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Cyber - A Digital Cultural Heritage in a Museum and University Setting

Ladislav Župčán and Martina Župčánová

Abstract

In recent years, we have registered for the professional and lay public several published scientific and popularization papers on the use of virtual reality in cultural institutions, especially from abroad. The applicability of the components of virtual reality at present is not only dependent on the technical or economic nature, but also on the degree of mutual teamwork forming the basic framework of the project. The presented study consists of a theoretical nature in the context of the analysis of museum virtualization with an impact on positive and negative use in practice. The purpose of the practical section is direct examples of use in practice with a connection to the educational environment.

Keywords: museum, virtual reality, cyber-exposition, online exhibition, source

1. Introduction

The instinct of the collector and exhibitor has been present in man since the earliest phase in the form of cave paintings and sculptural art in the form of Paleolithic and later Mesolithic Venus. This trend of preserving and expanding the “art of past generations” took place in all subsequent periods and centuries. However, it gradually manifested itself as an attribute of preserving and documenting the authenticity of time through objects.

Today’s exhibition language is the product of a combination of current knowledge of science and exhibition practices, knowledge and needs of the visitor of the 21st century. Among the priority needs for visitors to a modern museum is not only to learn about collection items, but also to examine them in detail, e.g. try them, touch them, or make a true copy of them. At present, the needs of visitors can be saturated with technology in the form of 3D printers, as well as the direct craft creation of castings of selected collection items.

Alternatives to adapting modern cyber technology are almost limitless; from visual presentations (from educational aids such as PowerPoint, Impress, Kyenote and others) to the technological creation itself (eg. software - graphic reconstruction of monuments and collection objects, 3D shapes and forms of architecture of cities using 3D printing, or 3D Puzzle of world cities and cultural heritage and others).

Today we can no longer talk only about the form of “help and finding solutions to problems” but it is necessary to create modern procedures (online presentation of

field results associated with video calling, practical adaptation of acquired theoretical knowledge into practice, for example when researching issues using a virtual archive, verification of architectural knowledge in constructed 3D and XD virtual monuments, and the like) in combining the acquired knowledge with technological advances.

2. Methodology of the study

The research samples were selected according to the following basic factors:

- Constant and stable attendance of selected institutions.
- The scope of digitized collection items and the degree of execution of virtual reality.
- Necessary economic stability (eg. the largest state support) and cooperation with the private sector, which helps to create alternative exhibitions in the form of a virtual presentation.
- Marketing and advertising promotion.
- Multimedia education and interactive research of collections for practical purposes [1].

Based on the above criteria, several national and specific museums of diverse character were documented (according to the typology: artistic, historical-patriotic and ethnographic), which applied elements of cyberculture as much as possible (2014/2015–2019/2020).

The priority of the research was to analyze the following pitfalls using comparison, area diagnostics, psychological and axiological methods:

- Virtual interface of the museums website (eg obtaining clear information, degree of online interaction, etc.).
- The impact of visual design on the visitor or his need for self-education and relaxation.
- Invoking an emotional experience from a selected exhibition and presentation.
- Empirical experience in demonstrations of the application of virtuality (an effort to understand collection items and today's technologies).
- Inducing renewed interest in visiting selected museums.
Register of cultural institutions using elements of virtuality, resp. virtual reality is geographically and technologically diverse. The main criteria in compiling the list of museums for the study that apply cyberculture to their prepared programs were:
- Combination of classic and virtual exhibitions. A key factor is the degree of diversity in the design and adaptation of digital collections.
- Offer interaction on the web, even in classic spaces.

- Use of virtual and multimedia elements in the advertising presentation of the museum. It goes e.g. about the use of 3D videos. This includes design promotion based on the use of technical innovations such as. handheld scanner.
- Experimenting with interactive components of cyberculture during the tour, such as e.g. tablets, audio-guide devices and others.
- Presentation of development stages of the application of technical innovations in the interpretation of their collections in the form of pilot projects and short-term exhibitions.
- Applying more demanding components of cyberculture (eg holograms) to the exhibition process.

3. Deepening the exhibition plans of museums with university practice

From the very beginning, museums have promoted the idea of providing new facts to those who intend to broaden their knowledge horizons. Such an example are the collections from the 2nd millennium BC. from the city of Larsa for didactic purposes. It is education and the acquisition of new knowledge that play a key role in the creation of museums and their collections. This moment intensified at the turn of the 18th and 19th centuries, when the foundations of exhibition plans for the realization of expositions were laid.

