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Application of Modern Trends in Museums

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Meet the editor

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Contents

Preface

The current digital age has created new possibilities for explaining, understanding, and using cyber elements in a variety of areas and industries, including museums. For example, virtual reality (VR) can be used to present and educate individuals about cultural heritage as well as help protect cultural heritage assets for future generations. To accomplish this, cyber-virtual visualization of selected monuments should respect the general principles of the San Antonio Declaration regarding authenticity in the protection and management of cultural heritage. This process involves constructing the architectural form of the units using visualization models that sufficiently reflect the historical concept of the selected monument. It should consider certain factors, including:

- integrity - to what extent the correct missing architectural models were added in the created models
- environment - whether the reconstructions of the visual models are in accordance with the original or today's natural scenery
- identity - whether the constructed virtual-visual models are identified with preserved graphic materials and whether they are in accordance with the general laws of architectural styles of the time
- use of visual models - existing possibilities for further research of the cultural monument or the entire site

These visualization models push the boundaries not only of historical objectivity but also of construction development in the respective location. By the so-called moving of virtual boundaries, a more precise understanding of the structures between individual stylistic epochs or even regions can be obtained.

This book discusses the use of VR in the museum environment to connect history and presentation of expositions where the key component is architectural objects. The fulfillment of the goals set out in the first section of this book took place through gradual systematic work that diagnosed basic historical, political, or cultural attributes. The results were also created through other source testimonies. The overall verification of these resulting arguments from historiography is not only a matter of time but also of the re-implementation of research with other documents, especially from the field of contemporary military, surveying, the structure of communication, and current knowledge from the environment of museum virtualization.

The very theoretical essence of the selected goals, the so-called schematic mosaic, had to be corrected in some places. This was due to the absence of several important source documents and some discovery reports. Despite this, the processing and interpretation of theoretical principles were carried out in a combination of historical and

modern, contemporary writing. This initial mosaic of work opens a wide spectrum of possibilities for examining entities in a national and transnational context.

The second section of the book was marked by the technical proportions of the present and had the task of depicting the architectural likeness of selected cultural entities and ways of their application in practice. This part is characterized by field-work and an experimental idea. The purpose of the field activities was to document the current state of the monuments with the help of the obtained geometrical results. The acquired measurement results were then compared with the existing ones. In addition to the terrain itself, field duties were significantly complicated by the fact that they are located in a zone with an increased level of protection. This phase ended primarily with the photographic documentation of the preserved remains of the architecture, where the implementation of the laser and photogrammetric concept played a significant part. The next step was the actual visualization grouping of the selected units. When constructing the visual models, attention had to be paid not only to the already established historical connections but also to the present-day dimensions of the monuments as well as to the general architectural background. The form of the constructed models directly depended not only on the credibility of the original sources but also on the graphic visual environments.

Currently, the created models remain in a transitional form because it is still possible to continue working on their improvement and elimination of possible errors. The status of this goal was not the characteristics of the technical base and typology possibilities, but the addition of color in the historical reconstructions of selected units of the world cultural heritage.

The presented work was created on theoretical and historical foundations and with the use of the latest technological software and graphic achievements. This state brought up-to-date views and a reasonable number of graphic portraits, thus opening a new era of knowledge of selected regions in space and time, also from the point of view of museum exhibitions with the contribution of cyber virtualization.

The merits of the book relate to history, museology, cultural studies, and the use of information systems. The contribution of this work lies in its complete complexity, which was created by the combination of historical methods and the creation of experimental visual-virtual models in connection with the museum world. The comprehensiveness of the work brings new knowledge and perspectives on selected world-class monuments.

This book can be used in the professional sphere as well as for applied practice. It allows for more detailed processing of almost all available factual data from original and oldest secondary sources. The analysis of political and cultural contexts brings a chronological dimension to the issue for the needs of museology, which can be identified in several parts.

The interdisciplinary contribution of the presented work is noticeable in the reconstruction of virtual experimental models serving for the possible rescue of unique cultural heritage. The supporting pillar of virtuality in the form of visual models is not only the most probable forms of structures in the entirety of building repairs. The revitalization of visual models also plays a big role and is permissible since it

is possible to continue working with them. The current working sketches of their foundations and other working perspectives were created directly from studies that combine knowledge from history, architecture, and museology. In addition, the models are also based on the materials of contemporary stonemasons, masons, carpenters, and military architects. The benefit is visible in the possibility of supporting local tourism. The local patriotic understanding of this cultural heritage can also be manifested in the circle of the lay public in the form of providing information about selected units based on the principle of the official website, brochures, and various graphic publications. The data can also be presented internationally. This part can be presented not only in connection with state institutions but also by various organizations or associations on the domestic and especially international scene by participating in professional conferences, seminars, or various workshops.

The analysis of political and cultural contexts brings a chronological dimension to the issue of the needs of museology, which can be identified in several parts, such as: the interdisciplinary contribution of the presented work is noticeable in the reconstruction of virtual experimental models serving for the possible rescue of unique cultural heritage. The supporting pillar of virtuality in the form of visual models are not only the most probable forms of structures in the entirety of building repairs. The revitalization of visual models also plays a big role and is permissible, since it is possible to continue working with them. The current working sketches of their foundations and other working perspectives were created directly from studies that combine knowledge from history, architecture and museology. In addition, the models are also based on the materials of contemporary stonemasons, masons, carpenters and, last but not least, military architects. The benefit is visible in the possibility of supporting local tourism. The local patriotic understanding of this cultural heritage can also be manifested in the circle of the lay public in the form of providing information about selected units based on the principle of the official website, brochures and various graphic publications. The data can also be presented internationally. This part can be presented not only in connection with state institutions, but also by various organizations or associations on the domestic, but especially international scene, by participating in professional conferences, seminars, or various workshops.

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Section 1

Cyber-Virtual Time in Museums

Chapter 1

Introductory Chapter: The Role of Digital Humanistics in Safeguarding Cultural Heritage

Ladislav Župčán

1. Introduction

Developmental technical and construction facilities in the history of the human epoch helped man in the person of the architect to establish basic architectural systems. Individual historical events were manifested in the construction and reconstruction of cultural monuments of that time. Several architectural constructions became strategic systems in the field of political, administrative, economic and cultural seat of the lordship and the entire region.

Virtual-visual history within the framework of digital humanities serves as an "explorer of the past", in which historical testimonies, building elements from preserved source foundations are gradually recorded. Architectural monuments have a high historical, spiritual and esthetic value. Selected monuments of cultural heritage from all over the world are able to reveal to the public not only their history, their construction technology, location, but also their relationship with other architectural objects of the respective location. For this reason, it is necessary to have a "historical plot" that enables the issue to be presented not only in the form of a sequence of subsequent historical events but also to explain and emphasize contemporary situational moments. Although it seems that there are "just maybe" other general historical connections, the opposite is true, as the research reflects multiple answers to the questions asked, even parallel interpretations and hypothetical constellations of the studied issues of selected architecture in selected regions from Europe to Asia, or America, not forgetting the African continent.

The ambitious attraction of contemporary virtual-visual history is the more detailed construction of multi-dimensional models that also depict exterior spaces in relevant historical periods from relevant written and literary sources. These models (e.g. 2D, 3D as well as XD) are designed not only on the basis of knowledge of historical contexts but also reveal the then technical achievements of their time, which subsequently enable uncovering the mystery of the history of architectural systems.

The idea of the presented reconstruction models within the framework of virtual history is to respect the individual stylistic stages or the required architectural symbiosis for further study and establishing cooperation with other scientific spheres. The tendency of these models is to contribute to the preservation, preservation and possible restoration of this kind of cultural heritage also in the open online space.

Digital humanities is based on the interconnectedness of research in several spheres, e.g. history, archaeology, ethnology, museology, programming, work with

graphic editors, etc., with the intention of not only increasing the quality of the study of art history but above all finding suitable prototypes for the protection of cultural heritage for the following generations.

Modern history is intended to be a "practical editorial encyclopedia" for independent study and basic empirical work with visual-virtual models of selected monuments of cultural heritage in the sphere of presentation, further scientific research and protection with the help of cyberspace.

