

Characteristics of Interactivity and Using the Interactive Technologies in System North+

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Abstract. The present study examines the interactivity, categories and levels of interactivity and its various forms in the digital environment. The issue of the characteristics of interactive learning communication has been investigated. The study outlines the specificities of ensuring the integration and interactive representation of cultural heritage artifacts in the North+ region. The problems of people with visual difficulties in accessing interactive systems and digital cultural heritage are being addressed.

Keywords: Interactive Systems, Cultural Heritage, Interactive Learning System.

1 Introduction

The modern information and communication technologies (ICT) have evolved over recent years to levels that enable new ways of preserving and interactively presenting stored digital resources in digital storage places and libraries for the field of cultural and historical heritage (CHH).

For the purposes of the process of documenting, digitizing and presenting the material and intangible Bulgarian cultural heritage of libraries, museums, archives and galleries in North and Central Bulgaria (North +) an interdisciplinary study was conducted (Ivanova, Bogdanova, Zdravkov, Paneva-Marinova, & Pavlov, 2014). The study and analysis of the state of the existing modern methods and technologies for preservation, protection and interactive representation of the stored digital resources (text, photo, video, audio, 3D) in Digital North+ Center has been carried out (Ivanova & G. Bogdanova, 2015).

The following areas have been researched:

- Digital conversion of collections of CHH (text, photo, video, audio, 3D);
- Online accessibility and interactive presenting of information to specialized collections of CHH;
- Security and storage of digital resources depending on the type of media (text, photo, video, audio, 3D).

We will examine in more detail some aspects of the research related to the interactive presenting and online accessibility of information (the second area).

2 Research of Existing Technologies for Interactive Presenting of Information

Nowadays, consumers use the Internet every day and thus constantly access the computer technology. Most people today communicate with each other, which interaction is mediated by modern engineering technologies. Interactivity is associated with the use of the computer and requires action and response, so it is a two-way communication process using a specific user interface.

Concepts of interactivity and interactive interaction emerged in the 80s of the twentieth century. Technology for interactivity began to develop in the early 21st century. The phrase "interactive communication" becomes meaningful and defined in different ways. The term "interactivity" entered Bulgaria in the last decade of the last century.

Modern interactive systems use a dynamically changing environment, offer user-friendly navigation and dynamic design, based on specialized computer languages and new mobile technologies. In a multidisciplinary technological approach based on the type of human activity, the notion of "interactivity" can be seen in three aspects: interactivity between individuals; interactivity between the user and the technical system; interactivity between different technical systems (devices).

The interaction issues are addressed by a number of authors who define the key features of the Interaction concept and the need for its introduction into practice (Bolton & Saxena-Iyer, 2009), (Kirsh, 1997), (Rafaeli, *Interactivity. From New Media to Communication*, 1988). An application of the principles of interactivity in a software music user system was reviewed by Jon Drummond in (Drummond, 2009).

According to Liu Y. and Shrum L. (Liu & Shrum, 2002): Interactivity is the extent to which two or more communication parties can interact with one another via a communications medium and message exchange, and the degree to which these influences are synchronized. Professor Shisef Rafael defines interactivity as "an expression of space where there is a series of communication exchanges, with all later transmissions of messages having relations to previous exchanges and transmissions." Rafaelli (2003) defines the interactivity in the following three levels (Rafaeli & Ravid, *Information sharing as enabler for the virtual team: An experimental approach to assessing the role of electronic mail in disintermediation*, 2003):

- Non-interactive (two-stage non-interactive communication) - the message has no connection with the previous messages;
- Reactive (reactive communication or quasi-interactivity) - the message is related only to an immediate previous message;
- Interactive (fully interactive communication) - Each message transmission is linked to several previous message exchanges and is influenced by their interconnection.

The degree of interactivity depends on the capabilities provided by the specific technology. For example, a lower interactive service can offer download capabilities for an

application without giving options for further communication, such as back-to-back and new choices.

