logon process. For example, if a user who uses the system in Slovene language, logs to the MyLibrary, the information provided to him or her should be in Slovene. When the user logs off and another user logs on from the same computer, and if the second user's selected language is English, then the system should respond in English.

The process of adding the described functionality was not trivial – it required redesign of the entire system. The system had to be inspected for the language dependent data at the beginning. The system has most of the data continuously used for generating the HTML communication stored in one table in the database. The other language dependent features are the description texts of links, electronic journals, universities and databases. This information is stored in database's tables linked with the sections they support. There is some general and frequently used data, which is also language dependent (e.g. name of sections, such as "Quick Searches", headers and footers); their values are also stored in database. Unfortunately, there are some pieces of information (used most frequently for the communication forms, such as the words: "Username" and "Password"), that are hard coded in the Perl module and executable Perl script.

Every part of the system that comprises language dependent data required different approach to turn on the multilingual functionality. On the database layer, all the tables that contain language dependent data had to be expanded with an additional field, which indicates the language of record's information. Primary key was changed from the ID column to the junction of ID and language column. Patron's data also had to be extended to carry the information about the language user has selected at the account creation process. The translation of hard coded language dependent information in the Perl module could not be done directly. Fortunately, these texts present minor portion of all of the text displayed by MyLibrary@NCState. They are mainly presented in forms and have not yet been completely translated in the pilot version of the system with integrated multilingual functionality. We suggest moving these texts to the database, where the multilingual functionality can be added in the same way as it is achieved for general data. In the next version of MyLibrary@NCState system different approach for the data presentation layer using language dependent XML files and XSL transformation would be helpful. This solution would not make easier only the multilingual approach design, but also is recommended as a state of the art portal building solution and would also make the system portable to handheld or wireless devices.

To accomplish multilingual functionality at the application layer, Perl scripts and module had also have to be changed to use the new extensions of the database layer. This task demanded the most of the hard work. After completing it, some extensions to the forms and dialogues have to be achieved to enable users to change his or her preferred language.

At the end of the multilingual features implementation, the database had to be filled with the data in the languages the system is going to support. In the case of CMK, previously chosen records needed for the communication with users had to be translated in Slovene and stored in correct fields to the database. We did not develop our own administrative user interface for this purpose, but install MyODBC drivers to the translators' computers and give the translators direct access to the copy of MyLibrary database. The librarians could employ the program they are already used to – Microsoft Access — to enter the translated texts directly to the database. The system administrator had to review all the inputs and copied them into the original MyLibrary database.

3.2.1 MyLibrary CMK functionality

CMK is an academic medical library which provides biomedical information resources to its clientele. The organisation, role and function of CMK is somehow different from the university library NCSU Libraries. Therefore help text for users, content of MyLibrary and list of disciplines needed appropriate customisation and corresponding changes. CMK catalogers classify library information into 60 biomedical sub-disciplines, which are included in discipline-specific sections.

All text in the records, which help user to create and use MyLibrary CMK, was translated in Slovene language. Records considering databases, reference shelf, new book list, librarians, some technical detail etc. needed customisation to the CMK environment.

Resources on the user's MyLibrary CMK page include information about the system, message from librarians, links to your librarians, university resources, personal list of Internet resources, reference resources, databases, electronic journals, as well as access to search engine and display of News. The authorised librarian can create, modify or delete the names and contact information of librarians, links and description of information resources, help texts and messages from librarians.