2. Digital history

The new, digital history should serve not only in research, but also in the educational sphere. The combined procedure is chosen because it offers enough space to highlight the positive aspects of the research field, such as:

- analytical study of the history of selected objects in the original documents,
- supplementing the historical development with materials from secondary literature,
- creation of experimental visual models based on proven facts of history and contemporary architecture,
- the possibility of completing the created visual models with new virtual elements,
- by using the possibilities and procedures of modern and aerial archeology for the selected monuments, it is possible to verify the plausibility of all existing documentary materials and knowledge practiced from other scientific fields with the intention of more deeply documenting the structural side of medieval and modern society in the investigated territory,
- popularization of results with the help of elements of cyberculture,
- cyber–virtual protection of cultural heritage.

The key attributes remain the methodological combination of an analytical nature with the popularization of historical monuments based on reconstruction models processed in 2D and 3D, but also in holographic design based on the cooperation of several scientific departments.

As stated in the Venice Charter under article nine, "...in the case of hypothetical reconstructions, any work (recognized as necessary for esthetic or technical reasons) must, however, be distinguished from the old architectural composition and bear the stamp of current times" [1]. Authorities in the former communist countries of the Central European area is skeptical of such works, referring to the fact "...that reconstructions are based on acquired knowledge, in which history is not reversible. In addition, they point to the damage done to the original historical structures, especially in the area of the medieval and modern environment, to which the ideas of reconstruction have already been applied" [2].

The idea of reconstructive visual model experiments is to respect the individual stylistic stages or the required architectural symbiosis for further study and

establishing cooperation with other scientific fields. The tendency of these models is to contribute to the preservation, preservation and possible restoration of this kind of cultural heritage. In these contexts, it is good to keep in mind the idea of Eugène Emmanuel Viollet—le Duc: "…restoration does not mean preserving, repairing, or rebuilding an object, a monument, but it means rebuilding it to the best possible perfection, in which it could not be at the appropriate time to exist…" [3].

Virtual reconstruction models capture architectural components that emphasize design, construction moments and stimulate thinking about new questions, hypotheses, such as:

- how the complexes were exposed,
- which was a model for builders and possible architects and an impetus for several reconstructions,
- determination and evaluation of the basic and specific components of architecture between individual stylistic periods, in which a probable view is revealed,
- innovative "realistic two- and three-dimensional forms of virtual entities" bringing special views even from the field of hypothetical structural development of architecture even after their demolition, extinction,
- two- and three-dimensional patterns can be compared in a national and international context.

3. Verification of historical illusions

The final form of the work is a summary of almost all available data. This work is characterized by the knowledge of historical evidence, the so-called traces of the reconstruction of the past. The diversity of all historical narratives and book accounts proves that many times there is conflicting information about selected architectural units. It is precisely these contradictory traces that need to be verified and the erroneous inaccuracies of "historical illusions" excluded. Methodological criticism of the available source base is an invaluable aid in eliminating older factual errors. The language structure of the work is based on the principles of comprehensibility and logical continuity of arguments from archival and oldest literary sources. Due to the investigated issue, the most important aspect [4] is the identification of complexes from the period of their probable creation to the era of their demolition or demise.

In the formulation of methodological problems, another, non-source base was also helpful, in which the generally accepted views of the laws of historical-evolutionary development were respected, not to mention the achieved results of the technical framework, which predetermine and open up the possibility of knowing the selected architectural systems [5–7].

The results led to a regional research method, that is, to the construction of a municipal model [8–10]. Today, it is necessary to take a chronological approach to the hierarchization and clarification of the historical chain of selected virtual entities, due to the discovery of new facts to uncover and explain the phenomena in the studied geographical environment. The existing construction-architectural details of possible today's ruins are subject to the basic ones, i.e. generally accepted

empirical—building data, corresponding to the principles of the context of the internal and external cohort of profile two- to three-dimensional pages (**Figures 1** and **2**) of newly reconstructed virtual images.

Basic factors play an important role in determining the assumptions of the form of work:

- respecting the laws of historical development,
- respecting the position and tasks of the investigated territory in the light of sources,
- respecting the general laws of architectural development,

Figure 1.
Castle Slanec (author: Ladislav Župčán/Martina Župčánová).

- respecting the laws of a functional society in the selected territory in the then noble hierarchy [11–13].

These mentioned factors capture the historical reality and its portraits, not to mention the determination and differentiation of several parts of the structure carrying certain contours, for the objective content impact of the originality of the work [14].

In the entire work, the presence of a "historical plot" is necessary, enabling the presentation of the issue not only in the form of a sequence of connected historical events but also the explanation and emphasis of individual situational events. These are possible general historical connections reflecting more answers to the questions asked, even parallel interpretations and hypothetical constellations of the studied issue in selected regions. The choice of questions is based on the thoughts of the French historian, the founder of the Annales school, Marc Bloch, who claims that the

Figure 2.
Castle Slanec (author: Ladislav Župčán/Martina Župčánová).

questions must be "...extremely flexible, capable of adding more and more points over time and open to any surprise" [15].

The following tasks are indicated in the work schedule:

- creation of a detailed bibliographic list of the investigated site,
- the most accurate cartographic capture of systems in localities,
- in-depth research of available archival funds in terms of political and economic tendencies,
- analysis of preserved graphic materials (paintings, plans, engravings, graphics),
- analysis and revision of the acquired factography and proofreading of the disposition proportions of the obtained data.

The most significant investigated indicator is the object-residence, i.e. a specific building with its owners, individual development building sections of the structure with the definition of the territory—the land where the foundations are located, i.e. the remains of the architecture. The key is defining the initial relationships of architectural formations with their own regularities, namely: political, economic, cultural and social dispositions. Descriptive representation of the primary function of objects can declare or even isolate the position of structures in the national context, which evokes the effort to understand the actors of the time who were behind many architectural reconstructions of individually selected complexes [16].

In addition to historical themes, the concept of the work also covers other areas, such as:

- military (analysis of the defense mechanism of units),
- economic (analysis of economic parts of the object),
- economic (analysis of the financial situation of the owners),
- artistic—architectural (analysis of architectural and artistic details, analysis of preserved interior collections) [17].

The independent construction of the systems in the given space was influenced by two sets of criteria, namely:

I. The formation of one's own territory, on which the foundations of the components are laid, is permanently influenced by the natural conditions affecting construction activities. Among the most important factors of natural conditions, we include the type of terrain, soil composition, forest segmentation and especially altitude. Within the natural environment, it is necessary to observe the applied changes of the human activity of transforming nature in the process of carrying out various construction activities. The formation of fortified formations and centers helps to advance and create the architecture of a higher kind. It is in this place that alongside historical research in the future, it is possible to overlap natural science and interdisciplinary subjects that are on the border of social

and natural sciences [18]. The sense of interdisciplinarity respects the results of the "diffusion" of views from the circle of civil engineers, art historians, stone masons, economists and economic managers on the subject of architectural units in virtual form.

II. Another criterion is mutual social relations in the form of the cultural structure of the given territory, political-administrative units and economic-communication system, which had a significant impact on the development of the building construction of architectural units. When describing the arguments of social continuity, the knowledge of related scientific fields of history is also a decisive component, such as: ethnography due to the recognition of the ethnic origin of the systems together with cultural ideas (in the given locality in the form of superstitions, myths and legends), not to mention the ethnic origin and status of the owners at the time. Applying art science is important for more precisely assigning the period of the birth of new architectural details. The knowledge of this scientific field can be used especially in the analysis of artistic craft (stonework, carpentry, sculpture, painting) and the architectural character itself. For the investigation of the later period (from the second decade of the 18th century to the first decade of the 20th century), the analysis of drawings and graphics is also essential.

Historical linguistics is also of particular importance for understanding local nomenclature in individual historical eras. In older historical lexicons and chronicles, a lot of data on the investigated material culture of local conditions are recorded in names whose equivalents are difficult to recognize. In order to avoid possible mistakes, not only the oldest existing nomenclature is adopted but also younger equivalents. As Marc Bloch states, "…the studied documents tend to assert their own nomenclature. When a historian obeys this, he writes for everyone under the influence of a different time, otherwise he always thinks in the categories of his own time, even if he writes in different words…" [19].