The degree of interactivity also depends on the skill level of users involved in the interactive process. Users with more technological skills can effectively use systems that provide more complex interactivity processes. The degree of interactivity also depends on the ability of the particular system to enable the user to make adjustments to the material he is examining (Jensen).

In the context of communication, Raphael describes interactivity as an experience defined by the concepts of chance and temporality: the information exchanged in the process of interaction depends on what previous interactions have been exchanged as messages.

In the present study, we accept the definition that an interaction is interactive when, through a series of actions and /or messages, communication is achieved between two or more objects, where each action or message is connected and generated by the previous ones.

Three categories of interactivity can be distinguished:

- First Category - navigational interactivity. It enables the user to navigate through the information sites using the appropriate hyperlinks.
- Second category - functional interactivity. It allows users to interact with other users as well as receive news using discussion forums, blogs, and emails.
- Third category - adapted interactivity, enables personalization of the site and the browser, depending on the specific preferences of the specific users.

Last but not least, we should note the introduction of interactivity in free public online spaces designed to share interpersonal communications (e-mails, forums, Internet chats, etc.) (Paneva-Marinova, Goynov, & Luchev, Towards Wider Sharing of Iconographical Art Content, 2014; Luchev, Márkus, Kaposi, Szkaliczki, & Veres, 2013). These web paths are rapidly entering the everyday life of modern man and occupy a significant social, organizational and economic place in him (Butler, 2001), (Jones, Ravid, & Sh, 2004). There is a need for information system researchers to consider the relationship between shared interactions (publications, user responses) that contain such virtual spaces and the behavior of users of these systems (Peintner, Viappiani, & Yorke-Smith, 2008). Tasks that users perform in a computer-based environment can be better accomplished when the application adapts to the user. This is done by analyzing and evaluating previous users' reactions. Today, interactive systems are already striving to share the overall goal of preferentially assisting users in tasks - from finding a product to retrieving a preferred model. Advanced interactive systems are created that can actively support the user by anticipating and modeling his needs and desires (Rafaeli, Ravid, & Soroka, De-lurking in virtual communities: A social communication network approach to measuring the effects of social and cultural capital., 2004).

3 Characteristic of Interactive Learning Communication

Nowadays the interactivity is getting more into the learning process. The web based systems are being developed offering educational platforms. The creation of web-based learning pages begins to be used by teachers and thus facilitates the teaching process and the process of learning new knowledge. The introduction of new interactive interfacing training systems is accompanied by the comparatively little experience of lecturers in new computer technologies and the relatively high level of difficulty they teachers encounter in learning of the new technologies. To this end, educational systems are being developed to support and assist teachers and students in their attempts to learn and use the new interactive web-based systems.

The creation of modern, high-efficiency education systems implies the consideration of a number of factors, such as: design of the system implying the use of interactivity and interaction principles. In order for this system to be effective, it is necessary to take into account the specifics of the specific types of learners who will use the system. It must be designed to be understandable and user-friendly. It is not enough to give the learners various tools, but their opportunity to use them should be taken into account. For this reason, it is necessary for the system to take into account the preferred methods of learning, to take into account learners' knowledge, abilities and experience. The same applies to the teachers - users of the system - it is necessary to take into account their knowledge, experience and way of teaching. This necessitates the cessation of learners' dependence on teachers and achieving a degree of independence between them. In addition, the use of new, modern information technologies must necessarily be in line with pedagogical methods, which play an important role in the learning process.

In choosing the form of interactive learning, it is necessary to consider:

- The characteristics, conditions and behavioral label typical of the built interactive environment;
- Selecting processes appropriate for the purpose of learning;
- Search for contacts and interaction with virtual communities with interests close to the learners' interests.

Components of the Learning System:

- The "Learning" component - collecting individual knowledge of the learner;
- The "Subject's content" component includes information describing what should be learned;
- The "Technology" component - refers to the tools that can be used;
- Component "Pedagogy" - the way the training will be presented in instructions.

