
ПРОБЛЕМА В ФОКУСЕ: ЭКСПОЗИЦИОННО-ВЫСТАВОЧНАЯ ДЕЯТЕЛЬНОСТЬ

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MUSEUM EXHIBITIONS IN THE AGE OF DIGITAL COMMUNICATION

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The present paper will outline some of the most relevant innovations and events related to the history of Museums. Starting from the basics, the reader will be introduced to issues and achievements associated with virtual museums, cataloguing, digitising, publishing, and the sustainable exploitation of cultural content, relevant case study. Drawing upon the many (over twenty-five) years of experience and achievements in digital cultural content, this paper aims to provide a comprehensive overview of the issues and achievements associated with digital collections and cultural content. Within the document we will get close to some fundamental questions. Do virtual museums really provide added value to end-users? Are museums, content providers and users ready and willing to use new technologies to explore cultural heritage? Do ICT tools really help content holders and/or end-users? Shall we now try to provide some answers? Have we mastered the general framework? Is the necessary technological framework already in place? The duty to reply to such questions is left to the reader on the basis of the reading.

Key words: eCulture, Cultural Heritage, Virtual Museums, Digital clones.

Preface

This paper outlines basic issues and achievements in the field of the application of ICT and advanced technologies to cultural heritage, where heritage is considered to be the “path toward today’s society and culture”. The role of digital technologies in the field of cultural heritage preservation is a subject of intensive scientific discussion¹.

The extension of the concept of a cultural heritage to new classes of “objects”, both tangible and intangible, and the relationship between conserving them and experiencing them provide new challenges, such as the combined utilisation of various online databases, and the creation of supranational and multilingual thesauri. Furthermore the rapid obsolescence of technologies focuses our attention on data storage and access from a long-term (i.e. after ten, twenty or more years) perspective².

¹ See for example: *Ronchi A.M.* e-Culture: Cultural Content in the Digital Age. Berlin; Heidelberg, 2009; *Theorizing Digital Cultural Heritage: A Critical Discourse*. Ed. by F. Cameron, S. Kenderdine. Cambridge, 2007; *Lynch C.* Digital collections, digital libraries & the digitization of cultural heritage information // *Microform & imaging review*. 2002. Vol. 31 (4). P. 131–145; *Nikonova A.A., Biryukova M.V.* The Role of Digital Technologies in the Preservation of Cultural Heritage // *Muzeológia a kultúrne dedičstvo*. 2017. Vol. 5 (1). P. 169–173.

² *Ronchi A.M.* Digital Preservation: Cyber Ark, Rosetta Stone or Print? // *Preservation of Digital Information in the Information Society*. Proceedings of the International Conference (Moscow, Russian Federation, 3–5 October, 2011). Moscow, 2012. P. 76–91.

A significant number of charters, principles, and guidelines, including the Nara Document on Authenticity (1994), the Burra Charter (1999), the International Charter on Cultural Tourism (1999), and the Principles for the Conservation of Heritage Sites in China (2002), Kyoto Declaration (2005) on the Protection of Cultural Properties, Historic Areas and their Settings from Loss in Disasters, UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage have emphasised the fundamental role of sensitive and effective interpretation in heritage conservation.

The general theme of Universal Access to Information, launched on the occasion of the 32nd UNESCO General Conference (2003), the World Summit on the Information Society (2003–2005), and the implementation of the documents adopted by the Summit lead us to consider (among the others) the technological and cultural aspects of this.

Entering the digital communication era

The history of computer applications in the field of cultural heritage and museums dates back different decades and it is sprinkled of failures and relevant investments. Early experiences were devoted to the definition of filing standards and digital inventory of artefacts on mainframes. This was many times a never-ending sequence of data standardisation proposals forcing cultural institution to restart from scratch the filing process. Frequently it happened that the strong interest and need for a standard pushed each memory Institution to create its own standard many times highly incompatible with the others. In addition as it happened recurrently in the early stages of the use of computer systems the lack of mutual understanding between information scientists and end users generated a trial and error loop.