At present, we can prove the existence of three exhibition plans:

Syntagmatic plan. The plan was created in about 1750, depending on European countries. When visiting the exhibition, the social status of the visitor was important in the given period, as well as his education. The change in the exhibition plan came only after 1950, when some of the artifacts were made available to the public freely. The syntagmatic plan represents a diverse complex of collection objects, which are directly set in the display case, in the pre-planned space. According to this plan, all collections should be displayed in display cases or plastic structures.

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Associative plan. The plan creates a multi-colored non-linear form of presentation in a directly reserved space [2]. We can also declare this state on the idea of I. Maroevič that “the gradual professional elaboration of a museum object leads to the reduction of ambiguity (museal indefiniteness) through more detailed knowledge, which is presented through communication levels” [3]. M. McLuhan also drew attention to the associative plan in the sense of communication in museums in 1967 when creating expositions [4]. The author stated that the exhibition collections should be exclusively without descriptions, so that the visitor participates in the interpretation of the facts. This thesis was refuted in the following years, but nevertheless in the last twenty years, its basic idea in the form of virtual exhibitions has come to life again [5]. In the associative plan, the education of visitors plays an important role in understanding the interpretation, social status plays a marginal role, as museums are accessible to everyone. This condition is currently visible even at the free entrances of some museums every first or last Sunday of the month.

Visual-virtualization plan. The plan began to be used in museums at the turn of the 20th and 21st centuries. It is related to the gradual establishment of the idea of “self-survival of values” obtained from the visit to the exhibition [6]. On this principle, a new digital exhibition language was created. In practice, the scheme is based on the purposeful intervention of the visitor in terms of his initial interest. The digital language is directed through several channels and gradually penetrates the consciousness, with an effort to maximize the expansion of the museum’s virtual reality.

The basic contours of the visualization-virtualization plan are:

Direct transformation of digitized collection objects into an exhibition hall.

For the visitor, this means moving the collection from the cognitive to the emotional level. Depending on the technical level, the collections are still available in digital form in an innovative form. This example is also for collections that have not yet been made available to the public. Thanks to virtual reality, visitors can explore collections from almost any angle. Collectibles performed in a virtual form do not form the exhibition unit itself. In most cases, digitized objects are presented with authentic collection artifacts. As a suitable example, we can mention a part of the collections scanned by a 3D optical scanner from the Slovak Mining Museum in Banská Štiavnica. From a foreign environment it is e.g. permanent exhibition from the National Museum of Rome (Thermae Diocletiani) or from the Archeological Museum of Naples (Museo Archeologico Nazionale di Napoli).

Creation of expositions to historical events that have not yet been processed and presented. In addition to historical contexts, scientific topics also resonate. Various visual reconstructions in the form of static models or film simulations are used to achieve the step. Animations can also be linked to interaction. These attributes provide access to current scientific knowledge, which also revitalizes older claims. An elaborate example of this type is the permanent online exhibition called “Keys to Rome” [7]. Several museums collaborated on the exhibition, e.g. Museum dei Fori Imperiali from Rome, Allart Pierson Museum from Amsterdam and more. The exhibition has been open to the public since September 2014.

By creating various technological constructions depending on the design of segments of museum cyberculture. In this step, there is an effort to elaborate the exhibition themes in more detail. As a result, attempts have been made to restore old exhibits. Archival documentation is used to achieve the output process. A good example was the 3D exhibition of the most important Italian Renaissance paintings located in the Louvre Museum. E.g. Using the Nintendo game console, the 3D Mona Lisa came to life, clipped lashes, nodded, waved, but also answered questions in seven languages. This exhibition was created using the Nintendo console, and visitors did not even have to wear special glasses to create a 3D image.

Creation of virtual exhibitions and interactive collections that are not located directly in the museum. In this context, some museums use the so-called multi-media XD digital objects as well as museum holograms (eg Dubai Museum and Al Fahidi Fort: *يادي هفال* نصح - *يبد فحتم*) to show historical stories. Since about 2013, we have also registered exhibitions using nanotechnologies (eg the Museum of Science in Boston) or directly robots (eg the Robot Museum in Madrid), in which current technological knowledge is applied.

4. Cyberspace - museum (cultural heritage) - university (virtual education)

Life in society has changed a lot in the last 50 years. Undoubtedly, this is also a consequence of the technology that, with the advent of classic television sets, was

already creating a ramp to gradual virtualization. This was most evident in cinematography. Virtuality is one of the basic forms of cyberculture, which is “generated through fiction and illusiveness in confrontation with mimeticism, emphasis on identity in terms of ideal presentation and the existence of what is otherwise impossible, inaccessible, and brings a permanent deal with the degree of expression, disrupted to hyperreality and superficiality...” [8].

