

# The Importance of Usability in Development of Digital Libraries

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## Summary

*Digital libraries are among the most interesting electronic information resources of our time. They are the collection of services and the collection of information objects and services that support users in accessing information objects available on the Internet. They are complex information systems consisting of many components which depend on each other in their operation. To achieve the flawless operation of digital libraries their developers should evaluate their achievements during the phase of development as well as during the phase of use. As a result of their efforts, users should get usable and easy to use information systems which are adapted to their needs and preferences. Evaluation and usability are two important concepts which may help librarians and computer specialists to design better information systems and better services for them. Usability testing may include one (usually the user interface) or many components of an information system for evaluation. Evaluation also includes the research of user community. Information acquired in such a way may also significantly help in information system improvement. Since the goal of evaluation is to achieve quality and improvement, the final result should be a superior information system like digital library and satisfied users.*

**Key words:** digital library, usability, evaluation

## Introduction

The world of exciting and content rich electronic resources of information available on the Internet is growing constantly. Digital libraries are among these resources. Digital libraries are the collection of services and the collection of information objects and their organization, structure, and presentation that support users in dealing with information objects available directly or indirectly via

electronic/digital means.<sup>1</sup> Still, they are not just collections of information objects as physical libraries are not just places. According to Pomerantz and Marchionini, fundamental characteristics of libraries are systematic access to information resources, the ideas represented by those resources and sets of human stakeholders.<sup>2</sup> In case of digital libraries, information and communication technology provides systematic access to information resources and makes possible their fundamental functionality by giving users an opportunity to access the information resource regardless of their physical location i.e. point of access to electronic information resources. The primary medium for use of the content stored in digital collections is the Internet i.e. World Wide Web. World Wide Web is a window to the world for many Internet users, and due to the number of users accessing digital libraries each day and their differences it is difficult to develop a perfect digital library with a perfect user interface which will satisfy everyone's needs and preferences. At that point, the concept of usability may help librarians and computer specialists to design better digital libraries with more usable user interfaces and better services by collecting data about digital library users. The collected data information can be used as a valuable tool in planning of new services in digital libraries. For the reason, evaluation and usability testing are prerequisites for the development of quality digital libraries.

### **The role of information technology in digital library**

Operation of digital libraries would be impossible without information technology. The role of information technology in digital libraries can be broadly divided into three views:<sup>3</sup>

- Revolutionary view on IT (physical location is irrelevant; more and more activities will be supported by IT; printed publications will vanish; electronic publications and distribution will become a rule etc.)
- Evolutionary view on IT (network technologies are addition to the previous technologies; digital media are extension of previous media; electronic publishing will be limited only to a certain material with specific purpose; printed and electronic publications will co-exist etc.)
- Co-evolutionary view on IT (in between of the first two views; co-evolution of IT, human behavior and organizations; people use technologies which are helpful for their work; technologies are adapted to user needs etc.).

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<sup>1</sup> Koohang, Alex; Ondracek, James. Users' views about the usability of digital libraries. // *British Journal of Educational Technology* (2005), 3; 408

<sup>2</sup> Pomerantz, Jeffrey; Marchionini, Gary. The digital library as place. // *Journal of Documentation* (2007), 4; 506

<sup>3</sup> Borgman, Christine. *Od Gutenbergova izuma do globalnog informacijskog povezivanja*. Lokve;Zadar : Naklada Benja, Gradska knjižnica Zadar, 2002. 1

With the advent of Web 2.0, in theory, co-evolutionary view on IT began to be perhaps the most feasible one since Web 2.0 offers the most similar context for use of IT and is oriented to users and their preferences in organization and use of available electronic information resources on World Wide Web including digital libraries. Such a viewpoint is very valuable for understanding of different aspects of interaction between users and digital libraries. Although it still not clear how significant is the Web 2.0 phenomenon, it will certainly give computer professionals some new ideas for the development of new and useful Web based services.