In the eighties we assisted to the experimentation of the first tri-dimensional digital models of monuments, historical palaces³, it is unclear if such experiences were driven by a real interest for heritage or, more likely, by the will to test and promote computer graphics thanks to very well known monuments.

We do not consider relevant to the aim of this paper to enter in detail in this phase of the process consequently let's skip this phase and approach the real "entry point" of digital technology in the field of heritage and museums.

Virtual Universes and Heritage

Even if the massive use of computer graphics it is not the focus of this paper, anyway we cannot avoid to mention, even if briefly here but recalling it later on closer to present times, the use of Interactive Virtual Reality in the field of cultural heritage. Using the term Interactive Virtual Reality we underline interaction to differentiate this technology from pure panoramic views or walkthrough video clips. After a long period of time spent "underground" virtual reality come to the fore thanks to a German artist, Monika Fleischmann⁴, a pioneer in the use of cutting edge technologies in the field of art. In 1989 she created a virtual reality tour in the famous Alexander Platz metro station. Virtual reality has also inspired many other artists, such as painters, sculptors and movie directors (Benjamin Britton, The "virtual" Lascaux Cave⁵, Brett Leonard—The Lawnmower Man; Josef Rusnak—The Thirteenth Floor; Andy and Larry Wachowski—The Matrix and its sequels).

The general impression at the end of the eighties was that VR was born at NASA in 1984, and the virtual reality is a solely technological triumph. In reality, this technology originated

³ E.g. Andrea Palladio's Villas in Veneto

⁴ Monika Fleishmann at that time use to work at the GMD in Bonn (later on merged with Fraunhofer Institute).

⁵ <http://www.sciencephoto.com/media/351581/view> (accessed 20.06.17).

more than a decade before when Myron W. Krueger coined the term artificial reality in the middle of the 1970s, he was referring to both the Videoplace⁶ technology and the head mounted display technology that enables three-dimensional vision, created by Ivan Sutherland (Sword of Damocles, 1968). In 1989, Jaron Lanier, the general manager of VPL Research, a Californian society that has focussed on “virtual technologies” from its inception, coined the term virtual reality in order to group together all virtual experiences. These two technologies represented two different paths toward the same goal: total body immersion in computer-generated environments that is convincing that it is just like a “real” experience.

This technology, even if at that time extremely expensive, stimulated the creativity of different scientists and journalists so on one side it was considered the silver bullet to solve all the problems, as it was the case of Artificial Intelligence one decade before⁷, on the other side a kind of powerful drug generating addiction⁸. Early in the nineties an incredible number of VR experiences were carried out ranging between gaming to medical rehabilitation. Some of them tried to simulate the real world some of them broke the schema creating “impossible” worlds, from vis a vis interaction with atoms to negative gravity environments or even VR based lessons of Latin language. Among these applications we can consider as a reference some of the applications devoted to cultural heritage. Of course major efforts were addressing the need to recreate no more existent or not accessible monuments. In 1993 three different experience were presented to the public: the Virtual Viking Village⁹ reconstructed by Ole Odegaard for Norwegian Telecom, the Basilica Superiore di Assisi by Infobyte—Roma, later on seriously damaged by an earthquake, and the virtual reconstruction of Contemporary Art Pavilion (Padiglione d'Arte Contemporanea—PAC) by Virtuality Group—Milan, just destroyed by a terroristic attack and the virtual model of the Grand Place in Brussels by De Pinxi¹⁰. Since that time a number of virtual experiences in the field of heritage were designed and developed till nowadays.

VR wasn't the only approach to digital worlds, Enhanced reality (also termed enriched reality) was developed as an alternative approach; it can be thought as a version of the real world that has been enriched with computer-generated information. One of the most well known of these devices was a helmet, the “one-million-dollar” display by Kaiser Optics¹¹, today thanks to mobile location aware devices equipped with camera and connected to the Internet enhanced reality is one of the key technology in everyday life.