However, we can not understand virtualization purely as a way of visual presentation, [9] as it is a fundamental phenomenon of network, so-called cyber-communication. From a sociological point of view, virtuality is an epistolary genre, [10] that is, writing on the screen, not on paper. This type of writing is mostly used for communication, especially on social networks and e-mail.

The development of science and technology in the field of communication and information means has opened up new, previously non-existent spaces. These spaces are connected by relatively large geographical distances, it is possible to move in them and create virtual communities. The current consumer population is adapting space and time, even discovering and explaining the importance of connecting borders. In this spirit, J. Pašiak sketched the basic scheme of spatial trends, forms and types of society, which in the course of historical development reacted to the then technological boom [11].

Similar views arose from the technological and economic predictions of many authors (eg. D. Bell and H. Kahn), [12, 13] who emphasized the evolutionary model of post-industrial society. A. Toffler also predicted in 1968 that the main “feature of cyberculture” would be “work from home”, performed using a computer connected to a telecommunications network [14]. These predictions led from industrial and urbanized space to cyberspace and virtual networks. This transformation of processes represents a global trend and is characteristic of the civilizational component of globalization [15].

In the context of globalization, cyberculture has strengthened certain boundaries and barriers between the various strata of society, such as:

- Between people who have access to information and people without access.
- Among people who can work with new technologies and among people who do not have the necessary knowledge to use technology.

This trend is also applied in museums and galleries through museum digitization and elements of virtual reality, especially with regard to virtual reconstructions and high technology [16]. The purpose of museums is not only exhibition activity, but also the formation of public opinion of the past. Contemporary museums are exposed to a compromise between authenticity, the display of original museum collections and virtual pomp in the struggle for their existence. This situation is primarily influenced by the website and the degree of presentation of digitized collections to the public via the Internet, which has its supporters and opponents. A significant shift in information and a cross-section of traffic was also ensured by Google’s computer application. Google Corporation has launched a project called “Google Art Project” to unite selected world museums with art and graphics in a virtual environment using the Internet [17]. The revolutionary idea was to create a list of the best virtual museums in the world according to certain criteria. The criteria were e.g. virtual museum with the best exhibition activity, the best application of virtual products, animation-virtual stories (scenes), interest of visitors, etc. The list of museums is expanding every year and even new applications are being created in the project with the basic intention of attracting visitors to the museum premises. Currently, the leading position in Google search traffic per weekly click

belongs to the French Louvre. The museum currently has the most detailed elaborate graphic design and interactive interface. In addition to the interior, the virtual tour also offers some of the floors of the museum's exterior.

In other leading places in the ranking were placed museums, such as Smithsonian Institute: Museum, NASA Museum or Virtual Museum of Canada, etc. A rather specific virtual museum is the NASA Museum in Washington. The museum has an animation-interactive page. The robot in the role of a guide accompanies the virtual visitor through the history of the American national space program. The virtual museum is complemented by original, authentic materials from the archives, photographs and various audio / audio samples.

The museum with the largest number of existing virtual exhibitions so far is the Virtual Museum of Canada. The virtual museum operates on the basis of a grouping of physical museums from the territory of Canada. So far, 752 virtual exhibitions have been constructed. The most interesting presentations within the exhibitions are considered to be cartoons in 2D and 3D and profile cities. Individual cities are processed in a virtual form. It is possible to follow their historical-architectural development, or contemporary local sounds from factories, neighborhoods, cars, etc. It should be noted that the latter museums are located exclusively on the Internet.

The basic forms of museum cyberculture include digitization, internet communication, cyberspace, virtual reality and online presentation. Defining the concept of museum cyberculture is complicated for several reasons, such as non-uniform terminological bases, absence of elaboration of methodological procedures in analysis of impact of digitization and virtualization of museum artifacts, different execution of virtual reconstructions on the basis of technical complexity and lack of financial and marketing promotion [18].

From the museum practice, the most used elements of cyberculture are the digitization of museum artifacts and the internet presentation of the museum, the so-called virtual tours [19].

Although digitization is a relatively long-term matter in terms of time and technology, it is gradually becoming established in the pedagogical environment. We can observe the greatest manifestation in the creation of digital and multimedia laboratories directly at universities or in the museum sphere. In addition, the digital - visualization trend also affected the educational process. Nevertheless, various forms of application of the components of cyberculture prevail among individual departments (as well as universities) for the benefit of research and interpretation of knowledge. This fact is also noticeable in the Slovak Republic, where it is necessary to improve the usability of digitization and work with virtualization in the university environment. Compared to other, comparable countries (eg Poland, the Czech Republic or Hungary), this situation is considerably underestimated in our region, which is also reflected in the acquisition of European projects or the success of graduates with digital experience in obtaining employment.