The priority page of the so-called cultural structure is an examination of the language itself and the waves of migration caused by the economic acceleration of the entire region. The linguistic nature of the territory determined many times the name change of the investigated units, and often even today's names are diametrically different from the original ones, or those recorded in later secondary sources. For that reason, it is necessary to point out their origin and explain their historical names in individual historical stages within the source database. An important source of information in the analysis of the issue is also toponymy and deceased property. Toponomastics helps to name the locality and the units themselves. On the basis of deceased property (according to data from the oldest municipal cadastres), it is possible to at least partially show the development of territorial property in a given location.

In the case of a political-administrative unit, the possibility of expressing the spatial and temporal boundaries of the given territorial unit in combination of the state in the past with the current dispositional units was important. Sources documenting the activities of administrative authorities, which play an extraordinary role in the historical development of the territorial unit, are important when defining boundary contours and determining basic definitions.

For the region itself, the communication network had a double function, as it not only connects long-distance and national roads between individual territorial parts but also defines the boundaries of the territory—plots of land. Within the economic-communication channel, an important development criterion was mainly the

technical-building level, encouraging the spread of characteristics, specific features and elements of individual styles. The degree of construction level also depended on the application of the function of the objects, such as residential parts, representative and defense mechanisms.

The very role of digital humanities can be summed up in the idea that the modern foundations of historical methodology open the entrances to true arguments and hypothetical constellations for clarifying justifiable historical reality on the principle stones of plurality in terms of views and knowledge from past generational results.

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Chapter 2

Perspective Chapter: Times of Virtuality and Social Isolation – The Mantiqueira Museum and Digital Polyphonic Experiences as Museological Practices

André Fabricio Silva and Diana Costa Poepcke

Abstract

The coronavirus pandemic has brought new challenges for museums in communication and interaction with their audience. This text seeks to reflect on the theoretical aspects of virtuality and digital collections, as well as their uses in museological practices in the pandemic context. As a reflection of the impact of the pandemic on museums, we present the project developed by the Museum of Mantiqueira (MuMan), the "Mantiqueira polifônica", which proposes collaborative sound cartography and reveals the relationship between sound, place, and everyday life, besides highlighting the important role of virtual museums in the preservation and dissemination of local memory.

Keywords: museums uncurrent, mantiqueira museum, mantiqueira mountain range, history theral, covid-19, polyphony

1. Introduction

The historical periods marked by pandemics are characterized by technological advances and changes in values in society and pre-established criteria, which cause social, cultural, political and economic transformations [1, 2]. The pandemic of covid-19 reinforced the phenomenon of virtualization that undoubtedly has already transformed several aspects of everyday life, especially our way of relating, communicating, and being present in a certain time and space, which is now a space constantly permeated by virtuality.

Museums were instantly impacted by the effects of the pandemic, as their doors were closed to maintain the necessary social isolation, while their teams began work remotely. Faced with this new pandemic reality, the institutions suddenly faced various dilemmas of museological communication, especially the virtual one. Virtuality

has taken on a new meaning, as it has become the only way for museums to continue to perform one of their main functions: communication with the public.

However, the need to reinvent one another in the face of the new context was not limited only to the universe of physical museums, but also to virtual museums. Thinking about these two types of museums, Bowen [3] brings an important reflection by noting that "virtual museums interact with virtual visitors, just as real museums interact with real visitors."[1] This statement offers some axes of reflection that are central in this text and in the museological practices of the Mantiqueira Museum (MuMan), which involves thinking about the actions of museums in the virtual environment, digital collections and the very idea of the phenomenon of virtuality as a reflection of the real.

2. Virtuality and communication of the museological object in the digital environment

Difficult task to demarcate the boundaries between "real" and "virtual", because there is a risk of proposing an opposition between the terms, as if they were two distinct and opposing objects until we realize that they are complementary. It is interesting to think that, after a year of social isolation, our professional, family, and emotional relationships still manifest themselves in the virtual sphere. This discussion intensifies and brings to light the dimensions that involve thinking about the virtuality that is expressed as a reflection of reality.

Pierre Levy, one of the great theorists to philosophically think about the issue of virtuality, is categorical in saying that the virtual does not oppose the real [4]. The author proposes an analysis that understands the virtual as a movement in power, not in act. Thus, virtualization in Levy is understood as one of the main vectors of the creation of reality. It allows people, collectivities, and information to multiply their interactions, enabling a process of deterritorialization. Removed from physical space, the virtual is not only imaginary but produces effects on the subjects, bringing the idea of virtualization as the materialization of the real.

When dealing with virtualization in museums, it is necessary to highlight the debate about the processes of virtualization of museum objects. For Walter Benjamin, the technical reproduction of the art object would result in the loss of its authenticity, which he called the "aura of the object", Benjamin [5][2] removing this aura characteristic of its existence. Contrary to this thought, André Malraux [6] brings the reflection of what could be represented as a virtual space, transiting between the real and the imaginary, from the "imaginary museum", problematizing the function of museums, by centering its analysis on the metamorphosis of the object. For Malraux, the reproduction of the object enables other relationships with it, helping to modify the dialog between the work and the subject from reproducibility, allowing the relationship with the objects of museums through their virtuality. In addition, individuals know artistic productions of different cultures that are displaced in space and time, from reproduction, become atopic and timeless and can be appreciated in different temporalities.

[1] 1999 Bowen [3].

[2] For Walter Benjamin, technical reproduction devalues the present of the work, your brands Historical Of cultural heritage. The aura of art dislikes, this aura that for Benjamin would be the singular figure of the object.

The virtualization of the object is established as a tool that expands the field of operation of museums. As Teresa Scheiner points out, digital technologies contribute to the conservation of heritage, in which "the electronic environment seizes and homogenizes the immense plurality of patrimonialized objects and transforms them, in turn, into new heritage icons – virtual documents." The diversity of the virtual environment represents a reconfiguration of the material and immaterial good, by assuming new forms and functions through the scanning process and its share in the virtual environment ([7], p. 230).

Thus, we bring an important reflection with regard to whether this object or well when being digitized and made available in the virtual environment loses its museal value. As initially highlighted, the virtualization process does not represent that the scanned object is the opposite of the actual object. In the same direction, Marina Gowert of Reis states that the virtual, even if it does not exist physically, is able to produce effects and influence physical reality. The author identifies the virtual community as a space where the virtual is related to the real, to the extent that the process of virtualization of the museological object means the virtualization of information, transmitted in the virtual environment [8]. Concomitantly with this thought, Renata Cardozo Padilha [9] points out that when the museological object is transported to the digital environment, through digitalization and digital reproducibility, it starts to have a virtual dimension, as a "digital museological object". According to Padilha [9], the three-dimensional object of the museum, when digitized, becomes a new virtual existence. This process highlights its transformation into a digital museological object, going through the same processes of musealization, transforming material and immaterial goods into museological goods, and acquiring a new communicational feeling.[3]

The validation of the "aura" of this object and its recognition by the public, or users of the web environment, permeates the recognition that it has a new history and new uses that require it to fit into this "contemporary intentional way of storing, preserving, organize and disseminate heritage assets". This digital museological object becomes another, which differs from its original reference. From its own identity, it must go through a musealization process, considering its informational function in the digital field. It evokes ideas and thoughts that go beyond the mere musealization process. The relationship between the values added to the object can be amplified in its digitalization process, or virtualization, reinforcing, to a certain extent, the thought elaborated by Malraux about the metamorphosis of objects from their digitalization to virtual use.

It was possible to perceive that, with the popularization of the internet from the 1990s onwards, the museum-web environment relationship and the virtuality of museum objects in their communication with the virtual public has been a matter of concern for some museological institutions and researchers in the area. Although it is a central theme in the discussions to think about the paths that museums should follow in this century, we see, with the advent of the Covid-19 pandemic, that many museological institutions were not adequate to the processes of changes brought about by technological advances. The transformations caused by the pandemic raised some debates about the place of the museum in the digital world, highlighting the need to think about new professionals in the area, whose function permeates the virtual space. Thus, the process of virtualization and consequent metamorphosis of the museological object, which was already on the rise with the growth of technologies,

[3] p 2018, p. 21.

was accentuated during the period of the pandemic. If at first we observed skims about the possible dialog between virtuality and museums, the pandemic made it a primary necessity, causing direct effects on the museological field.