After a first static approach located in Ename¹² thanks to the work carried out by Dirk Callebaut, the use of enhanced reality grown up from the early experience of ARCHOGUIDE¹³, a pioneering example of enhanced reality experience in the archaeological site of the ancient city of Olympia, to the recent time virtual experiences in Jumiege¹⁴ or Ancient Aquileia 3D¹⁵. Both of them released through an APP on mobile devices.

⁶ <https://www.youtube.com/watch?v=dmmxVA5xhuo> (accessed 20.06.17).

⁷ Artificial Intelligence, after a long period of time spent in “smart” objects, is actually back as a kind of “big brother”.

⁸ *Rosenzweig R.* Scarcity or abundance? Preserving the past in a digital era // *The American Historical Review*. 2003. Vol. 108 (3). P. 743.

⁹ www.aselibrary.ru/datadocs/201312/1-1_Ronki.pps (accessed 20.06.17).

¹⁰ <http://homes.esat.kuleuven.be/~konijn/depinxi.html> (accessed 20.06.17).

¹¹ <https://it.pinterest.com/pin/544231936207066287> (accessed 20.06.17).

¹² http://visualdimension.be/heritage/exhibitions/pages/pam_ename.html (accessed 20.06.17).

¹³ <http://www.archeoguide.it/old/> and <http://archeoguide.intranet.gr> (accessed 20.06.17).

¹⁴ <http://www.abbayedejumieges.fr/actualites/jumieges-3d-1.html> (accessed 20.06.17).

¹⁵ <https://www.youtube.com/watch?v=NAnXPvWkyic> (accessed 20.06.17).

Why do we consider relevant in the field of culture the use of interactive virtual reality or even enhanced reality? One of the main aspects characterising virtual reality is the unique ability to let us experience a specific environment created in the virtual world, concepts and aspects once approachable only on books may now be experienced.

This approach exceeds the “hands on” approach letting us put the “hands on” an electric charge floating in a magnetic field or trying biological experiments in a virtual lab. It is the typical approach of “learning by doing” one of the most powerful¹⁶.

In the domain of built heritage I can freely virtually visit the Tomb of Nefertari¹⁷ and try virtual restoration of paintings and inscriptions clicking on some hieroglyphs to hear the translation.

Both virtual and enhanced reality can provide a relevant contribution to a better understanding of artefacts providing the original context physical, historical or artistic. Contextualisation of artefact and objects is one of the most appreciated contribution provided by technology, it supplies to the usual gap between archaeological relicts exhibited in museums and the location where they were excavated and the original shape and function of the specific tool or object.

Super Information Highways v/s Information Society

Almost in the same period of time something intended to deeply influence our life come to the fore. We can recall the recent story coming back to the early ‘90s; we may refer to both the US project, promoted by the vice-President Al Gore, entitled Super Information Highways¹⁸ and to the Bangemann Report¹⁹ that, in partial antithesis, presented the “European path” towards the Information Society.

On February 1995, the European Commission organised the first meeting on the Information Society, in Brussels. During the meeting, a list of eleven pilot projects was approved:

- Global Inventory (of projects)
- Global Interoperability
- Cross-Cultural Education and Training
- Bibliotheca Universalis
- Multimedia Access to World Cultural Heritage
- Environment
- Global Emergency
- Government Online
- Global Healthcare
- Global Marketplace for SMEs
- Maritime Information Systems.

In June 1995, a worldwide G7 Summit was held in Halifax, Canada. The G7 Group approved and adopted the abovementioned list of projects.

As a consequence, practical demonstrations followed during the ISAD Conference (Information Society and Developing Countries) held in Midrand, South Africa in May 1996. During this conference, four demo projects were selected, representing the four principal sections identified by the project Multimedia Access to World Cultural Heritage.

¹⁶ <https://www.youtube.com/watch?v=Qav3Xxkt6nU> (accessed 20.06.17); <https://www.youtube.com/watch?v=w--RqouUKGA> (accessed 20.06.17).

