

Virtual Museums and Cultural Heritage: Challenges and Solutions

Nadezhda Povroznik

Center for Digital Humanities, Perm State National Research University, Perm, Russia
Povroznik.ng@gmail.com

Abstract. This paper examines the role of virtual museums as information resources for preserving and promoting cultural heritage. The focus is on strategies for the preservation, documentation and representation of historical and cultural heritage including addressing challenges associated with historical sources and their organization and support. Issues related to searching for resources related to virtual museums, their aggregation and documentation are also discussed. Digitalhistory.ru is highlighted as one solution to organizing information about virtual museums and their content on the basis of the resource-aggregation of information resources of historical and cultural heritage.

Keywords: virtual museums, cultural heritage, digital collections, information systems and resources

1 Introduction

Modern information systems and resources are enabling new understandings of cultural heritage. The digital environment is diverse and includes a very wide variety of informational resources. Virtual museums play an important and multifunctional role in this environment.

Virtual museum resources have varied purposes, functional features, and many different audiences. As a result it is difficult to define the concept of a "virtual museum", and the range of definitions reflects this variety [1-5].

The concept of "virtual museum", as it is understood here, is *an information system containing a conceptually unified electronic collection or set of collections of objects (items) with metadata, which has the characteristics of a museum, and which facilitates research, education and discovery activities in the virtual space.*

Virtual museums may include unique and rare objects of cultural heritage, the preservation, documentation and representation of which are important for research and public use for educational, and scientific purposes. Virtual museums often represent a wide variety of resources in terms of organizational and functional content, and therefore suggest many different possibilities for representing cultural heritage. In terms of scientific usage of these sources, virtual museums have great potential, and yet we are often not able to use them effectively due to limitations in the organization of fundamental information resources. The study of virtual museums as a specific

kind of informational resource is important to identify effective ways to structure these resources for use in scientific knowledge as well as digital cultural heritage in education, arts, fashion industry, commerce and other spheres.

The purpose of this research is to consider the main obstacles to the effective use of digital cultural heritage, the problems associated with virtual museums as information resources for the representation of cultural heritage, and also to discuss the resource-aggregator Digitalhistory.ru as a recent example of best practice in retrieval and documentation virtual museums.

2 Related work

Theoretical understandings of virtual museums are connected with the formation of virtual or digital museology as an auxiliary scientific discipline [6-8]. Researchers of virtual museums have paid attention to issues of designing virtual museums for high-quality visualization of cultural heritage sites [9-10], using virtual museums' content in education [11-12], copyrights and open access to cultural heritage [13-14], the social impact of virtual museums and their digital content on different spheres of human life and communities [15-16], among other issues. The question of the effectiveness of the use of virtual museums and their resources in humanities, education, culture and art and other fields were also considered. Thus, the limitations of the use of specific technologies in the representation of cultural heritage have been analyzed, the advantages of 3D technologies have been shown in contrast to the two-dimensional, often represented in the form of only one projection images [17]. The problem of the representation of objects of the cultural heritage in isolation from the context has also been discussed [18]. In this regard, the need for a comprehensive review of the problems of using virtual museums and their resources in the study of cultural heritage becomes particularly important.

On the other hand, the improvement of virtual museums can be achieved due to the cataloging of existing virtual museums. Nowadays, there is a wide range of catalogs, which contain the lists of virtual museums. These catalogs have different content:

1. lists of virtual tours in virtual museums [19-20];
2. lists of virtual museums (lists of virtual resources of real museums) [21-25];
3. lists of thematically-oriented virtual museums [26-27];
4. lists of virtual museums with particular purpose (e.g. educational) [28-29].

The majority of the mentioned catalogs are lists of information museum resources, which contain hyperlinks and have short description of resources. Moreover, the majority of such catalogs has popular character and are not used for scientific studies.

We should mention here the informational recourse V-must (Virtual Museum Transnational Network) [30], which also contains a list of virtual museums. But the authors of this resource have developed the system of virtual museum description, according to which a user can choose the necessary type of a virtual museum and get the list of necessary resources. Description system includes such parameters as: Content (virtual museums are classified by their subjects – archeology, history, natural

history, ethnography, arts, technology); Interaction technology (the possibilities for users to take an active part in the work of the museum – games, virtual tours, voice control systems etc.); Duration; Communication; Level of Immersion; Format; Scope (possible applications of the virtual museum resources - Educational, Edutainment, Enhancement of Visitor Experience, Entertainment, Promotion, Research); and Sustainability. The difficulty of the use of this catalog is that the categorization is based on the authors' suggestions but not on the real facts of existing virtual museums. That is why, the developers of this resource had to sort the virtual museums according to the definite categories and many categories did not include any virtual museums (they turned out to be empty). Moreover, there is only a limited number of virtual museums listed – only 58.