The interactivity of learning systems can take various forms by using different types of learning interactions:

- Student - information; The Learner interacts with information;
- Student - teacher; The Learner interacts with lecturers;

- Student - student; The Learner interacts with other learners.

4 Interactive Presentation of the Digital Resources in Digital Center North+

Interactive information systems allow a more efficient learning process and easier access new knowledge about cultural heritage (Paneva-Marinova, Goynov, & Luchev, Multimedia digital library: Constructive block in ecosystems for digital cultural assets. Basic functionality and services, 2017).

In the North+ system research for ensuring the interactivity of information systems has been done and necessary solutions are proposed with the help of modern digital technologies for interactive access. Multidisciplinary methods have been developed for interactive North+ communication system.

The system has multiple layers and various custom modules, depending on the system users. It has first-class navigation interactivity and partial functional interactivity; it contains an interactive cultural map and other interactive functionalities. The interactive information systems permit the learning new knowledge of cultural heritage.

The digitized objects in the North+ system are stored in a common repository of several digital archives. Thematic collections and cultural routes can be generated. The software allows to conveniently generating different thematic collections of all repositories according to selected criteria.

In North+ software environment selected collections from the North+ region on the topic “Master Kolyo Ficheto” (Figure 1), topic "Religious sites in Veliko Tarnovo - Arbanassi", etc. are presented themes.

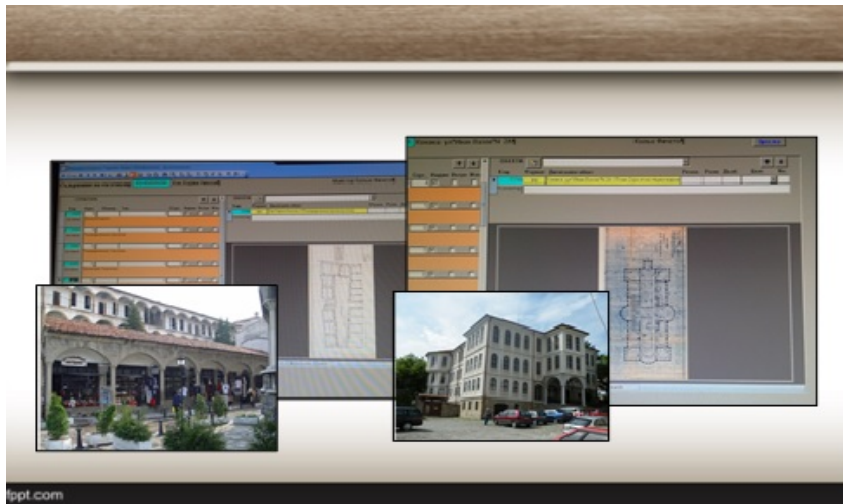


Fig. 1. Cultural collection “Master Kolyo Ficheto in the region North+”.

Another option for thematic presentation of digital content is through the interactive map. The interactive map was developed as an accessible interactive platform for existing and potential cultural sites, activities and practices on the web. REST API is implemented for retrieving information through programming languages such as JavaScript and Python. Other useful option is to retrieve information through API, which locally caches the results and visualizes the necessary information.

The platform has implemented responsive design, which helps the interactive map to work on all popular mobile and desktop devices running a modern browser. The various icons have been developed for different types of objects and events on the cultural map. For each category of objects the Filters are created. Full CMS functionality is created for the description of objects, which gives the ability to add photos, files, videos, additional galleries. There is also support for a set of attributes like name (multilingual content), type/category of the object, a text description of the object, geographical location, a text description location, main picture, set of additional media - photos, videos, files (Bogdanova & D. Koleva, Interactive Cultural Map of Veliko Tarnovo Municipality as a Part of the eCity Platform Veliko Tarnovo, 2014).

