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# ELECTRONIC LIBRARY: SERVING PEOPLE WITH DISABILITIES

**The ways of efficiency improving of information presenting with using of multimedia technology were examined in this article, thus ensuring the use of a new powerful tool for perception of information by disabled persons. The formation peculiarities of multimedia information content for disabled persons were analyzed. This paper considers a digital library as an information system, where the information is formed and collected from different sources, also, it is sorted, structured and intellectually processed. It's proposed a set of information-technology services, which make multimedia information content accessible for disabled persons.**

**Keywords — multimedia, disabled persons, digital library, information content**

## Statement of the problem

It is need to rethink the traditional forms of work with readers in today's information society for effective library service for disabled persons. The need of empower of comfortable providing information for disabled persons in various accessible formats for their perception is all the more urgent. The information technology is developing and improving, also their methods and tools that implement the recruitment and formation of funds of digital libraries by specialized information products that integrate different kind of information to ensure information needs for disabled persons.

The digital libraries are the leading library institutes that provide information support and educational support and society communication processes for disabled persons. The term "digital library" is defined as a new kind of information system intended for accumulation, structuring and organizing an array of electronic documents with appropriate system access. Library provides remote access to distributed and heterogeneous resources [1].

The key focus of the modernization of library science is its computerization: the introduction and development of libraries in new information technologies, formation and use of electronic resources, the introduction of multimedia technology, the development of networking libraries to connect to the world of the Internet. This leads to the creation of new departments, changes in the functional responsibilities of staff, involvement of experts from various disciplines.

## Analysis of recent research and publications

A typical set of basic features of digital library is its hardware, digital method of recording information technology of online access to information resources, and others [2].

We suggest the following approach to library support of the educational process for disabled persons:

- Using the specific forms of representation library bibliographic information for disabled persons, which in turn affect the features of the relevant information resource;

- Implementation of processes based on algorithms submission of information and library resources, which are generated for each of the categories of users;

- Development of guidelines for the implementation of library support and information technology support for the educational process of disabled persons.

The problems of information educational content were analyzed by Krapyvenko A.V. [3], Dunaev V.V. [4], Davydova E.V. [5], who investigated the problem of developing the effective multimedia

information products. However, a comprehensive study of the features of information content formation for disabled persons is not done yet.

## Formulating aim of article

The aim of this article is methodological and systematic study of the formation of high-quality multimedia information content for people with disabilities in digital libraries.

## The main material

### 1. FUNCTIONAL ASSIGNMENT OF DIGITAL LIBRARIES FOR DISABLED PERSONS

An important aspect of the formation of a "digital content library" is the creation of specialized data warehousing submitted electronically using the appropriate software and hardware systems for accounting, storage and protection, as well as software and hardware for its local and remote usage [6]. Digital libraries are actually electronic analogues of traditional libraries with digital computing environment, where it offers new features such as improved procedures for access to information for disabled persons. However, the storage and processing of electronic library funds and access to them makes a number of specific new requirements for qualification of librarians. They must ensure the transition to a new data storage technology, to ensure compliance with copyright law, the cost of digitization of materials from published sources.

Digital information, which is circulating in social communication, is presented as the electronic documents with visual form displaying data. Multimedia library for disabled persons is a digital library that provides education-oriented content to meet the information needs of disabled persons. These libraries store and process information presented in text form as well as audio and video presentation. Digital libraries are working on a multimedia content type that is not supported in traditional libraries. One of the main challenges of the multimedia library, which is aimed at supporting the information needs of disabled persons, is to provide efficient access to information content, presented in an easy to use format.

Digital library is essentially a system - an information broker that provides the information needs of users, taking into account all the features adapted proper way multimedia content.

There are four main areas of the tasks, which are necessary for the effective implementation of the mediation:

• Selection of content: librarians analyze and select high-quality multimedia content, focusing on the information needs of disabled persons.

• Structuring of content: library staff structures the content according to the types of channels of information perception by disabled persons.

• Enrichment of content: librarians supplement a store of digital library by metadata, which are extracted from existing information sources.

• Library Services: providing and ensuring efficient access to multimedia content for its using by disabled persons.

Solution of these challenges can allow e-library to reduce the gap between the voluminous array of available different kind of informational materials and specific information needs of disabled persons.

### 1.1 Search technologies

Information retrieval technology is necessary for the effective and efficient analysis and selection of appropriate content for updating of information assets of digital library and finding relevant information. We use two approaches to implement search procedures in digital libraries, which can be interrelated: on the one hand, this is direct methods of information retrieval and multimedia data, on the other hand, it is a search that is based on metadata.