There are also site-aggregators, which allow not only the cataloguing of virtual museums but unifying their resources under one platform. The project EUROPEANA, for example, is a major site-aggregator [31]. It allows the searching of exhibits and online collections of more than 140 organizations from different parts of the world. Yet its disadvantage is that only allows working with first-rate world storage institutions. So, it is hard to fulfill the developers' demands to improve the project.

3 Problems of existing virtual museums, connected with the preservation, documentation and representation of Cultural Heritage

A critical look at the creation of virtual museums, the analysis of problems, and difficulties in their usage indicates recommendations to improve the quality of these information resources.

We can identify and classify several main blocks of problems relating to existing virtual museums, which appear to be obstacles for effective usage of digital cultural heritage.

The following are problems connected with the sources and their organization:

- problems of metadescription (and its absence) and the variability of used standards;
- problems of the origin and authenticity of the source and the possibilities of its verification;
- quality of digital copies;
- organization of sources and
- multiple sources format.

Problems connected with the information support (a legend) include:

- Not all information resources pay attention to the questions of conditions and origin of sources.

Problems of the organization of information in the VM space include:

- Lack of research and complexity of its functionality;
- Attention is not paid to the possibilities and methods of using hosted resources; and
- The absence of classification, subject distribution or other types of material categorization.

Overcoming these difficulties will improve the quality of resources created by GLAM institutions, increase their informative impact, and expand the possibilities of using digital cultural heritage in humanitarian research, education and other spheres. The key to improving the quality of resources is the professional approach to their creation. Much depends on the scale of informatization of institutions, on the budgets and development priorities of GLAM organizations, their understanding of the further possibilities of using the created digital content and directions of development of the information infrastructure of cultural heritage.

4 Problems of the usage of virtual museum resources in humanities studies

A vast array of virtual museums is an important means of preservation, documentation and representation of cultural heritage. However, there are a number of problems hidden in the very specificity of these information resources, which prevent from the effective involvement of cultural heritage (CH) in the research process.

Firstly, the significant part of museums appears to be educational resources, rather than research and academic ones. The purpose of resources certainly affects the nature of its implementation and maintenance (in particular, such important factors as metadata and legend may be ignored).

Secondly, the variety of formats of representation of some types of sources requires a more unified approach for expanding the possibilities of the use (such as the creation of custom collections etc.).

Thirdly, interpretation of information prevails over the quality of imaging CH-resources when resources are only a few examples of the narrative, rather than a self-contained part of a virtual museum structure.

Fourthly, there are problems of the availability of virtual museums and their CH-content, which are commercial products that prevents the democratic spread resources and, therefore, greater involvement of the sources in the scientific revolution.

The search of virtual museums with the necessary topic is a problem, too. The number of virtual museums has increased very rapidly but the search of needed information resources poses challenges (including the necessity to make requests in search systems).

The listed difficulties show, that, on the one hand, we should pay more attention to versatile study of virtual museums as a special type of information resource. It means, that we should sort out the main types of virtual museums, analyze the meaning and audience of resources and reveal the basic classes of represented sources.

5 Aggregator Digitalhistory.ru as a way to organize data of the virtual museums and it's sources

The Center for Digital Humanities of Perm State National Research University developed the platform “History-oriented information systems”, which is a catalog of different history-oriented information systems [32]. It contains descriptions of a list of historically-oriented information systems as well as the results of their use in humanities and education. Information systems are connected with scientific publications and other publications, which have the relationship with the information systems and their resources. Aggregator DigitalHistory.ru includes virtual museums, directed to the representation of cultural heritage.

We think that aggregator DigitalHistory.ru has wide possibilities for the organization, cataloging and documentation of virtual museums and their contents. The Aggregator DigitalHistory.ru helps to overcome the problems of finding the resources, more active and effective use of virtual museums and digital cultural heritage in humanities, education, art and culture. At the same time, in the structure of the aggregator Digitalhistory.ru a multiresource approach is laid that allows to unite not only virtual museums, but also any information resources focused on the representation of historical sources, cultural heritage, including electronic archives and libraries, virtual collections, etc. Virtual museums are important components of the information infrastructure of the digital cultural heritage, so some of the elements of the aggregator's description are designed specifically to describe the structure of virtual museums.