The Brazilian Institute of Museums (Ibram) highlighted the growing number of virtual actions promoted by Brazilian museums since the beginning of the covid-19 pandemic [10]. Thinking about Brazilian reality, the instant use of the virtual environment revealed that Brazilian museums were not able to experience the virtual immersion that can provide to the public. This experience, according to Nathalia Lavigne, refers to the fact that the visit to a museum brings with it a series of body choreographic rites that involves the way we relate to the musealized objects and the processes of subjective transformations provided by this encounter [11]. Therefore, this experience should be thought of equality in the virtual environment.

3. Virtual museums, collections, and oral history

Faced with the problem, two points deserve to be highlighted and presented as a reference of museological actions, since their genesis is already established as important communication tools in the virtual environment, through digital collections, being: the museum virtual and the oral historian.

Bernard Deloche points out that virtual museums are characterized as spaces of records produced directly in the virtual environment, establishing itself as a field of mediation and relationship of heritage with virtual audiences [12]. It is a museum that highlights virtual communication as a way to present a certain heritage. In parallel, we have the field of oral history and its records that seeks to register and digitize orality. The preservation of oral history collections contributes to bringing the presence of memory. Such collections can be digitizations of old collections that were recorded in some analog audiovisual media or are collections created with digital equipment, that is, a nato-digital collection. The preservation of oral reports has highlighted the importance, as they seek to record oral expressions and narratives that are not expressed in the typologies of traditional collections safeguarded through digitization. They contribute to the diffusion of other memories that have been forgotten or silenced.

In view of the debate presented on the experiences that digital collections represent from the sensations amplified in the process of digitization of the collections, establishing a communication that expands from its uses in virtual spaces, we will present a case of MuMan's experience during the pandemic. A virtual museum that has been developing a work of oral records, from the perspective of a virtual open-air museum, which seeks to musealize the territorialities of the Serra da Mantiqueira through digital devices and platforms. It fits the double point highlighted above: it proposes a virtual experience through the digitization of oral reports and offers an expanded experience between the virtual museum and digitized oral collections.

4. The Mantiqueira Museum (MuMan)

MuMan had its first concepts formatted and published in 2013, being a virtual open-air museum, which seeks to musealize the territories and territorialities of the Serra da Mantiqueira through digital devices and platforms, creating paths, narratives

and expographies that allow experiencing the cultural heritage of the region in its sociospatial context. Although virtual, MuMan preserves in its essence the interaction with its audience through a choreographic performance and transposes it to a hybrid model of expanded reality, in which the visitor enjoys part of the virtual experience and also experiences the territory[4] *itself on site*.

MuMan seeks to musealize the ways of life of mantiqueirenses, the ways of being and being in the territory, with its diversity and uniqueness. Fulfilling the main museological functions, the museum's mission is to study, safeguard and disseminate the cultural heritage of Serra da Mantiqueira. To this end, it has a digital collection available on the museum's website and is divided into three collections: 1. "Oral History", oral history interviews conducted by MuMan with the local community; 2. Two of them. "Iconographic", selection of digitized photographs from public and private physical collections; and 3. "Documentary", the selection of official documents and digitized newspapers from the physical collection of different organs and vehicles in the region.

Currently, the collection research projects are aimed at the constitution of a digital collection composed of narratives of life in audio and video, part of the collection of história oral. These collections are performed by the research team and require physical contact. We can hardly perform extensive oral history research without the immersive process in the territory. This collection method developed by MuMan – also applied in other museums, such as São Luiz do Paraitinga Museum,[5] Zé Pereira Museum and Monteiro Lobato Folk and Pedagogical Historical[6,7] Museum – proved unfeasible in the face of the pandemic context and social isolation. Within this reality, MuMan was awarded by the ProAc LAB notice "Award for Historical Museum of the State of São Paulo" with the project that created[8] or the *Mantiqueira Polyphonic* platform, a new way of collecting collection and interaction

[4] The Serra da Mantiqueira is one of the largest geographical formations in Brazil, characterized by a mountain range that extends for more than 500 kilometers, sewing three states of southeastern Brazil: São Paulo, Minas Gerais and Rio de Janeiro. This chain, formed from large vertical tectonic movements, consists of infinite ridges and seas of hills between the cities of Bragança Paulista (SP) and Barbacena (MG).

[5] Project of ampimplementation of the adeer of the Oswaldo Cruz Historical and Pedagogical Museum, approved by the edital of the ProAC Preservation of Museological Collections 2018. During the development of the project, the pLano museological for the museum, which municipalized the institution and switched its name for Museu São Luiz do Paraitinga – Oswaldo Cruz House. The project was carried out by enterprise ConectaMUS and delivered to the community in November 2019. Site: https://www.saoluizdo-paraitinga.sp.gov.br/post/museu-sao-luiz-do-paraitinga--casa-oswaldo-cruz$48837.

[6] Project "Exposure permanente of the Museum of Ze Pear tree", than included the search process and collecting of collection. FHi contemplated by the edict of the ProAc Dissemination of Museological Collections 2018. Executed by the ConectaMUS and delivered to the community in January 2020. Site: https://saobentotur.com.br/_cultura/museu-do-ze-pereira.

[7] Project "Modernization MHFPML: 100 years of *The menina of the nariz arrebitado*", approved by the edital of the ProAc 2019 Museum and Collection sisation, in which a survey of digital collections was carried out in a network.

[8] Program Cultural Action (ProAc) is legislation from encouraging culture of the estado of São Paulo created in 2006 through Law N° 12.268/2006. Or ProAc finances activities cultural and artistic offering, from annual notices, values for the financial viability of projects of various sizes and types presented by residents of the estado. The nominated edition "LAB" are the edicts with resources from the Aldir Law Blanc (Law No. 14,017 of June 29, 2020).

with its public during the pandemic, without losing the experience of the territory as an open air museum.

5. *Mantiqueira Polyphonic*: a sound and collaborative cartography

Polyphony, in music, is the compositional technique in which sound textures are produced and performed in which various melodies or independent voices are present in a harmonic way, generating a melodic and rhythmic character [13] in literature, Bakhtin uses this concept to analyze, above all, Fiódor Dostoiévski, dealing with polyphonic romance, the one in which each character functions as an autonomous being, with vision, voice and position in the world [14, 15]. Here, dialogism can arise between the voices of the characters, the narrator, the readers and the writer.

When we turn our gaze to the relationships between memories and identities that emerge from a territory, it is understood, beforehand, that they are a true discursive polyphony, where several interdependent voices can come to harmonize or disarm, thus creating a dialogism around the same reality. It is interesting to think that sounds occupy spaces and are potential agents of actions and reactions, so they produce invisible borders, but material, participating in disputes and negotiations around the use and meaning of public spaces.

MuMan's Mantiqueira Polyphonic project was created from the understanding of the importance of all these elements that involve the relationship of the subjects with the territory. It is constituted as a digital platform of dual function: collecting collection in a collaborative way, engaging the public of the museum, transforming it from visitor to an active collaborator of the collection, and creating a sound and collaborative cartography of the Serra da Mantiqueira, with the objective of showing what are the sounds, voices, music, noises and vibrations that the inhabitants live in their daily lives, configuring the territory as a representative element of mantiqueirense identity.

The collaborative character of the platform has several functions, such as strengthening the community's relationship with the museum's collection and making the community itself recognize itself in it. The platform design is designed for a multitude of approaches while enabling employees to create their own sound projects, which are presented with separate and individual keywords of recordings within the map. Sound records can be recorded directly from the mobile phone and sent by the museum's own virtual visitors to the platform.

The records within the platform are divided into eight sound categories and into two groups. The first are soundscapes, composed of the categories: sounds of the city, sounds of nature, sounds of the house, and sounds of the swidden. The second is the voices, composed of the categories: causes, life reports, ways of doing, and ways of speaking [16].[9] The same record can fall into more than one category. However, it is up to the user, who assumes here the role of researcher-curator, to choose which tonic he wishes to give to the registration made. The material is received by the museum staff and is approved individually to then become available online. Thus, the public of the museum interacts with the virtual exhibition – cartography – and with the collection, to the extent that the registration is made with minimal social contact.

[9] These categories were based on the experiences highlighted by *Michel* from *Certeau In Relations that the subjects establish with the territory*.