Information retrieval mechanism of digital library based on deep semantic analysis of multimedia information objects of the digital library. Search indexes are built and updated automatically for implementation of procedures for effective search. Metadata is the data of the second level – arrays' data of multimedia documents of digital libraries. Metadata is formed to describe information objects and to

implement the disparate information processes within a given subject area. Metadata are additional informational level of the top of the library storage. Processes of metadata management can be compared with the processes of formation of traditional card catalogs of libraries.

### 1.2 Services of digital libraries

Digital library provides other forms of library and information services, in addition to services, which are search procedures. They involve cooperation with users in the selection process and the formation of content, while allowing include their own content in the digital library funds.

Providing service of annotation allows users to submit additional annotations as comments, ratings, etc. This annotation can be used in the process of information retrieval, as comments on the document, serves additional information about the contents and value to users.

A digital library system maintains administrative control processes in customer service. The main purpose of this process is the purposeful formation of the library fund for each category of disabled persons. Herewith, information technology decision-making on the inclusion of new multimedia documents or remove them from the library fund is implemented. Along with this procedure, the restructuring of library fund periodically is implemented too. The administrative functions include tracking accuracy adherence user access rights, copyrights and intellectual property rights, which generally improves confidence of users of its services provided in a digital library [7].

### 1.3 Trends and transformation in digital libraries for disabled persons

The first generation of digital libraries was generated and implemented as a kind of scientific and technical experiments. Once, the advantages of this concept were understandable, it was defined the basic functionality of digital library prototype. Existing systems of digital libraries management contained functional modules of digital library, on the platforms of DSpace and Greenstone. The modern high-tech systems such as Grid Computing, Web, Grid Services, Peer-to-Peer are developed [1]. These systems are freely available now and used in a large number of digital libraries. Modern trends in technology of digital libraries are more decentralized and usually are based on service-oriented approach to architecture.

The first trend can be represented as a system aim of our research, which is the systematic revision and enhancement functionality of digital libraries to improve access to information resources of disabled persons, reducing development costs and reorganize this technology to improve its flexibility and adaptability. The proposed by us the digital library is moving from centralized services to the dynamic association services and provide specific services that can provide efficient service for disabled persons.

The second trend is the realization of an innovative approach to the formation and management of multimedia content. It is rethinking of the role of digital library in the context of information needs of disabled persons. In general, the modern concept of a digital library is based on the overall implementation and providing public information and communication processes, providing fast and quality access to information for disabled persons.

The third characteristic tendency inherent for modern digital libraries is to use Web-based technologies for fast and efficient intelligent information retrieval relevant documents at the request of disabled persons. The complex of these technologies includes semantic annotation of content objects based on ontologies and a concept of query results clustering. The models of users are building and their information needs are presenting based ontological approach too. This approach differs significantly from existing ways of personalization. For digital libraries the innovative trend is that the context of a specific information object can be used to accelerate and improve the overall results of information retrieval.

## 2. INFORMATION PRODUCTS REQUIREMENTS FOR DISABLED PERSONS

There is no need to prove under the present conditions that the paradigm of information service, which is based only on a paper form, is obsolete, and it was replaced by a new one – based on an electronic representation of a wide range of documentary information that is replicated in unlimited quantities and is accessed via a global computer networks, regardless of time and location. The accelerating of pace creation of documentary information, improving the means of preserving and transmitting, change the principles of

human interaction (librarian – user) in the exchange of this information led to the emergence of two new organically connected components - appropriate telecommunication structure and information resources.

Computerization of libraries is a new opportunity to maintain the readers and subscribers, providing of fund accessibility, maintaining the directory, the release of a number of staff from routine work on the preparation of files, books, lists, orders, letters, report documentation and more. And the most importantly is the maximum using of the world's treasury of knowledge, providing opportunities for access to the information space to cater for users' needs in documentary information. These problems can be solved only by active using of advanced information technology based on network integration of information resources [8].

The preconditions for the transition to a new paradigm of users' services are already formed in the information society. First of all, it is the transformation from libraries in library-information centers that provide a range of services. These centers require necessary equipment, adaptive technologies and devices for effectively carry out its mission. This allows to create a virtual environment of library, to implement the automated information and library systems, to form their own electronic resources and provide access to the subscribed resources. And it is important to recognize that access to information in libraries should be available to all categories of citizens, making specific emphasis on service of users with special needs.