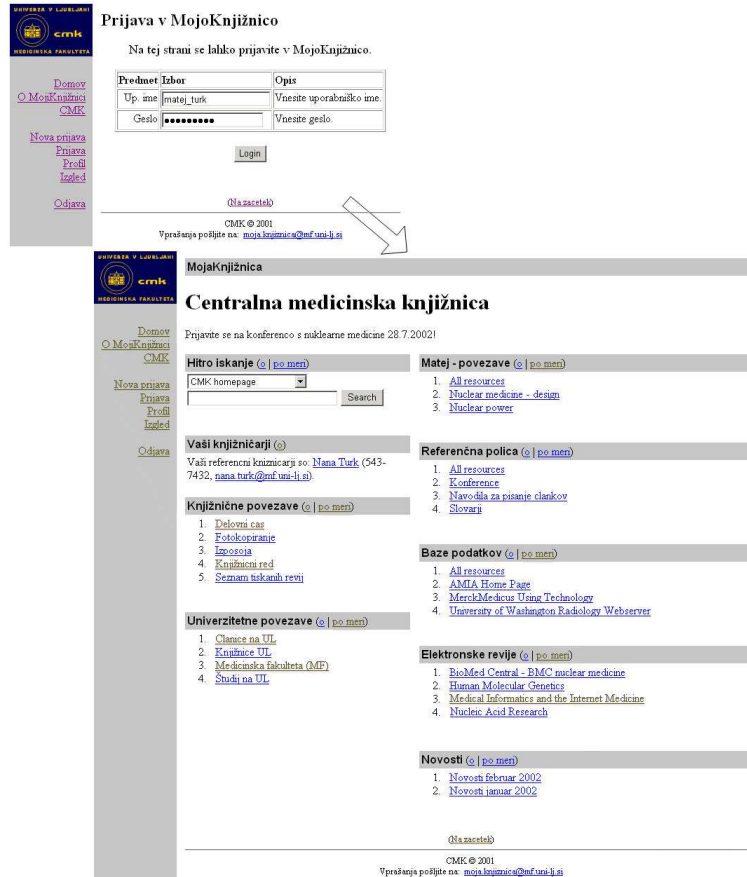


Figure 1. Login and MyLibrary CMK page are displayed in the language which was selected in the user's profile, e.g. in Slovene language

Usage of MyLibrary CMK usually starts with the creation of new account. The user has to fill up the displayed form and to choose the appropriate language from it. Afterwards the MyLibrary page is displayed to user in the Slovene or English language and further communication with MyLibrary is done in the selected language (figure1, figure 2). The users have a possibility to customise their profiles as needed including the change of the language (figure 3).



Figure 2. Login and MyLibrary CMK page are displayed in the language which was selected in the user's profile, e.g. in English language

The Message from the librarian is intended to be displayed only to people who have chosen particular discipline. Every user of MyLibrary is associated with a sub-discipline and each of these sub-disciplines is associated with a text message. The user cannot customise message functions.

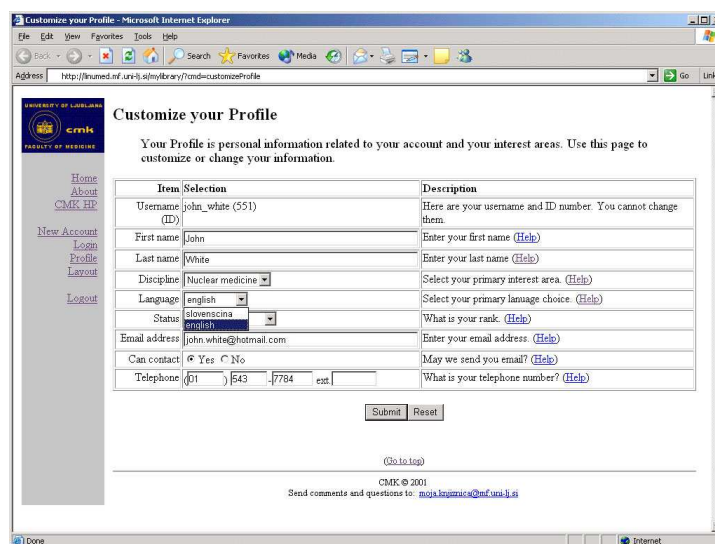


Figure 3. Customising the user's profile enables also the change of the language

Your librarians section lists names, telephone numbers, and e-mail address of the librarians associated with the user's chosen discipline. In CMK, all reference librarians serve all biomedical sub-disciplines therefore all of them should be associated with all sub-disciplines. This section is not directly customisable by the user.