The platform was launched in August 2021 and is already in use.[10] Some of the records inserted are of people who live with their families and take advantage to collect the stories or sounds of everyday life. Some were collected via WhatsApp or in transit between one location and another. To stimulate the contribution of users and qualify professionals who can use the platform as a teaching tool, concomitantly with the launch of the platform, distance training in Oral History and Virtual Collections was launched in May of this year, in order to disseminate knowledge about capturing life history reports.

From this training, several projects were developed, among them a pedagogical project in Baependi (MG), conceived and developed by professor Maria Fernanda Silva Alves, participant in the training. In this project, history students of the eighth grade class of the Anísio Esau dos Santos State School, in the neighborhood of São Pedro, a rural area of the municipality, will collect the reports with their cell phones and register on the platform. They're students who are taking remote teaching classes. It will be a way to increase their interactivity with school content and technology, making *them understand concepts such as primary source*, orality, and memory and, together with this, make them perceive themselves as historical subjects, stimulating the feeling of belonging to their community and local history.

In a month of the platform, many records have already been received from visitors-users from different places in the territory of Serra da Mantiqueira: São Bento do Sapucaí (SP), Campos do Jordão (SP), Monteiro Lobato (SP), Itajubá (MG), Canas (SP), Taubaté (SP), Baependi (MG), among others. Users of different ages and backgrounds. It is possible to identify a diversity of daily reports, such as the project made about corn flour, typical food of Mantiqueira, present in the daily life of all residents in various dishes, such as corn turn, turned beans, turned banana. There are several records brought involving the universe of cornflour. One of them, in "sounds of the swidden", is the "Som andxterno de moinho", recorded in Baependi, which, according to the description of the record itself made by the user "[...] shows the strength of the water that makes the mill turn and grind of cornflour." Other collaborators brought reports and memories about a traditional flour house in the city of São Bento do Sapucaí, also categorized as "ways of doing it". The report is described by the user as "reporting the structure of the cornmeal plant, employees, distribution and sale. Uses of cornflour in local cuisine and region."

Such records are good examples of characterization of the cultural landscape of the mountains. The other sound universe, which is already being mapped, are the soundscapes that have no voices or memories. They are, for example, the sounds arising from phenomena of nature, such as the "Rain", recorded in Campos do Jordão. There is also the "Fire lit in the fireplace" registered in the neighborhood of Serranos in São Bento do Sapucaí and "Cars and birds", registered in the center of Taubaté. There are several sounds, even noises, that also help to make up the sound polyphony of this territory.

These are some of the examples present on the platform today. Todavia, is a project designed for long-term development. Although created for the pandemic context, it is a format that will still reveal a kaleidoscope of possibilities from the moment the users themselves appropriate the platform and attribute other uses and meanings, different from those that were thought of in its original conception.

[10] Available in: https://museudamantiqueira.com.br/mantiqueirapolifonica.

Through the *Polyphonic Mantiqueira* it will be possible to observe that identity is constantly changing, because memory is also in motion. It will be possible to attribute new meanings to the past and the present, living new experiences, providing new sensations from the sound. The complex process of identity construction is permeated by polyphonies in which dialogical elements will appear in so many voices and sounds; in the feeling of a group created by the collective imaginary or through other elements such as sounds, language, customs and common territory.

6. Conclusion

We seek here to highlight that the virtual experience can serve as a great tool of the actions of museums. The virtual environment emerges as another possibility of the transformation of individuals from their relationship with digital museological objects, thus expanding the social function of museums. We know that one of the major challenges of museums is to rethink the uses of virtualities, and it is necessary to increase digital efforts in communication with their audience.

The pandemic caused profound changes in the actions of museums, which were forced to rethink their virtual presence, requiring in this context new methods of interaction with the virtual public. MuMan, even if it fits the typology of virtual museum, similarly saw the need to rethink its actions and propose new experiences so that the public could interact with the museum and the territory in a safe way, respecting the sanitary protocols of social isolation. Thus, it is possible to contribute to the expansion of its digital collection without the museum needing to go to the public to carry out oral records. The *Mantiqueira Polyphonic project* emerges, then, as a proposal to expand the access of the virtual public to the museum and democratization access to the collection through a platform of easy interaction, in which anyone can share their sounds, being voices, memories, or soundscapes.

In addition to the theme and examples highlighted here, it is necessary to reflect and understand that, for the subjects to have a complete experience of the virtual scope, there must be the necessary democratization of this access. And for this, we understand democratization not only the development of actions designed for the virtual environment but also how the public will have access to this environment. It is necessary to think about inclusion in the virtual environment and understand that several groups have difficulties in using the virtual environment for several factors, such as the low quality of the Internet, few technological resources, physical, visual, auditory, intellectual, and psychosocial disabilities, social inequality, among others. It is essential to rethink this new concept of audience and how virtual communications of museums can access their audience democratically.

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Chapter 3

Perspective Chapter: Museums and the Metaverse – Emerging Technologies to Promote Inclusivity and Engagement

James Hutson and Piper Hutson

Abstract

Over the past two decades, museums have increasingly sought to build connections with the community and increase inclusivity of visitors. At the same time, emerging technologies, such as extended reality (XR) and virtual museums (VM) are increasingly adopted to engage with different generational expectations but also for the purposes of supporting inclusivity and neurodiverse populations. First such technologies were adopted to augment exhibitions in the physical museum space for edutainment. Since then, XR has expanded from room-size environments (CAVEs) and augmented exhibitions to the creation of entire virtual museums, such as The Museum of Pure Form and The Virtual Museum of Sculpture. Digital twins of museums are increasingly common, along with UNESCO World Heritage Sites. Such virtual experiences can be leveraged to prepare neurodiverse visitors prior to visiting a museum. This chapter will outline how existing approaches to social stories and sensory maps may be combined with XR experiences to support neurodiverse visitors and their families. While onsite, immersive technologies can be used both for engagement and to provide accommodations for greater inclusivity and diversity.

Keywords: neurodiversity, social stories, sensory maps, museums, ASD

1. Introduction

In times of public health crises when travel becomes restricted, public spaces close, and anxiety over an uncertain future spread, institutions must adopt an agile mindset to continue to engage with their constituents in innovative ways. At the same time, such events as the global spread of COVID-19, which the World Health Organization (WHO) classified a pandemic on March 11, 2020, promote human resilience and spur innovative solutions to emerging problems that find application beyond their immediate intended use cases. Such was the case for cultural heritage institutions who had to quickly pivot to find new ways for the public to engage with their collections. The call to stay home and limit large gatherings of people led museums, galleries, and cultural heritage sites to close around the globe almost overnight. For instance,

the Smithsonian announced all 19 of its related institutes, museums, and even the National Zoo would close to the public on March 14, 2020 [1, 2].

At first, front-of-house staff were repurposed in other areas, such as helping to catalog and digitize collections [3]. But as the pandemic wore on, there was increased pressure for furloughs and then layoffs among museum staff and educators [4]. To stave off further loss of human capital and retain public engagement with sites and collections across the globe, many museums turned to emerging technologies. For instance, The Louvre in Paris spent much of the year digitizing and then releasing over 480,000 pieces from its collection in 2021 on their platform, while the work began in 2017 for digitizing UNESCO World Culture Heritage Sites would provide remote access to global locations cut off by border closures and travel bans in 2020 [5, 6].

An unprecedented investment in research and development followed with companies such as Facebook (now Meta) to make extended reality (XR)—including augmented reality (AR), mixed reality (MR), and virtual reality (VR)—commercially available, user-friendly and affordable. The launch of the all-in-one head-mounted display (HMD) Oculus Quest 2 (released October 13, 2022) represents a watershed moment for immersive experiences and the ability to engage the public [7]. At the same time, advancements were made in digital twin technologies. While previous photogrammetric techniques would require thousands of individual photographs painstakingly stitched together manually to create 3D models of objects or spaces, the latest generation of software compiles millions of individual images automatically [8]. The latest handheld scanners, such as Scantech, can also be used to produce high-resolution digital twins of objects, complete with precise colors and textures [9]. Both VR HMD and digital twin systems are now highly portable, user-friendly, and affordable. These technologies are now poised to work in tandem to create high-fidelity recreations of objects and historical sites and view in an immersive environment anywhere in the world.