¹⁷ http://www1.adnkronos.com/Archivio/AdnAgenzia/1995/11/27/Spettacolo/MOSTRE-NEFERTARI-LUCE-DEGITTO-A-TORINO_143800.php (accessed 20.06.17).

¹⁸ <http://www2.lbl.gov/Science-Articles/Archive/information-superhighway.html> (accessed 20.06.17).

¹⁹ http://cordis.europa.eu/news/rcn/2730_en.html (accessed 20.06.17).

- Digitization → 3D Acquisition (originally called Laser Camera), a laser camera presented by the National Research Council, Ottawa;
- Data structure → History of Science Museum, Florence;
- Visualization → The Tomb of Nefertari, a IVR experience by Infobyte, Roma;
- Navigation → “System for Universal Media Searching” by SUMS Corporation, M. Mc Lohan, Toronto.

These projects were designated as reference models in each specific sector; let's say examples of “best practice”.

Almost at the same time, focusing on European initiatives as follow up of the concept of Information Society, the combined initiatives G7/EC led to the birth of a new framework of understanding. The reference document was largely a Declaration of Intent that was initially signed by 240 museums and institutions. In this context, there was the development of a likely organic approach to the use of multimedia and more generally of ICT in the field of cultural heritage. The Memorandum of Understanding for Multimedia Access to Europe's Cultural Heritage, or more simply the MoU, is usually considered to be the Act of Incorporation for the “Information Company on European Cultural Heritage”.

The official MoU progress report dated April 1996 reported that apart from filing and digitisation a third area that can be defined as application and testing “will be made up of projects that are market-oriented and based on the enjoyment of cultural heritage. This area will include projects aiming at producing advanced cultural applications by using the present technological resources in key sectors (education, entertainment, cultural tourism, disadvantaged users etc.)”. In this area, an assessment of museum initiatives highlighted that the World Wide Web assumed a leading position within the Multimedia Access to World Cultural Heritage project.

The MoU lasted, as stated in the document itself, for two years, and then the European Commission issued a “call for tender” it asked for follow-up projects. MoU was mainly a declaration of intent; the follow-up had to be much more pragmatic.

In 1997, based on the already existing MEDICI organisation, a new “agency” called the MEDICI Framework of Cooperation was launched. A partnership has since been developed between the MEDICI initiative and the Council of Europe in the application of new information technologies to the field of culture.

The primary goal of MEDICI at that time was to promote the use of advanced technologies to access, understand, preserve and to promote the economics of cultural heritage. The aim of this was to create conditions that permit the development of new economic activities that promote cultural heritage, mainly through the use of new media, and to create new employment opportunities in related sectors.

The Invisible universe of data

The interest in ICT for culture, often termed eCulture, soon become ubiquitous and international institutions, governments, cultural bodies as well as researchers and companies invested time and resources in eCulture.

The classic way to access information within databases is to create a query using single or multiple keywords and type this into a form²⁰. This approach requires a good knowledge of both suitable keywords and the properties of the query language. Querying can be a frustrating task,

²⁰ See, for instance: *Yilmaz H.M. et al.* Importance of digital close-range photogrammetry in documentation of cultural heritage // *Journal of Cultural Heritage*. 2007. Vol. 8 (4). P. 428–433.

because we may know that interesting data are inside the database, but we may not know the correct query to use to retrieve that data.

The “direct query” approach is suitable for experienced users but is too complicated for general users interested in accessing cultural content. Following relevant discussions on data structures, interoperability and data management (OODBMS, XML, CIMI, Dublin Core, CI-DOC and others), web sites devoted to cultural content tend to offer a query form based on a list of selected entries²¹, such as Artist Name, Work Title, etc.

However, interactions achieved through the use of a set of interrelated keywords do not offer a comprehensive view of the network in terms of relations and references. It often happens that we jump from no results to hundreds of links; an invisible universe of data is again beyond our reach.