An interactive map is created that provides a good base for the cultural infrastructure and presents interesting and important way of presentation for our cultural identity, cultural objects and routes. Thematic cultural routes were created. Cultural route "Master Kolyo Ficheto" is shown on the interactive map (Figure 2).

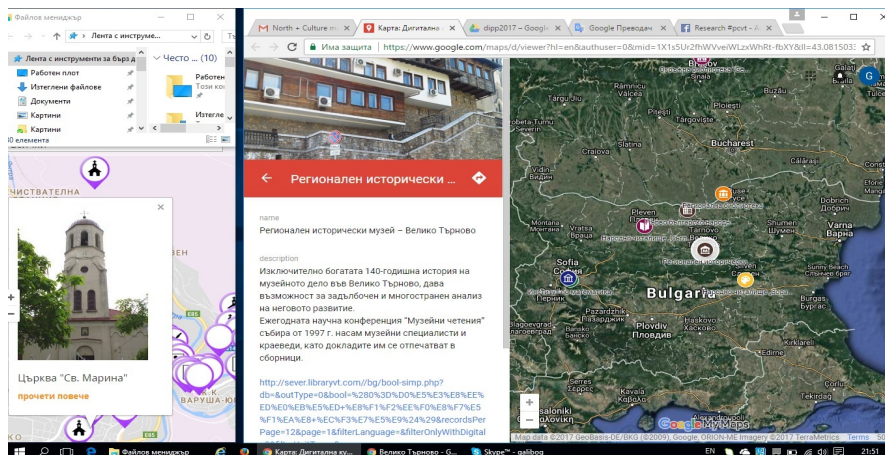


Fig. 2. Cultural route “Master Kolyo Ficheto” is displayed on the interactive map.

5 Problems in Accessing the Interactive Systems and the Digital Cultural Heritage of People with a Sensory Deficit

Ensuring the interactivity and web accessibility for people with sensory problems of information systems is serious problem.

The most of interactive communication methods are web and digitally oriented. The web based systems offer different educational platforms. The studying and interpreting

cultural heritage and showing it differently for different audiences is particularly important. The user is the focus and precise definition of the target group makes it possible to say more with less effort.

The group of people with visual difficulties have problems in accessing interactive systems, the interactive learning lessons, digital presentations and materials of cultural heritage (they access to public places is further hampered and by other infrastructure barriers). Creating web-based interactive learning sites that are also web-accessible for people with sensory problems will be make it easier for trainees from this group to learn and learn new knowledge of cultural heritage.

In the North+ digital center has explored the ways to access the cultural heritage of people with sensory problems and possible solutions and instructions to overcome the constraints and difficulties in the blind world (Bogdanova & Subev, The second principle of operability in the standard for web accessibility WCAG 2.0., 2007).

For this purpose the standard for web accessibility WCAG 2.0, the principles of web accessibility and their criteria have been studied. It is investigated possible solutions that oriented to people with sensory problems (level class of web accessibility A, AA). Possible approaches are to create interactive environments with alternative digital audio, video and text files, sensory depictions of cultural heritage, and other alternative approaches to accessing information.

In digital center North+ instructions and tests of the principles of accessibility standard WCAG 2.0 at level AA have been developed (Bogdanova & Subev, The second principle of operability in the standard for web accessibility WCAG 2.0., 2007).

Through additional digital technologies for accessibility and alternative cultural heritage presentation, users with sensory difficulties will be able to touch on cultural heritage and acquire skills for understanding it.

6 Conclusion

ICT has changed the way how the information is presented and made new services possible, which were not possible before. These studies are part of the interdisciplinary work about the preserving and presenting the knowledge and artefacts of cultural heritage from the Central Northern Region of Bulgaria.

The studies of interactivity, the created interactive map and the other interactivity methods in North+ provide modern access to digital materials and presents interesting way of presentation for our cultural identity and cultural objects in the North + region.

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