In several humanities and social sciences, the adaptation and dissemination of technological innovations (eg the use of tablets, smartphones, Tesla's transformer, etc.) is currently the most prone in the field of visualization elements. The basic task of virtualization is the presentation and verification of theoretical knowledge in real form. It is visual practice that documents other research alternatives from other scientific disciplines.

Currently, the following scientific phenomena are the most preferred:

- creation of reconstruction models of existing collection objects in order to present them online as a promotional item, as well as for available study (eg the Digital Museum project, which is under the patronage of the SNP Museum in Banská Bystrica).

Figure 1.
 Example: *Life and works of Galileo - a virtual 3D survey* [21].

- creation of various collection items (most often damaged or stolen, processed on the basis of preserved documentation) using 3D printers.
- making available reconstructive museological exhibitions of historical and social themes in universities (eg “Virtual Exhibition of Slovak Castles” at the University of St Cyril and Methodius in Trnava, or “History of Scotland” at the University of Glasgow.). In this regard, it should be noted that most foreign universities (eg, the University of Denver, the University of Maryland, and many others) focused on the study of history and architecture on their official (department) site offer direct virtual exhibits.
- construction of an ideal virtual form of cultural monuments (especially ancient and medieval buildings: sacral and profane buildings) in a digital format for the study of the history of architecture.
- virtual animated demonstrations and feature films about individual historical periods. They are mostly 2D, or. 3D examples documenting the social conditions of the time [20].
- virtual geographical and cartographic plans and maps created using technological and navigation systems (eg GIS).
- creating simple educational presentations (**Figure 1**) using multimedia tools (eg. virtual book) to simplify and explain historical - socio - cultural processes for high school students (especially grammar schools) and universities.

5. Cyber - artifacts and cultural heritage

In the way of studying and interpreting the nature of complex historical processes and their connections as a whole, implementation using individual virtual elements is increasingly present on a global scale. Important promoters of virtualization include, in particular, German, Anglo-Saxon, Francophone and

Sino-Japanese university experts, who apply forms of virtualization and cyberspace in the analysis of the history of the human population.

This situation manifests itself in several patterns (eg from short clips to rehearsal and repetition alternatives, etc.), which are accessible to the public, especially in the online interface. In the educational process and especially in the interpretation of the history of architecture, especially in the presentation of building changes in urban planning and differences in the architecture of monuments, we can consider the following forms as decisive elements:

- 2D to 3D virtual reconstructions of various cultural monuments included in the then cities (**Figure 2**). These forms are based on sources of archeological provenance and also on architectural and historical graphic documents.
- cartographic, geographical virtual plans and floor plans of the then cities. (**Figure 3**). Virtual maps as well as books are based on the geography of the time and preserved maps.
- static and virtual reconstruction models of cultural heritage (layout of buildings, natural attributes, as well as period sounds). Knowledge from the

Figure 2.
Example: 3D castle Slanec [22].

literature and previous graphic and sound analyzes play a significant role in the creation. A typical example is the exhibition at The Virtual Museum of Canada (VMC), which documents one of its exhibitions of the social changes of selected Canadian cities from the 19th and 20th centuries through old photographs and period sounds (**Figure 4**) or the line exhibition of the floor plan of the city of the Manhattan district from 1812 to the present (**Figure 5**).

- reconstructions of the then portraits of the most important figures, which changed the character of the history of cities (eg kings, statesmen, architects, etc.). Selected reconstructions are created mainly with preserved artifacts (eg. sculptures, busts, paintings, graphics, photographs and others).

Today, there are a relatively large number of professional websites on several Internet browsers that visually process the history of individual European and non-European cities. Nevertheless, no website (with the exception of the National American Archive with its own virtual museum) offers the online user historical [26] and factual interactions (except for pre - stored facts and graphic recordings). Almost all websites lack the alternative of creating and documenting the history and visualization of cultural artifacts.

Figure 3.
Example: 3D floor plan of the city of Lucca [23].

Figure 4.
Sample: Exhibition entitled “Urban Life Through Two Lense” at VMC [24].

Figure 5.
Sample: Online exhibitions of Manhattan Island history [25].

6. Virtual museums and contemporary pedagogy

Virtual museums are created with innovative technology and represent the most modern virtual and didactic models. Their purpose is to ensure current marketing progress, they are part of an entertaining, but mainly educational digital - virtual space, where we can move, walk, respond to stimuli and gain certain knowledge [27]. The authenticity of visual - virtual objects and artifacts in a cyber exhibition depends on the processing and application of current technology. The originality of a virtual object is not always static, so it is necessary to approach it broadly, as it has the dimension of the original objects and we can not talk about copies, but illusions or even reproductions of missing articles that directly create a visual experience, but many times do not correspond to the original objects. and thus create hypotheses of the selected object, the artifact [28].