### **Usability and digital libraries**

Digital libraries are complex information systems consisting of many components depending on each other in their operation in order for the whole system to work flawlessly. To achieve the flawless operation of digital libraries, their developers must adhere to certain standards and plan smartly each phase of digital library development. McCray and Gallagher suggest that every digital library development should follow ten principles:<sup>4</sup>

- Expect change
- Know your content
- Involve the right people
- Design usable systems
- Ensure open access
- Be(a)ware of data rights
- Automate whenever possible
- Adopt and adhere to standards
- Ensure quality
- Be concerned about persistence.

Users expect usable and easy to use information systems adapted to their needs and preferences. That is the reason for considering usability (and evaluation in general) in phases of development and later during the use of digital libraries.

What is usability? For different disciplines, usability has a different meaning. According to Chowdhury, librarians perceive the usability of an information service in terms of efficient and effective access to information.<sup>5</sup> Nielsen defines usability as a quality attribute that assesses how easy user interfaces are to

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<sup>4</sup> McCray, Alexa T.; Gallagher, Marie E. Principles For Digital Library Development. // Communications of the ACM (2001), 5; 50

<sup>5</sup> Chowdhury, Sudatta; Landoni, Monica; and Gibb, Forbes. Usability and impact of digital libraries: a review. // Online Information Review (2006), 6; 658

use; the word "usability" also refers to methods for improving ease-of-use during the design process.<sup>6</sup>

In addition, Nielsen points out that usability is defined by five quality components:

- Learnability: How easy is it for users to accomplish basic tasks the first time they encounter the design?
- Efficiency: Once users have learned the design, how quickly can they perform tasks?
- Memorability: When users return to the design after a period of not using it, how easily can they reestablish proficiency?
- Errors: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
- Satisfaction: How pleasant is it to use the design?

This definition refers to the user interface (the most visible component of a digital library) and design but usability can be tested on some other components of digital library. The user interface is the main access point of every digital library and points of interaction of user and information system and its development ought to be supported by the results of user studies. These results must include user needs and preferences which are often revealed a posteriori, after the development of digital library has been finished. Building and user interface to be attractive rather than to be functional is the result of not taking into account context in which users access the digital library on the Internet (i.e. previous knowledge and experience in use of electronic information resources, choice of a browser, screen resolution, content organization preferences, font type, size and color, accessibility support etc.).

According to McCray and Gallagher, when building a usable digital library system, one must take into consideration difference between (user's) computers and browsers, speed of access, differences among users including Web navigation preferences. The user interface should be as simple as possible with clear navigation mechanisms, and it should provide the user with multiple access points to the content of the visited digital library. Furthermore, accessibility for the users with disabilities should be provided: user access to all content must be given, documents must be clear and simple, user should have control of styles (of content display), information about context and orientation should be also supplied and standard markup should be used.<sup>7</sup>

Van House, Butler, Ogle and Schiff point out that digital libraries can be described and evaluated on three key components: contents, functionality, and in-

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<sup>6</sup> Nielsen, Jakob. Usability 101: Introduction to Usability. URL: <http://www.useit.com/alertbox/20030825.html> (23.7.2007.)

<sup>7</sup> McCray, Alexa T.; Gallagher, Marie E. Principles For Digital Library Development. // Communications of the ACM (2001), 5; 51

terface, and that usability wrongly addresses only or primarily interface design, which is, according to them, too narrow a basis for evaluating something as complex as a digital library.<sup>8</sup>

Additionally, usability is generally characterized as the determining aspect of a system's capability to satisfy the needs and specifications of users. Usability is the degree to which users easily and effectively use a system.<sup>9</sup>

To acquire valuable data from users about the use of an interface of a digital library, a number of methods can be employed: observing users while using different digital libraries, Web sites and collecting data about their activities during these visits, users can verbalize their thoughts while completing necessary tasks on a particular digital library Web site; their activities can also be videotaped and later analyzed. Other methods are: comparative studies of Web sites or their respective components against the list of criteria, use of benchmarks (eg. time necessary for a task completion), asking questions related to the tasks in question to users, user studies (questionnaires, interviews, focus groups) etc.