The promotion of the social mission of libraries as institutions, which provide the basic rights of people with disabilities in access to different kinds of knowledge, intellectual and creative activities, to encourage the modernization of its work, the acquisition of functional principles of information and resource center that aims to ensure the availability and dissemination of information resources in field of social adaptation and integration the persons with disabilities, and also, combine information, education and general functions.

Multimedia content of digital libraries for disabled persons requires differential representation of educational material according to needs of users.

Innovative technologies of forming of digital libraries and service for disabled persons inevitably entail the need for training of staff and provide cost for continuous personnel development.

Effective library service for disabled persons involves the creation of library funds to meet the specific needs of each category of users with specific information needs.

The library collections should be formed with books in Braille, as well as books that "speak", manufactured using modern digital formats accepted by the international consortium Daisy for service for users with visual impairments.

The libraries should have documents that present information in the form of visual signs, posts to meet the information needs of people with hearing.

It should include services to provide information in the form of scanned or digitized documents from the library fund, for readers who are not able to directly visit the library.

Each category of users has the opportunity to obtain the information in the most convenient form for them. Library and information services for disabled persons impose certain requirements on construction and technical and technological support of readers individual workstations, problem-oriented reading rooms, high-speed Internet telecommunication channels.

The important technological step in the creation of digital libraries was the formation of informational content, based on a new digital information technology to store information on a microchip and CDs, which are called Digital Talking Books [9]. This informational content primarily is accumulated in the collections of digital libraries that serve disabled persons.

Libraries and librarians, using technology DAISY, have the opportunity to expand and implement in practice, advances in information technologies that allow blind people to "see" sufficient information, "keep up" with the development of society, to achieve the results that the power of healthy people. Synchronized Multimedia - it's a key information technology for library service for disabled users in the near future.

The book in DAISY format can consist of audio content, text and images, or combinations thereof. All books in this format use a common set of file types. Virtually all types of files are based on XML. The book in DAISY-format will be easy in using, it must contain the following file types: batch, text content,

images, audio file, file synchronization, file navigation control, resource file, the presentation style, file conversions.

Digital Talking Book (DTB) - it's a collection of electronic files of relevant topics for submission of information through alternative means of display and reproduction of information, such as synthesized speech texts, relief-dot Braille alphabet, visual images, particularly large-format printing. The files are generated and submitted in accordance with this DTB standard, creating a wide range of features including fast, flexible navigation, labeling and use bookmarks, keyword search, search for words sound request, a custom control selected on demand content (eg, footnotes, page numbers, etc.). Such ways of presenting information solve many problems for readers with visual impairments. Content of DTB is supplied by the audio signals, a combination of audio, text and images, or only with text. Navigation, which is used to creating of DTB, allows blind readers of "flipping" a book skipping its sections and pages, paragraphs, celebrate voice laying the necessary information in a digital audio recording.

For readers with hearing problems it should provide the ability to work with documents presented in video format.

This library must have at its disposal several components:
- Simulator of sign language;
- Fund documents that contain information presented as a gesture video sequence translation;
- Software and hardware for media playback with video documents (books, magazines, newspapers).

Specificity of library service for users with limited mobility requires addressing issues linked to the development of guidance services remotely:
- Providing on-line access to library collections;
- Sending the documents in digital format or scanned.

The requirements that are applied to the storage and processing of information are rather complicated. The amount of stored information is very large; the most processes require a paralleling; the arrays of records need the edits and changes as well as a continuous monitoring in real time. The most important processes of information processing, including content analysis, classification, search and obtain the necessary documents, must be interactively executed running user process while adjusting and maintaining operational of information files, including the changes that occur in the processing of information. All this poses extremely high standards to the concept of a digital library and requires clarity in the planning of all components, and also, requires the use of new methods of arrays organizing to simplify operations in a dynamic environment of variable information processing [9].

It is important to provide the access to Internet resources via Wi-Fi during library service of users with special needs. The possibility of independent work for the user in a library creates additional convenience for the person who comes to the library with own computer, iPhone or Daisy-player. It allows to combine work with documents which are stored on these devices and with the information obtained from the World Wide Web, keeping it in the most convenient place and feeling comfortable.