A common solution to this problem is to give the user hints and cues about this invisible world of data. This may mean dynamically updating the list of available keywords with the most relevant choices, or in a graphic environment the links and data distribution around the focus of the query can be displayed.

When dealing with cultural content it is important to outline some relations or at least make them visible. One of the most important early experiences in this field was the already mentioned SUMS, System for Universal Media Searching²². The interface proposed the classic “5 Ws”: who, what, when, where, why to guide the search thanks to such well-known entries.

A web of cultural content

In the early period of experimentation of the web technology (1993,94) a French student developed a web version of the Louvre and at the same time the Ricci Oddi art gallery located in Piacenza was published on line including the “in-visible gallery” section showcasing stored artefacts.

Since the early meetings of researchers interested in the web technology, for instance the one held in Darmstadt in 2003 and more specifically in 2007 on the occasion of the 7th WWW Conference held in Brisbane, the interest in the field of culture and cultural heritage was more than evident.

As already mentioned, in 2007 a specific WWW session was devoted to cultural heritage, on that occasion apart from the announcement of the semantic web, xml and RDF were introduced igniting a revolution on the web. Judy Gradwohl from The Smithsonian presented a revolutionary approach to collection management, Smithsonian Without Walls—Revealing Things²³. Revealing Things offered for the first time a very sophisticated graphical query mechanism enabling a multiple entry exploration of a contemporary object collection. One year later Gradwohl presented History wired²⁴, based on the Treemap research studies carried out by Ben Shneiderman, a simplified version of the Smart Money Market Map²⁵ graphical interface enabling contextualised exploration of multiple collections as requested by the Smithsonian huge set of collections. These two projects, presented to the WWW community revolutionised the concept of on line collections offering a power tool to enjoy collections.

²¹ Authority files and Virtual International Authority File (VIAF)—refer to OCLC <https://viaf.org> (accessed 20.06.17).

²² <http://www.sumscorp.com/sums/> (accessed 20.06.17).

²³ <http://dl.acm.org/citation.cfm?id=282272&dl=ACM&coll=DL&CFID=953311647&CFTOKEN=-15208920> (accessed 20.06.17); <http://www.thinkmap.com/pressrelease.jsp?id=67> (accessed 20.06.17).

²⁴ <http://americanhistory.si.edu/exhibitions/history-wired> (accessed 20.06.17).

²⁵ <https://visualalign.wordpress.com/2011/10/29/treemap-of-the-market/> (accessed 20.06.17).

A number of different approaches were developed to test the opportunities offered by the rapidly evolving information technologies, tri-dimensional interactive walkthrough in virtual copies of existent museums or even, more engaging, virtual walkthrough in imaginary museums such as for instance museums of artefacts stored in warehouses or museums of dispersed collections²⁶.

Among the most relevant European Museums we recall the official version of the Louvre split in three main sections: Institutional, Educational, Commercial. Very innovative, at the time it was introduced, the Educational version expressly designed in order to fit with students needs and interests, texts and images are copyright free to be reassembled and reused by students.

In June 1997 thanks to an international agreement IBM launched the State Hermitage Museum²⁷ project, a massive digitisation campaign never tested before, in 2003 on the occasion of the CIDOC ADIT International Conference held in Sankt Petersburg an interactive application concerning the Russian State Museum located in the Mikhailovsky Palace was presented by the authors. Users were enabled to approach the Palace virtually and visit the exhibit rooms, thanks to two couples of “connected” paintings hosted by the museum and computer graphics, two unusual “experiences” were offered to the public, a virtual walkthrough inside the natural environment between the two views. On the same occasion, as an extension of the use of digital technology inside museums, the movie director Aleksandr Sokurov presented the “Russian Ark” (Русский ковчег, 2002) a movie entirely shoot in one day in digital format inside the Winter Palace. This movie stands as an incredible exercise of “digital story telling” dedicated to an “entity” that is “content, container and history” all in one. There are no other similar examples, audience is captured by the atmosphere and enters the spirit of the unique location.