Basic elements of description are: the resource name and address on the Internet, the organization-creator, the authors, the country (in which the resource is created, if definable), the language of the museum interface and the source, the year of the creation and the sources of support (research funds and other organizations) and some others.

The following parameters are sorted out as the basis for the classification of information resources:

- the type of virtual museum;
- purpose;
- target audience;
- types of representation of the CH-objects;
- subject;
- geography;
- period of time;
- relation to the humanities (history, sociology, cultural anthropology, etc.);
- metadata;
- the presence of legends;
- the presence of virtual tours and other ways of real museum space representation;
- the availability of ways of interacting with the digital cultural heritage;
- guidance and recommendations for the use of virtual museums' sources (age-related, educational and others); and

- the availability of personal account and its possibilities (e.g. the creation of one's own collections on the basis of virtual museum resources).

Systematization of information on the appointment, organization, target audience, the structure of the other elements of virtual museums allows the user to filter data when searching. At the same time, the distribution of information about the resource content helps to identify groups for common features, simplify the search of required resources and creates an important basis for researching the virtual museums themselves as information resources. Thus, the creation of an aggregator dedicated to the virtual museums and cultural heritage enhances the ability of detection thematically close virtual museums, as well as realize a variety of other needs.

To date, the retrieval and information-analytical capabilities of the aggregator Digitalhistory.ru have been developed. The next stage is to develop a variety of visualization capabilities of the detected data, including sorting of the categorized information (quick access to virtual museums according to their category, type and other characteristics), as well as the possibility of storing individual results of queries in the user's personal interface. The diverse data visualization system is assumed to appear, including, the mode of the digital map to display the query results to the geographical location of museums.

At the moment the aggregator Digitalhistory.ru is actively used at the Perm University in the educational process in the course "Information technologies in humanitarian research", within the framework of which students learn to analyze information resources, fill the aggregator with data, search for interrelations between resources of different types, study the use of resources aggregator in research.

6 Conclusion

Thus, the opportunities for the effective use of virtual museums and digital cultural heritage depend on a whole range of factors, such as the quality of digital content and the documentation of data on virtual museums and their resources. Creation of new virtual museums should be based on important principles of formation of valuable resources, which will have diverse purposes, as well as expand the opportunities of their use.

The filling and development of the aggregator's catalog can allow virtual museums and their resources to become more widely available. This can enable virtual museums to be more central to research and educational processes. This can also become the basis for providing and communicating important information about the peculiarities of existing virtual museums as information resources, geographical specificity of virtual museums, variety of themes and other aspects.

The problem of many existing catalogs of virtual museums is connected with the restricted need for them and limited possibilities for development. Versatile analysis of virtual museums has the potential to enable greater understanding of the value of virtual museums as resources for storage of cultural heritage and in support of research.