What importance does the usability have in the world of digital libraries? The results of user studies and usability testing can improve interaction between users and digital libraries on the Internet in most cases. The first digital library projects in the early 1990s were groundbreaking because of the technology they used, electronic material organizational schemes they employed or just because they were the first in their field of knowledge. There wasn't any systematic evaluation since it was more important to get a digital library running rather than to evaluate aspects of its development and use. In contrast, traditional libraries did research their users, collecting valuable data which enabled them to improve the existing services and to develop new ones. However, the important aspect of the traditional libraries – their holdings based on printed material are unchangeable in the physical form. In contrast to physical libraries, digital libraries can be reconfigured comparatively easily after they are built<sup>10</sup> if librarians knew something about their users, which is sometimes very difficult, since the Internet user community represent very heterogeneous population with different motives for visiting digital libraries. To identify and recognize your user is especially important in situations in which users leave digital library Web site if they come across any difficulty during their visits. In such situations usability testing can be helpful to measure how easy is to use a digital library.

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<sup>8</sup> Van House, Nancy A.; Butler, Mark H.; Ogle, Virginia; Schiff, Lisa. User-Centered Iterative Design for Digital Libraries: The Cypress Experience. // *D-Lib Magazine* (1996), 2; <http://www.dlib.org/dlib/february96/02vanhouse.html>

<sup>9</sup> Koohang, Alex; Ondracek, James. Users' views about the usability of digital libraries. // *British Journal of Educational Technology* (2005), 3; 408

<sup>10</sup> Pomerantz, Jeffrey; Marchionini, Gary. The digital library as place. // *Journal of Documentation* (2007), 4; 512

What are actual criteria for usability testing? Saracevic offered a selection of criteria which could be applied to digital library usability testing.<sup>11</sup> He divided criteria into four categories:

- Content: accessibly, availability, clarity (as presented), complexity, (organization, structure), informativeness, transparency, understanding, effort to understand, adequacy, coverage, overlap, quality, accuracy, validity, reliability, authority
- Process (carrying out tasks as search, browse, navigate, find, evaluate or obtain a resource): learnability to carry out, effort/time to carry out, convenience, ease of use, lostness (confusion), support for carrying out, completion (achievement of task), interpretation difficulty, sureness in results, error rate
- Format: attractiveness, sustaining efforts, consistency, representation of labels (how well are concepts represented?), communicativeness of messages
- Overall assessment: satisfaction, success, relevance, usefulness of results, impact, value, quality of experience, barriers, irritability, preferences, learning.

The difficulty with the usability testing in digital libraries is that usually there is no clear decision about what should be evaluated and there is no definite list of criteria for the evaluation, and results from one digital library cannot be directly applied to another digital library, as they sometimes differ significantly. That is the reason why criteria for the evaluation of digital libraries are subject to change and development.

### **Evaluation**

Usability testing is a part of evaluation process in digital libraries. For Marchionini, evaluation is a research process that aims to understand the meaning of some phenomenon situated in a context and the changes that take place as the phenomenon and the context interact. Evaluation specifies what is the research process (metrics and procedures), what is the phenomenon (its mission and salient characteristics), and the context(s) in which the phenomenon occurs.<sup>12</sup>

Evaluation of a digital library is equally important in the initial stages of its existence i.e. during its development and later during its use. The phase of development is especially important if we want our users to become firmly oriented toward the use of digital libraries in future. To achieve this, digital library

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<sup>11</sup> Saracevic, Tefko. Evaluation of Digital Library: An Overview. [http://dlib.ionio.gr/wp7/WS2004\\_Saracevic.pdf](http://dlib.ionio.gr/wp7/WS2004_Saracevic.pdf) (30.08.2007.)