On 30 September 2012 in the Kremlin theatre in Moscow a special event entitled “The Last Judgment”²⁸ took place. The main theme was to offer an unconventional exhibit of the Michelangelo’s Last Judgment Sistine Chapel fresco analysis on a six surfaces projected scenography representing the chapel itself adding, to complete the experience, the incredibly powerful Giuseppe Verdi’s *Messa da Requiem*.

Following a similar *fil-rouge* on July 2015 a startup, VirtuItaly, started the project *Uffizi Virtual Experience*²⁹ presented to the public early in 2016. An impressive digital story telling based on huge multiple screen projection of paintings and frescos enriched by texts and audio and music accompanying the audience through the history of art from Giotto to Caravaggio. A typical example of innovative approach to museums could be represented by the recent opening of MUSME (Museum of Medicine) in Padua (Italy); scientific content transferred to visitors thanks to the hands on approach merged with virtual experiences and avatars is the recipe of the success³⁰. Even this experience has the positive effect to provide a privileged standpoint for future visit to the real museum as it happened in 2007 at the Museum für Naturkunde, Berlin thanks to JURASCOPE³¹ by Art+Com. The experience provides a proper context to the different paintings reconnecting them to the cultural, social and political condition of that time.

²⁶ Battro A.M. From Malraux’s imaginary museum to virtual museum // Museums in a Digital Age. Ed by R. Parry. London, 2010. P. 136–147.

²⁷ <https://www.hermitagemuseum.org> (accessed 20.06.17).

²⁸ <https://www.youtube.com/watch?v=l09OoFA5IYs&feature=plcp> (accessed 20.06.17).

²⁹ <http://uffizivirtualexperience.com/en/home-2/> (accessed 20.06.17).

³⁰ <http://www.musme.padova.it/video-di-presentazione> (accessed 20.06.17); <https://www.youtube.com/watch?v=IwRYtO2q3iU> (accessed 20.06.17).

³¹ <https://artcom.de/project/jurascope/> (accessed 20.06.17).

Mobile technologies, and much more location aware smart devices, have great potential and at the same time they contributed to bridge the digital divide, they are not perceived as “computers”, they are tablets as it was already done by smart phones they show only one hard key. This key many times is considered the “emergency exit” from difficult situations. They are already regularly used by kids and appreciated by elderly people or people reluctant to become digital literate. Smart phones and tablets pertain to the sphere of “personal belongings” which have become a part of our daily life. There are basically few limits to what creative can do with mobile devices from proximity services to customised services based on actual mood, location, time, season, weather ...

Anyway one of the most relevant innovations due to the actual generation of mobile platforms is the concept of APP, something that may be easily built up with a number of authoring systems even by non-professionals and distributed for free or by payment worldwide. APPs may easily “cooperate” providing tailored services even supporting temporary events having a positive cost/benefits ratio.

Technology and recommendations

Getting closer to the conclusion it is worth to recall the relevant role-played by Institutions in promoting and supporting innovation, among the cultural Institutions and bodies I will limit my excursus to the role recently played by UNESCO IFAP. IFAP took into account some relevant aspects such as long term preservation of digital content otherwise termed digital preservation. In 2011 on the occasion of the International Conference on Preservation of Digital Information in the Information Society: Problems and Prospects³² held in Moscow the final declaration outlined some practical guidelines in order to minimize the risk to jeopardize digital archives and documents. As stated in the proceedings of the conference “The conference showed that traditional keepers of analogue information—libraries, archives and museums—are still unable to cope with the tasks of digital information preservation. And in fact they are the ones to raise the alarm. Policy-makers do not possess due understanding of the necessity of creating a new infrastructure for the preservation of digital information, probably on the basis of the infrastructure of information preservation on traditional carriers by modernizing and strengthening it. The discussions made it clear that most countries of the world possess neither regulatory framework that would oblige relevant institutions and structures to be engaged professionally in the process of information preservation in digital format, nor drawn up distinct policies that might lead to the creation of such a framework.”