7 References

1. Kaulen ME, Sundieva AA (2009) Slovar aktualnih museynikh terminov. *Musey J.* 5:48.
2. V-must, Virtual Museum Transnational Network. Virtual Museums. URL: <http://www.v-must.net/virtual-museums/what-virtual-museum>, last accessed 2018/01/10.
3. Virtual museum. Encyclopedia Britannica. URL: <http://global.britannica.com/topic/virtual-museum>, last accessed 2018/01/10.
4. Interv'yu doktora iskusstvovedeniya, glavnogo nauchnogo sotrudnika Laboratorii muzeynogo proektirovaniya Alekseya Valentinovicha Lebedeva (2006) *Mir museya J.* 11. URL: <http://www.future.museum.ru/lmp/mission/interview.htm>, last accessed 2018/01/10.
5. The VIMM definition of a Virtual Museum. URL: <https://www.vi-mm.eu/2018/01/10/the-vimm-definition-of-a-virtual-museum>, last accessed 2018/01/10.
6. Kanellos I. (2014) User-centered Digital Museology: Towards Profile Adapted Virtual Expositions. URL: <http://www.indicate-project.org/getFile.php?id=337>, last accessed 2018/01/10.
7. Myrivili E. (2007) Performativity, Interactivity, Virtuality and the Museum. *Museology e-journal*, Issue 4. 1-4; Robering K. (2008) Information Technology for the Virtual Museum: Museology and the Semantic Web (*Semiotik der Kultur / Semiotics of Culture*). 232 p.
8. Savaş B.K., Duman O., Şahin S. (2016) Smart Devices' Contribution to the Development of Virtual Museology in Turkey. *International Journal of Computer Applications*. Vol. 6. 21-24.
9. Rahim N., Tengku Wook T.S.M., Mat Zin N.A. (2011) Developing Conceptual Model of Virtual Museum Environment Based on User Interaction Issues. In: Zaman H.B. et al. (eds) *Visual Informatics: Sustaining Research and Innovations. IVIC 2011. Lecture Notes in Computer Science*, vol 7067. Springer, Berlin, Heidelberg.
10. Foo S. (2008) Online virtual exhibitions: Concepts and design considerations. *DESIDOC (Defence Scientific Information & Documentation Centre) Bulletin of Information Technology*, 28(4), 22-34.
11. Liu, H. Y. (2006). The educational role of virtual art museums. *Museology Quarterly*, 20(1), 55–80.
12. Jun, J. Z. and Bin, W. Z. (2011) Ideas transforming in the Public Arts Education of Virtual Museum. The 6th International Conference on Computer Science & Education. 3–5 August 2011. DOI: 978-1- 4244-9718-8/11.
13. Benhamou Ya. (2016) Copyright and Museums in the Digital Age. In: *WIPO Magazine*, 2016, 3, p. 25-28. URL: http://www.wipo.int/wipo_magazine/en/2016/03/article_0005.html, last accessed 2018/01/10.
14. Cannell, M. (2015). New Online Openness Lets Museums Share Works With the World. Retrieved October 29, 2015. URL: <https://www.nytimes.com/2015/11/01/arts/design/new-online-openness-lets-museums-share-works-with-the-world.html>, last accessed 2018/01/10.
15. Liarokapis, F., Pujol-Tost, L., Killintzis, V., Sylaiou, S., Mania, K. and Paliokas, I. (2017) Exploring the educational impact of diverse technologies in online virtual museums. *International Journal of Arts and Technology*, 10(1), p. 58. DOI:10.1504/IJART.2017.10004738.

16. Ismaeel D., Al-Abdullatif A. (2016) The Impact of an Interactive Virtual Museum on Students' Attitudes Toward Cultural Heritage Education in the Region of Al Hassa, Saudi Arabia. *International Journal of Emerging Technologies in Learning (IJET)* 11 (4), 32-39.
17. Styliani, S., Fotis, L., Kostas, K., Petros, P. (2009) Virtual museums, a survey and some issues for consideration // *Journal of Cultural Heritage*, Volume 10, Issue 4, October–December 2009. Pp. 520-528.
18. 'Virtual museums': engaging with our cultural heritage through digital media // *Culture & society. Impacts.* March, 2014. URL: <https://www.sussex.ac.uk/webteam/gateway/file.php?name=rsc-white-press-ready.pdf&site=274>, last accessed 2018/01/10.
19. Virtual Museum Tours. URL: http://www.lastplace.com/archived_virtual_museum_tours.htm, last accessed 2018/01/10.
20. Virtual Tours. URL: <http://www.virtualfreesites.com/museums.museums.html>, last accessed 2018/01/10.
21. Museum with No Frontiers. URL: <http://www.museumwnf.org>, last accessed 2018/01/10.
22. List Of The Best Virtual Museums In The World. URL: <http://www.youth-time.eu/articles-education-careers/list-of-the-best-virtual-museums-in-the-world>, last accessed 2018/01/10.
23. Virtual Library museums pages, a distributed directory of on-line museums. URL: <http://archives.icom.museum/vlmp>, last accessed 2018/01/10.
24. Virtual'nie Musei. URL: <http://www.culture.ru/museums/virtual>, last accessed 2018/01/10.
25. Museums in the USA. URL: <http://archives.icom.museum/vlmp/usa.html>, last accessed 2018/01/10.
26. Virtual Museum Exhibit... Museum On Demand. URL: http://www.virtualmuseumexhibit.com/Virtual_Museum_Exhibits.html, last accessed 2018/01/10.
27. Web Gallery of Art. URL: <http://www.wga.hu/index1.html>, last accessed 2018/01/10.
28. Oldies and Goodies: The Grand Listof School Virtual Museums <http://www.fno.org/museum/list.html>, last accessed 2018/01/10.
29. 20 wonderful online museums and sites for virtual field trips to use in class. URL: <http://www.educatorstechnology.com/2014/01/20-wonderful-online-museums-and-sites.html>, last accessed 2018/01/10.
30. V-must, Virtual Museum Transnational Network. URL: <http://v-must.net> last accessed 2017/09/10.
31. Europeana Collections. URL: <http://www.europeana.eu>, last accessed 2018/01/10.
32. History-oriented information systems . URL: <http://digitalhistory.ru>, last accessed 2018/01/10.