The advances in technology coupled with the demand for virtual experiences accelerated by the global pandemic have led to an unprecedented effort to digitize museum collections and create digital twins of locations globally. The initial impetus for such projects was to allow for access to locations that were closed to promote social distancing and to incentivize future tourism in general [10]. However, as this chapter will outline, the availability of digital versions of spaces and objects contained within and the hardware to view prior to and during visitation can now be leveraged to support inclusivity and accessibly efforts for neurodiverse populations in cultural heritage institutions. Efforts to support diverse populations with a variety of needs have dominated scholarship on museum studies since the last millennium. With an estimated 10% of the world's population (650 million people) living with a disability, museums have introduced many strategies to promote accessibility. For instance, audio and visual aids have seen widespread adoption, including audio guides, captioning, and sign language interpretation for visitors who are blind, deaf, or hard of hearing. Accessible facilities include wheelchair ramps and elevators, as well as accessible restrooms and parking for those with mobility restrictions. And inclusive programming showcases underrepresented perspectives to celebrate diverse cultures and communities. However, the unique needs of neurodiverse visitors have only recently begun garnering attention [11, 12].

2. Neurodiversity and museums

The American Alliance of Museum (AAM) commissioned a study to review how inclusivity efforts were being implemented across institutions, as well as perceptions of

such programming by both regular museum attendees and the public in general during the pandemic [13]. The results of the study were used to develop resources and strategies for museums, including primers for professionals to support efforts to promote diversity, equity, accessibility, and inclusion (DEAI). Support for such efforts have gained momentum with museum administrators and researchers, especially in addressing physical disabilities, however, the same call to action for supporting neurodiversity has yet to be headed. The lack of attention paid to this marginalized community becomes clear when reviewing AAM primers, which do not even mention neurodiversity [13]. Therefore, while advances in inclusivity efforts have been made with regards to ethnicity, culture, physical disability, race, religion, and gender, there remains a significant percentage of the population not considered [14–16]. With an estimated 15–20% of the global population considered to be neurodiverse, greater attention needs be paid to the specific needs of this group [17]. The population is also estimated to be growing. In 2022, the Centers for Disease Control and Prevention (CDC) reported that 1 in 44 children were diagnosed with autism spectrum disorders (ASD). The rate of diagnosis makes this population one of the largest among those with disabilities [18].

Individuals with ASD are classified as having neurodevelopmental difficulties, which may include autism, ADHD, ADD and dyslexia as the most common co-occurring diagnoses [18]. The different types and levels of social and intellectual abilities of the group require the diagnosis to use the term "spectrum disabilities" due to the way in which they can manifest. Despite such diversity in experiences and abilities, there are certain physiological considerations for museum professionals to consider when designing experiences that are inclusive. For example, those with ASD can find navigating museum spaces challenging given crowds, unexpected audio modulation, and/or lighting intensities [19]. Furthermore, museum challenges can include unforeseen vestibular sensory input from interactive exhibitions, close proximity of large crowds, and an overactive visual field.

The average museum going public may not experience stressors with sensory stimuli common in museums, such as noise, waiting in lines, crowds, or exhibition lighting, but those with sensory sensitivity may. Moreover, the 2001 Council for Museums, Archives, and Libraries identified that a fully accessible program should include many considerations associated with access, such as social, financial, emotional, attitudinal, cultural, and/or educational [20]. Notably absent were sensory considerations of access. Therefore, Schwartz and Knowles recently recommend readjusting the list to expand considerations of sensory needs of visitors. Sensory sensitivities not only dissuade those with ASD from visiting certain locations, but also their families due to the potential negative social behaviors that might arise [21].

Addressing the needs of the neurodiverse population of visitors to museums has only recently entered the accessibility conversation. The broadest adoptions regarding accommodations in institutions remain confined to physical accessibility with considerations for those with ASD emerging in the United Kingdom (UK) in large and established museums with resources [22]. Those programs that do exist that support accessibility for neurodiverse populations commonly use the following strategies:

1. *Providing sensory-friendly experiences*: Many museums are offering sensory-friendly experiences or "quiet hours" for visitors who may be sensitive to loud noises or bright lights.

2. *Providing sensory maps*: Some museums provide a guide that highlights sensory-friendly areas and features of a museum, such as quiet spaces, low lighting, and

tactile exhibits, as well as identifying potentially problematic areas with larger crowds or loud noises.

3. *Offering audio guides and other accessibility technology*: Some museums are offering audio guides and other forms of accessibility technology, such as apps, to help mitigate sensory input and modulate information to navigate the museum and access the exhibits.

4. *Providing social stories and visual schedules*: Some museums are providing social stories and visual schedules to help visitors with autism prepare for their visit and understand what to expect.

5. *Training staff on neurodiversity*: Many museums are training their staff on neurodiversity and how to best support visitors with a range of neurological conditions.

6. *Providing alternative format materials*: Many museums are providing alternative format materials such as large print, audio descriptions, and other multimedia experiences to make their exhibits and events more accessible to visitors with sensory processing.

A holistic approach to accessibility is being considered that addresses pre-visit planning and resources to familiarize visitors with sensory information and routes through unfamiliar locations [23, 24]. Support onsite can include accessibility maps, museum social stories, sunglasses, headphones, and even therapy putty [25]. Engaging a sensory sensitive audience now includes integrating kinesthetic or tactile exhibits and including "cool down" spaces with sensory modalities that allow individuals who are overstimulated to regulate their cognitive flexibility and extended the duration of the stay. Such areas are often equipped with therapy balls, mats, mood lighting, and sound modulation [26]. In certain programs, trained occupational therapy students run special sensory activities, and act as personal tour guides to support visitors and foster exhibit interactions [12]. Given that parents with children with autism report 70% higher rates of anxiety, isolation, and depression, the sense of well-being and belonging in the museum experience is significant and impactful [27].

One way a positive experience can be facilitated is to ensure preparedness for a visit. Research gathered indicates that families that feel prepared for the visit and prepare all involved greatly affects the quality of the experience that follows [28]. One of the most common ways individuals and families prepare is gathering information via the internet. An institutions website, social media pages, and advocacy organizations all provide information to learn about an organization and neurodiverse programming available there. The channels for disseminating information and social sharing are evident in that 35% of museums offer a mobile application (app). Therefore, the dialogical relationship between visitors and the museum is one that unfolds through storytelling—information is passed from the institution to visitors and, in turn, visitors provide feedback via social media. The development of this dialog is ongoing and helps create a personal story through the interactions prior to a visit and then shared thereafter [29]. But overcoming the anxiety of visiting an unknown location and potential sensory processing issues once onsite is just the first step towards accessibility.

Studies have revealed that 44–52% of those diagnosed with ASD have additional learning disorders or difficulties. That being the case, once the population overcomes the physical barriers to entry, comprehending the educational material presented represents another obstacle [30–32]. Fortuitously, museums were prepared for the needs of diverse learners and already have a range of resources to assist. Through online resources and digital access, collections, exhibitions, and educational resources are available remotely and, once onsite, virtual tours, digital audio guides and other interactive digital experiences further understanding of curated content [33]. On the other hand, the digitizing of collections and digital twin mapping of museum spaces carried out during the pandemic was not carried out with the directive of creating inclusive experiences. As such, the content was created for the neurotypical population at large [5, 6]. But these digital resources can be reconfigured and combined in a novel way with other strategies for inclusivity to assist individuals better understand the site they will visit and the societal expectations through the use of expanded digital storytelling [34].

3. Digital storytelling and museums

The use of storytelling as a method to convey information is an inherently human strategy and is counted among the oldest of social practices for communication and learning [35, 36]. With the expansion of digital technology, the way in which stories are delivered and received has been transformed and conceptualized into digital storytelling through various digital communication tools [37]. Instead of one medium used to tell a story, such as a speech, text, or video, digital storytelling often combines video, text, audio narration, and more into a multimodal experience. With the latest generation of emerging technologies in XR supported by artificial intelligence (AI), multimedia digital communication tools and hypermedia-supported tools can expand the limits of storytelling for museum goers and support neurodiverse populations [37–41]. This approach does not require investment in infrastructure or a radical reworking of current educational content to be effective.