In 2012 the International Conference on Media and Information Literacy for Knowledge Societies³³, held in Moscow as well, promoted the need to provide MIL in order to build up knowledge society.

In 2013 UNESCO IFAP launched in Sakhalin an International Conference on Internet Impact on Socio-Cultural Transformations³⁴. This was a long-range in depth exploration of the present and future transformation of society due to the advent of the Internet. This of course means as partially covered by digital preservation the hot topic of future heritage and our legacy to future generation.

Last but surely not the least multi lingualism and multi culturalism on the Internet must be ensured in order to preserve the cultural richness due to diversity limiting the risk that a “uniform” mass technology may impose a unified and simplified “culture”.

³² <http://www.ifapcom.ru/en/news/1257/?returnto=1&n=1> (accessed 20.06.17).

³³ <http://www.ifapcom.ru/en/news/1344/?returnto=0&n=1> (accessed 20.06.17).

³⁴ <http://www.ifapcom.ru/en/news/1446/?returnto=0&n=1> (accessed 20.06.17).

To conclude

We have now reached the end of this tour. We have travelled a long path, starting from early experiences in cultural data filing and the first attempts to use digital technology to both communicate cultural content and perform education, and finally exploring current and predicted applications of ICT to cultural heritage and more specifically to museums.

The exploitation of multimedia communication, computer graphics, virtual reality and the Internet has significantly improved the use of information technology in the cultural field, potentially providing added value and, we hope, useful services.

It has been at least twenty five years since ICT was first applied to the field of cultural heritage, and during this period of time many important players in both the “memory institutions” and the ICT community have invested a great deal of time and resources into creating pilot projects and applications. Some of the most significant experiences are outlined in the present paper. Some of them are shortly described; others are just remarked upon or mentioned as already carried out experiences.

Information and communications technologies should only be considered to be powerful tools for achieving important results; ICT tools will never compete with content and skills. Technology is not a constraint: digital services, networking, wireless connections, instant communication, cooperative and knowledge management tools are more than enough to fulfill our needs³⁵. The challenge now is how to take advantage of these tools³⁶ by channelling their use into creating true added value in Museum exhibitions.

References

Battro A.M. From Malraux’s imaginary museum to virtual museum, in *Museums in a Digital Age*. Ed by R. Parry. London, New York: Routledge. 2010. P. 136–147.

Lynch C. Digital collections, digital libraries & the digitization of cultural heritage information, in *Microform & imaging review*. 2002. Vol. 31 (4). P. 131–145

Nikonova A.A., Biryukova M.V. The Role of Digital Technologies in the Preservation of Cultural Heritage, in *Muzeológia a kultúrne dedičstvo*. 2017. Vol. 5 (1). P. 169–173.

Ronchi A.M. Digital Preservation: Cyber Ark, Rosetta Stone or Print?, in *Preservation of Digital Information in the Information Society. Proceedings of the International Conference (Moscow, Russian Federation, 3–5 October, 2011)*. Moscow: Interregional Library Cooperation Centre, 2012. P. 76–91.

Ronchi A.M. *e-Culture: Cultural Content in the Digital Age*. Berlin; Heidelberg: Springer, 2009. 456 p.

Rosenzweig R. Scarcity or abundance? Preserving the past in a digital era, in *The American Historical Review*. 2003. Vol. 108 (3). P. 735–762.

Wands B. *Art of the Digital Age*. London: Thames & Hudson, 2007. 233 p.

Yilmaz H.M. et al. Importance of digital close-range photogrammetry in documentation of cultural heritage, in *Journal of Cultural Heritage*. 2007. Vol. 8 (4). P. 428–433.

³⁵ Wands B. *Art of the Digital Age*. London, 2007.

³⁶ E.g. Google Cultural Institute and TED: <https://www.google.com/culturalinstitute/about/artproject/> (accessed 20.06.17); http://www.ted.com/talks/amit_sood_every_piece_of_art_you_ve_ever_wanted_to_see_up_close_and_searchable (accessed 20.06.17).