<sup>12</sup> Marchionini, Gary. Evaluating Digital Libraries: A Longitudinal and Multifaceted View. // *Library Trends* (2000), 2; 311

system builders should evaluate often and early and exploit existing good practices within library science.<sup>13</sup>

In his paper on digital library evaluation, Saracevic mentions dilemma of selection of level of objectives of evaluation. He divided objectives of evaluation of digital libraries into seven general classes or levels.<sup>14</sup>

User centered:

Social level. How well does a digital library support the needs and demands, roles, and practices of a society or community?

Institutional. How well does a digital library support the institutional or organizational mission and objectives? How well does it integrate with other institutional resources?

Individual. How well does a digital library (or given services) support information needs, tasks, activities of people as individual users or groups of users with some strong commonalties?

Interface. How well does a given interface provide and support access, searching, navigation, browsing, and interaction with a digital library?

System centered:

Engineering. How well do hardware, networks, and related configurations perform?

Processing. How well do procedures, techniques, algorithms, operations and so on perform?

Content. How well is the collection of information resources selected, represented, organized, structured and managed?

Saracevic points out, that digital libraries are usually evaluated only on one level and that one level can rarely answer question from another. This creates difficulties since digital libraries are complex information systems which require complete understanding of operation of all of its components. In 2003, the same author gave a broadened list of approaches for digital library evaluation:<sup>15</sup>

1. System-centered approach: study of performance assessing effectiveness and/or Efficiency
2. Human-centered approach: study of behavior such as information seeking, browsing, searching or performance in completion of given tasks

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<sup>13</sup> Blandford, Ann; Gow, Jeremy. Digital Libraries in the Context of Users' Broader Activities: JCDL 2006 Workshop Report. // D-Lib Magazine (2006), 7/8 <http://www.dlib.org/dlib/july06/blandford/07blandford.html> (23.7.2007.)

<sup>14</sup> Saracevic, Tefko. Digital Library Evaluation: Toward and Evolution of Concepts. // Library Trends (2000), 49; 363

<sup>15</sup> Saracevic, Tefko. Evaluation of Digital Library: An Overview. [http://dlib.ionio.gr/wp7/WS2004\\_Saracevic.pdf](http://dlib.ionio.gr/wp7/WS2004_Saracevic.pdf) (30.08.2007.)

3. Usability-centered approach: assessment of different features e.g. of portals, by users; a bridge between systems- and human-centered approaches
4. Ethnographic approach: comprehensive observation of life-ways, culture and customs in a digital library environment; impact of a digital library on a given community
5. Anthropological approach: comprehensive observation of different stakeholders or communities and their cultures in relation to a given digital library
6. Sociological approach: assessment of situated action or user communities in social setting of a digital library
7. Economic approach: study of costs, cost benefits, economic values and impacts.

Each of these approaches has its advantages and disadvantages. Since there is no standard model for digital library evaluation, nor is there a comprehensive set of models and toolkits that can be used by digital library evaluators<sup>16</sup> professionals involved in the process of evaluation choose different approaches and methods which seem to be the most appropriate in a particular situation. This makes longitudinal studies in digital libraries difficult and opens a possibility that the results will not be comparable and applicable to future library practice.

### **Conclusion**

Usability and evaluation are two very important concepts. Without the first, information and computer systems would be unusable. Without the second, almost any human activity could not reach the desired level of quality. Digital libraries are results of applied knowledge and experience of professionals from many disciplines. Two among them are very important for the existence of digital libraries: computer science and information science with librarianship. Computer science knows usability well. Librarianship knows evaluation well. By using these two important concepts, digital libraries will most certainly profit by improving quality of their service. Since the users have become the focal point of the recent digital library development efforts, it is expected that their needs and preferences will be integrated in new digital library services. Usability testing will provide digital library developers with information about the level of acceptability of a digital library in a particular user community. Users will define future directions of development of services in digital libraries more than they had chance to do so in the past and that is the reason why usability is an indispensable tool in the development of digital libraries.

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<sup>16</sup> Chowdhury, Sudatta; Landoni, Monica; and Gibb, Forbes. Usability and impact of digital libraries: a review. // *Online Information Review* (2006), 6; 657

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