Most institutions already provide accessible resources through a variety of mechanisms including their websites, social media accounts, digital applications, or traditional printed handouts of maps or museums guides. These resources are being coupled with mobility-enhancing systems using interactive digital storytelling, personalization and adaptability, and mixed media [42]. The new, enhanced experiences have the potential to improve the attractiveness of not only cultural heritage sites and museums, but also act as a new conduit for interpretation, analysis, and cultural knowledge for diverse communities. Additionally, the innovative use of new digital technologies will provide new forms of cultural interactive experiences that are comfortable, sensory-friendly, and comprehensible to neurodiverse audiences.

While existing accessibility resources seek greater inclusivity in visitor experience, new considerations delivered via digital storytelling can serve to address obstacles for neurodiverse individuals. In general, inclusivity seeks to provide equal access to opportunities and resources for potentially marginalized populations. In order to be truly inclusive, these individuals must not only feel welcomed on location through accommodations, but also prior to the visit. An understanding of the travel logistics, parking, desired paths mapped by curatorial staff, sensory-friendly areas, and more can reduce anxiety of the unknown for those with ASD and assist with sensory processing hinderances before even entering the physical space of a museum itself. Providing such

information through existing technology and digital assets facilitated with expanded digital experiences leads to a better experience and retention of educational material presented onsite during regular operating hours [43]. While "Sensory Days" seek to offer experiences tailored to those with ASD, they inadvertently segregate the population from the general public and imply that "normal" visiting hours are not for them [44]. Through expanded digital experiences, a sense of belonging can be created where regular visiting hours are welcoming. In addition, the ability afforded through virtual walkthroughs and digital recreations of the location provides an opportunity to revisit the site, review educational materials provided, and encourages post-visit interactions through sharing experiences on the institutions social media platforms. All of this instils conceptual anchors of memory and subsequent reinforcement of institutional messaging [25]. Other ways digital storytelling can support accessibility for neurodiverse visitors include:

1. *Providing multiple ways to access information*: Digital storytelling can provide different ways to access the same information, such as through text, audio, and video, to accommodate different learning styles and abilities.

2. *Enhancing engagement*: Interactive digital stories can engage visitors in a more immersive and personalized way, allowing them to explore and learn at their own pace.

3. *Creating a safe and inclusive environment*: Digital storytelling can create a safe and inclusive environment for visitors with neurodiverse needs, by providing accessible and inclusive design, and allowing visitors to control their own pace and level of engagement with the museum's content.

4. *Accessibility features*: Digital storytelling can be enhanced with accessibility features such as closed captioning, Audio Description, and sign language interpretation which can support visitors with different abilities.

Digital storytelling can thus allow visitors to personalize their experiences by providing a wide range of options, tailored to their specific needs, interests, and preferences, making the experience more engaging and inclusive. In a technology-driven age, museums are seeking a variety of these tools using XR to stay current with the ways their visitors are engaging with the world in their daily lives.

The ways in which museums are seeking to tell stories with technology include digital tour guides, AR and Bluetooth technologies, and smart museums. The integration of digital tour guides is becoming more commonplace, and companies are looking to support this adoption. Examples such as Mobile Tour App and Digital Guide System are digital solutions that allow museums to embed their own images, videos, and audio of their collections for visitors to experience [45]. The multimedia component allows for greater memory retention than traditional storytelling by addressing different learning styles [46]. This new form of content delivery combines participation commonly seen with computer or video games complete with automatic story generation and narration. For example, the British Museum uses AR in their mobile game A Gift for Athena (2014) for the Parthenon gallery using tablets that can be checked out. The game tasks visitors with finding specific statues based on an outline and rewards them with more information about the works prior to assigning another task to explore [47]. Furthermore, these digital tours need not be solely in person. Virtual experiences can also represent inclusive alternatives to traditional

museum visits through the digital embodiment of historical characters and their stories that may also blend physical artifacts with the immersive experience [29]. In such a way, visitors can experience the rich tapestry of stories in museum collections prior to visiting (if at all) and have a greater understanding onsite.

Along the same lines as digital tour guides, smart museums are also eliminating physical barriers to their collections by allowing technological advancements to remove sensory barriers, as well. Smart museums, such as the Smart Museum of Art (Chicago) bring together traditional exhibitions with emerging technologies where the use of immersive technology seek to enhance how material on complex cultural heritage is delivered to visitors [48]. The use of technology to enhance visitor experience can include interactive exhibits, virtual reality experiences, and mobile apps that provide additional information and resources. Smart museums may also use technology to collect data on visitor behavior and preferences, and to improve the overall management and operation of the museum. Overall, the goal of a smart museum is to make the museum visit more engaging, interactive, and personalized for visitors. The transition to becoming "smart" refers to the heterogeneous technologies allowing museum environment to become more interactive, innovative, and accessible [49].

Therefore, the infrastructure and ability to move past the elimination of mere physical barriers for museum accessibility exists. The developments support the call for greater attention to neurodiverse accessibility as only addressing physical disabilities and accessibility will no longer suffice. The new multisensory approach afforded by digital storytelling and smart museums is essential to remove barriers to learning as part of the museum experience [50]. Once sensory obstacles have been removed and/or minimized, personalized learning experiences can be tailored to each individual and material and spaces delivered by way of storytelling. At the same time, engaging visitors through multisensory approaches and considerations can bolster learning for stories are not limited to oral communication and are critical for the creation of an atmosphere through the senses.

The elicitation of emotions such as empathy enriches stories, maintaining the attention of the audience while also creating memorable experience one can become invested in [51]. Storytelling supports other cognitive factors that improve learning, including improving attention and time on task by keeping the listener engaged, and empathy through emotional identification with the subject providing a cognitive framework to help understand and retain new information [52]. Drawing upon previous research, the following proposes leveraging the engaging nature of storytelling and delivered through the new immersive and interactive digital experiences to mitigate various ASD symptoms that would prohibit access to and appreciation of cultural heritage in museums. The educational resources of social stories and sensory maps that have been created to support neurodiverse visitors with various sensory processing disorders (SPD) should be digitized. The proposed "storymap" combination can then be transformed into a digital expression and experience through digital storytelling strategies. Taken together, this digital storymap can provide support prior to the visit, onsite, and engage diverse audiences with personalized, story-driven narratives of museum collections, while supporting multisensory experiences.

4. Sensory maps and museums

Visual stories, or sensory maps, may be used prior to visitation to prepare visitors for what to expect onsite. Such sensory maps provide "descriptions of a particular

situation, event or activity, which include specific information about what to expect in that situation and why" ([53], p. 168). A sensory map is a guide that highlights sensory-friendly areas and features of a museum, such as quiet spaces, low lighting, and tactile exhibits. The resource can be a helpful tool for visitors with autism or sensory processing disorders (SPD). Research has noted that families with ASD children also have accompanying sensor processing and participation challenges 40–90% greater than other populations [54]. Additionally, studies also confirm that even adults who are overresponsive to stimuli in the environment describe their museum visits as disorganized, overwhelming, irritating, and distracting. The situation may result in the need to cope by spending extensive periods of time alone in order to regulate their emotional state, and result in feelings of isolation and exhaustion [55].

Regardless of demographic considerations such as age, visitors with SPD are often grouped into two separate categories by museum and occupational therapy researchers as either sensory avoiders or sensory seekers [25]. Sensory avoiders are individuals with SPD who have a heightened sensitivity to certain stimuli, such as loud noises or certain textures. This population may avoid or have an aversion to certain types of sensory input, as it can be overwhelming or uncomfortable for them. Sensory seekers, on the other hand, are individuals with SPD who have a lower sensitivity to certain stimuli and may seek out more intense or varied sensory experiences. Individuals who seek stimuli may have a greater need for movement and touch, which often results in easily becoming board in environments. Both groups face challenges that might manifest as either unwanted behavior that elicit sensory input, such as a compulsion to move, bump into other visitors, maintaining an understanding of their presence in space, or, alternatively, actions that seek to avoid stimuli by covering ears due to noises, and/or difficulties retaining attention with multiple sensory inputs. In both cases, the individuals may have difficulty interpreting and processing sensory information appropriately. Addressing the concern, sensory maps plot routes considering which galleries are most congested, loud noise areas, and potential tactile exhibitions in order to address the needs of both populations [21].