The virtual museum represents a hybrid concept [29] of a physical museum with digital flexibility of technological and technical equipment, while it has alternatives such as:

1. Digital collections are independent of physical artifacts.
2. Digital exhibits can facilitate the purchase distribution of replica sales, thus creating an effort for non-violent marketing and promotion of a cultural institution.
3. Digital exhibits can be used in another digitization process.
4. Digital, but especially virtual exhibits can be applied in the pedagogical process in several dimensions.

These alternatives are intended to support the diversity of the use of virtuality, from websites to virtual cyberspace. 2D and 3D exhibition (not to mention the application of anaglyphs, holograms, but especially the so-called augmented reality in the presentation process) serves as a tool for education and assistance in

solving other research hypotheses. The aim of the virtual exhibition is not only the creation of virtual space, respectively. Cybercocks, but especially the spatial rendering corresponding to the real state of the monument or artifact in the relevant historical decade.

Impact of museum virtualization [30].

Among the positive elements we include:

- in the long run they are lower costs,
- exhibiting other collection objects and objects not in the given museum,
- association of museums due to mutual cooperation and creation of joint projects,
- virtual reality is more personal than ordinary means of communication such as e-mails or social networks,
- virtuality has socio-sociological significance regardless of language, age and gender,
- the virtual reality community forms a whole without the influence of the geographical environment,
- virtual reality helps to more effective and productive communication between individual scientific disciplines,
- each individual can find their own territory of interest,
- the space of virtual reality offers complete free communication with the world.

Among the negative elements we include:

- lack of personal contact with collection items,
- hypothetical conclusions of newly created objects,
- loss of radiation and radiation from original collection items,
- restriction, even loss of social life and erosion of interpersonal relationships,
- virtual interaction gradually replaces social communication and discussion in the public,
- greater socio-property differentiation in society and increasing industrialization of everyday life,
- the virtual environment provides the risks of various hypotheses,
- virtual reality in some cases brings worthlessness, even insignificance of personalities, leading to destructive features,
- deterioration of the health status of users, especially the possible occurrence of ophthalmological, mental and neurological disorders.

7. A few words in conclusion

We can observe urban changes in culture in several spheres, but especially in the way of perceiving art and presenting cultural heritage. Today, it is no longer enough for visitors to present facts, as was the case in the past. It is necessary to process the overall context and create a diverse art and life of previous generations. Cyberculture components can handle this attribute.

We can also observe a fundamental change in the influence of cyberculture in museums, when documenting in the form of exhibition, educational and scientific activities. Cyberculture in the presentation and protection of cultural heritage can modify the basic emotional elements that affect human organs to such an extent that they evoke the impression of infinite space. The artificial virtual world, in which the human visitor feels without limitations and boundaries, is created with the intention of direct participation in the cyber world. Existing virtual exhibitions have created certain standards for the presentation of artifacts and individual themes.

This situation can be reflected from the opening of exposures to cyberspace at the turn of the 20th and 21st centuries. It is the openness of free cyberspace that creates new types of presentation of cultural monuments and artifacts to the public. It is one of the globalization trends taking place in museums and monuments. With the help of accessible cyberspace (eg. virtual tour), every potential visitor gets the opportunity to look at the world's cultural uniqueness. Year-on-year, European archeological sites (eg Pompeii, Herculaneum, Lasaux Cave, etc.) as well as American natural curiosities (eg Grand Canyon or Niagara Falls and others) will receive the most "clicks". Adherents of cyberculture also welcome the application called "Live" as a positive side, t. j. live broadcast from relevant sites. In recent years, this trend of a lively, current environment has also been applied to the largest cities in the world, or tourist sites. Most of the world's museums and galleries already have a similar treatment. It should be noted that negative attitudes prevailed among the conservative group in making the cultural heritage accessible in the cyber world.

At present, the mentioned phenomenon is supplemented by a new technological element, i.e. j. 3D reconstruction of ideal forms and shapes of existing cultural monuments. This type is mainly used by important tourist regions (eg. 3D Ancient Rome, 3D Louvre, etc.) using portable audio- guides.

The phenomenon of cyberculture is an extraordinary component of the presentation and its possibilities are almost limitless. For this reason, a wider application would be needed in the humanities, which lags behind the technical sciences. It is only up to the researchers of the humanities which direction their future will develop and what position they will build in the university environment.

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