Library links section enables selection of some of the most important items about library services, policy and directions. Users can select only those items needed for the regular use of the library.

University links section provides access to some important items on the Faculty of Medicine home page and University of Ljubljana home page. It is useful to have all these links in the same list and the possibility to choose the preferred ones.

Personal links section allows the users to save links to Internet resources they use often that are not included in other sections.

Reference shelf section includes a digest of about 500 quality Internet resources listed by biomedical sub-disciplines. Users can choose items in alphabetic list or in discipline specific list.

Databases section includes various medical databases: bibliographic, factual and electronic textbooks. The list of databases is limited; therefore the discipline-specific selection is not necessary even though it can be enabled. More useful seems to be the selection from alphabetic list.

Electronic journals is the most expanding section in CMK. At the moment it provides access to more than 1500 titles. Therefore personalization according to the preferred discipline could be very useful tool for busy faculty or clinicians. Selection from alphabetic list is also enabled (figure 4).

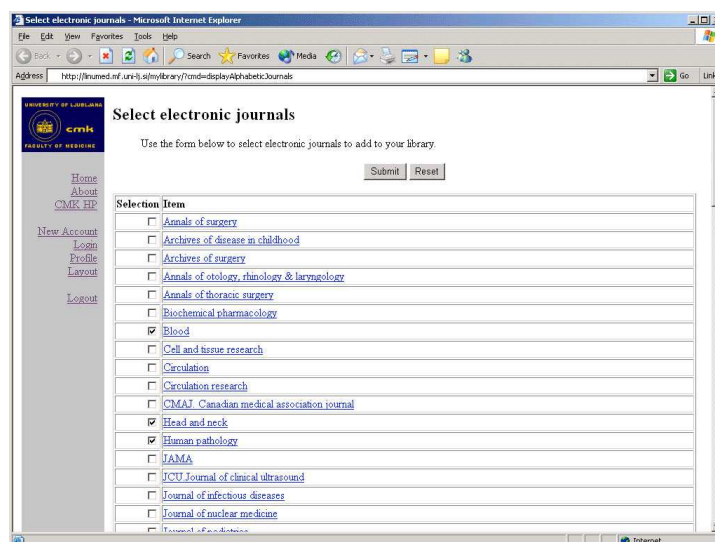


Figure 4. Selection of electronic journals which user wants to have displayed on his/her MyLibrary CMK page

News section is intended to offer a list of new books. For the generation of this list we plan to establish a connection with national library catalog COBISS.

The Quick Searches section provides direct access to the Internet Google search engine, CMK Catalog COBISS. A searching tool for the whole CMK website is under development.

4 Plans for further work

We plan to finish our pilot version of the CMK portal in next few months. Some more elaboration is still needed in particular sections to ensure full functionality. Afterwards the existing pilot will be evaluated from users' perspective through a usability study. The study will focus on how users think about the portal, figure out how to interact with it, and retain information essential to its operation. We plan to include faculty and students in the study.

5 Conclusions

Exponent growth of information and its availability in electronic form make users concerned about their ability to assimilate and manage this bounty. Library users have high expectations based on the broader commercial marketplace. Generation of library Web portals will inevitably make libraries and their staff more customer centred. Trends in portal development include customisation approach that must expand to personalization. The personalization process is provided by portals using dynamic page generation and server resided data storage. But the benefits are not only oriented to the users. Such systems also relieve the content updating procedures by the usage of developed user-interfaces and the tools they provide.

Pilot development of MyLibrary CMK is a logical final step in the CMK website developments from 1997 onwards. It is based on an existing portal solution with extended functionality, which is adjusted to the functions of the academic medical library and its users needs. One of the most important needs of visitors from Slovenia and abroad is multilingual-support, which means that the users can select a language in which the portal interface is presented to them. This multilanguage support is the key extension we developed for the MyLibrary CMK portal.

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