A service that involves the use of Internet telephony is rather used in libraries serving users with special needs. The use of free software Skype is the most common one, allowing to make phone calls directly from your computer. The program provides free connectivity to subscribers on computers where Skype is installed. The advantages of this software include voice quality, ease of use and protection of program connection. Information technology, based on the use of Skype allows professional conferences and consulting of users. You can use illustrative materials, manuals and books, video materials during consulting.

Formation of digital libraries associated with the radical changes of existing methods, providing users the ability to access databases on-line via remote terminals. Technologies of service for persons with special needs require the formation of high cost for ensuring fast file access.

Electronic library reached a new level of meet information needs of scientists through the use of advanced information technology. Significant role played the number of available information sources, the degree of relevancy, timeliness, completeness and efficiency of information [10].

The creation of digital library forms an entirely new set of problems, including the determination of amounts of assets forming and building strategies for its formation, pooling multiple networks, the creation

of remote storage space and data organization access to them within compliance with copyright law and the development of information security and unauthorized access to it.

Building a digital library should be based on the following principles:

- Forming system in which single dose of information is provided a consistent its processing, so that saved information is changed;

- Involvement scattered resources in corporate principles and provide access to them;

- Creating an adaptive environment that provides users' impact on basic intellectual processes of information resources formation.

This approach provides for digital library the ability to quickly respond to the needs of users in order to provide them relevant information.

## Conclusion

The use of all types of data in a single data repository enhances the quality of information and library services. Combining video, text, images and sound for efficiently help ensures effective access to relevant information. However, the full potential of information technology in library services of this category of users can be realized only after the reorganization of library logistics.

Since the free use of information from the Internet has a number of drawbacks, namely the librarians of digital libraries need to perform analytical processing of this information by filtering out unimportant and unreliable information.

It was determined that the mission of digital libraries is an effective providing of information, speedy and effective access to the different kind of information content and the organization of large media library repositories that provide efficient access to multimedia content objects. This should take into account current trends in the fast process of changing storage technology and processing multimedia data.

An information storage technology, processing and presentation of diverse multimedia information content can significantly improve the quality of information and library services, including educational needs of disabled persons in a digital library repository.

The multimedia library technology and information services for persons with special needs allow a differentiated providing the users with necessary information and to improve existing forms of service in all libraries. This shows necessitates of the formation of a special library environment to service all types of users, including those with special needs. The users are provided by library information services in such system, which includes an information support of particular consumer.

The using of multimedia power in the libraries need a further theoretical understanding of the phenomenon of "e-education", as the technological changes, as well as didactic and educational transformation, and develop information-analytical component of digital libraries in terms of the fullest processing and presentation of information resources. A promising area of research should be considered the development of access to scientific information in digital libraries. Also, the creation of the meta-data module needs a further research as a tool for accessing and searching digital information and design of socio-technical systems in the field of library service for users with special needs.

## References

1. Shlykova O.V. Culture of multimedia: a manual for students / O.V. Shlykova. - Moscow: FAIR-PRESS, 2004. – 416 p. (in Russian)
2. The Cambridge Handbook of Multimedia Learning / [ed. by Richard E. Mayer]. - New York: Cambridge University Press, 2005. - 680 p.
3. Krapivenko A.V. Multimedia technology and the perception of feelings: Textbook / A.V. Krapivenko. - Moscow: BINOM. Laboratory of Knowledge, 2009. – 271 p. (in Russian)
4. Dunayev V.V. Macromedia Flash MX 2004 / V. Dunayev. - St. Petersburg: "Peter", 2004. - 368 p. (in Russian)
5. Davydova E.V. Creating Graphics for the Web-pages / E.V. Davydova. // Computers and Education. - 2001. - № 6. P. 72-80. (in Ukrainian)
6. William Y. Arms, Digital Libraries and Electronic Publishing, Cambridge: MIT Press, 2000, 287 p.

7. Shrayberg Y.L. Modern trends in library and information technologies / Y.L. Shrayberg // Annual Keynote International Conference "Crimea", 2001. - Moscow: Publishing House of the Russian National Public Library, 2002. – 44 p. (in Russian)
8. Terry Reese, Kyle Banerjee, Building digital libraries, New York: Neal-Schuman Publishers, 2008, 277 p.
9. Sukiasyan E.R. Discussion Club "The term"/ E.R. Sukiasyan // Scientific and technical libraries. - 2000. - № 6. - P. 113-119. (in Russian)
10. Watstein S.B. Didital library: keywords. / S.B. Watstein, P.V. Calarco, F.S. Ghaphery // Reference Services Review. – 1999. – Vol. 27. – № 4. – P. 344–352.