Understanding the different sensory processing subcategories and groups affected will assist museum administration in better serving these populations. For instance, the categories of sensory processing include: auditory (hearing), gustatory (or taste), tactile (touch), proprioception (body awareness), vestibular (balance), visual (sight), and olfactory (smell) referencing [56]. Furthermore, within SPD there are generally three subtypes of sensory processing—*hypersensitivity, hyposensitivity,* and *general sensory overload*.

1. *Hypersensitivity*, also known as over-responsivity, is a condition where an individual is overly sensitive to certain sensory inputs. They may have an aversion to certain types of stimuli, such as loud noises or certain textures, and may avoid or have a strong negative reaction to them.

2. *Hyposensitivity*, also known as under-responsivity, is a condition where an individual is less sensitive to certain sensory inputs. They may seek out more intense or varied sensory experiences and may have a greater need for movement and touch.

3. *General sensory overload* refers to an individual's overall difficulty processing and interpreting sensory information correctly. They may have difficulty with tasks

such as paying attention, staying organized, or completing activities of daily living. They may have symptoms of both hypersensitivity and hyposensitivity.

Stimuli, or lack thereof, is of critical importance for supporting accessibility for these three populations. The heightened input from those with hypersensitivity requires sensitivity to and avoidance of highly stimulating areas of a museum, whereas those with hyposensitivity seek out tactile, auditory and other stimuli, and, finally, general sensory overload may have symptoms of both [57, 58]. The threshold for the number and amount of stimuli the nervous system can process is different for diverse populations and requires the ability to modulate said stimuli before, during, and after museum visits [59]. Given that the processing of stimuli and information is environmental, there has also been a call to reframe the concept of disability as relating to the environment instead of something inherently within the person experiencing them [60].

In supporting such visitors, sensory maps can be made available in multiple formats, such as printed, digital, or an app, and can be provided to visitors upon arrival or made available online in advance. The removal of future unknowns of a new location, visitors can pre-plan excursions and reduce anxiety. The resource can reduce stress for both the neurodiverse individual and their entire family potentially visiting with them. Such maps can be downloaded onto mobile devices, such as smartphones or tablets, or printed before a planned visit. Examples include the Sensory Friendly Map of the Metropolitan Museum of Art (https://www.metmuseum.org/-/media/files/events/programs/progs-for-visitors-with-disabilities/sensory-friendly-map.pdf). Potential crowded areas are highlighted in sensory maps, as well as identifying more high-traffic times of day and instances where there may be dramatic shifts in lighting. International institutions, such as the British Museum, have gone even further and included information on areas that might be potentially offensive to those with olfactory sensitivities, uniforms commonly worn by staff, identifying entrances and exits, and special events that might balloon attendance (https://www.britishmuseum.org/sites/default/files/2019-11/British-Museum-Sensory-Map-PDF-Download.pdf).

5. Social stories and museums

Like sensory maps, and often mistaken for them, social stories provide a social narrative about programming in a museum or cultural heritage institution. The term "social stories," a term trademarked by Carol Gray in 1991, are short, simple descriptions of a specific situation or activity, such as visiting a museum. These stories can be helpful for visitors with autism or other developmental disorders by providing a clear and predictable explanation of what to expect during a museum visit [61]. The goal is to not change the behavior of visitors, but to improve the individuals understanding of the events and the expectations. Originally devised with no visual stimuli as the subject or object of the resource, the inclusion of visual imagery was later revised based on an increased understanding and available research for those using the tool in 2006 [62]. Examples include Social Stories: Spectrum Project (2017) at the San Diego Natural History Museum (https://www.sdnhm.org/visit/accessibility/social-stories/) and the Social Story at the Brandywine Museum of Art (https://www.brandywine.org/museum/accessibility/social-story). Unlike sensory maps that provide sensory information about the environment, the narrative approach of social stories includes

all information about the environment, the adjustments that have been considered for the comfort of the visitor and a breakdown of each individual step that might limit access intellectually or socially for a visitor [63].

These social stories, otherwise known as social narratives, describe a situation that may be challenging for those with ASD where social behavior and cues are clearly identified. These narratives are used to inform those with socialization challenges of potentially difficult situations [64]. Museums and educational institutions like the Eugene Science Center Chicago Children's Museum, Boston Children's Museum and The Metropolitan Museum of Art in New York have social narratives embedded on their websites that can be downloaded and printed as PDFs (e.g. https://bostonchildrensmuseum.org/visit/accessibility/; https://www.twentyonesenses.org/places/united-states/il/chicago-1/chicago-childrens-museum/). These examples exhibit a storytelling strategy using therapeutic and educational mediations for the population in question. The brief narrative is presented using visual aids and text to reassure those of what to expect in a given social event, exchange, or activity. The resources are used as materials to learn how to promote the development of autonomy and learn social skills, including routines, understanding rules, and expectations.

Unfortunately, these social stories are generally found in the form of print media, which are outdated and do not fulfill their potential of full accessibility and inclusion that other digital and virtual interventions and experiences now afford [64, 65]. Accessible interventions need to align with daily use cases of individuals outside of the museum context. As such, new AR and VR options are being created to meet users where they are. For instance, Wearable Immersive Virtual Reality (WIVR) technology has been leveraged to produce an innovative social story aptly named the Wearable Immersive Social Story (WISS) [66]. By integrating immersive social stories using AR and VR one is able to take advantage of 360° videos with embedded elements that are interactive. Visual cues that include audio, images, and geometric shapes make the experience more engaging and entertaining in order to gain a greater understanding of the social expectations of visiting a specific institution. While digital media expands in museums to embed more multimedia experiences with images, video, and audio, VR can now be used more widely to assist those with ASD. However, these examples of immersive and wearable social stories remain confined to therapeutic and educational interventions for those with autism and include common use cases such as teaching students how to safely cross a road [67].

6. Sensory maps, social stories and adaptive extended reality

The future of accessibility will combine the resources and technology listed above. Sensory maps represent an educational tool to prepare those with ASD to engage with new situations and/or in new environments. The multisensory approach used to create sensory maps ensures that whether over- or under-stimulated, visitors will be prepared for the visit and to benefit from the educational materials provided. The currently exist in the form of handouts provided by an institution that takes into consideration how people perceive interacting with a space. Social stories, on the other hand, use a narrative approach to both deliver content and to address situational awareness for those with ASD. Taken together, the proposed combined "storymap" can now be transformed into a digital expression and experience. Digital storytelling strategies can be used and experienced with various XR wearable devices. This immersive storymap can provide support prior to the visit, onsite, and engage diverse

audiences with personalized, story-driven narratives of museum collections, while supporting adaptive, multisensory experiences.

Using the benefits of both sensory maps and social stories with VR, especially, enables those with sensory processing disorders, and other cognitive difficulties, to feel more comfortable in the museum space. Social stories can capitalize on existing avatar creators that are cross-platform and interoperable, such as Ready Player Me (https://readyplayer.me/) for a more immersive, enjoyable, and personalized experience. The use of avatars selected and created by a neurodiverse individual improve inclusivity through their use in virtual environments to better understand social contacts that may/ will occur onsite, familiarizing them with the facilities prior to visiting, and the rewarding recognition of accomplishment by completing a visit. As noted, the benefits of using head-mounted displays (HMD) and VR include improved focus and attention span as these remove the distractions of the outside world, which can be overwhelming for those with stimuli sensitivity [68].

There are several use cases already available that demonstrate the efficacy of integrating emerging immersive technologies into cultural heritage institutions. One such example is A Dip in the Blue (2022), an application (app) developed for museum visitors with ASD to provide a clear visual agenda along with additional accessibility resources [69]. The app uses a social story that is inspired by the experience of an archeologist discovering a tomb in Naples. After the experience, a survey gathers data on the emotional reaction and sensory feedback experienced as part of the tour. Additional, services and functional features within the app include a dashboard management panel, a live virtual tour scheduling system, a media library dedicated to storing documents, textual and multimedia contact like audio and video tours. There is additional socializing functionality built in with the ability to broadcast live streams of virtual tours.

Another example that uses interactive technologies, including mixed-reality, provides an interactive cultural visit of the church of Roncesvalles at the beginning of the popular tourist destination of Camino de Santiago [70]. The inclusion of avatars provides the ability for natural social interactions to further enhance the visit. The church is experienced onsite through the use of a three-dimensional projection mapping, while an agent generating conversation acts as a storyteller for visitors. The avatar of the storyteller uses the techniques of storytelling while exhibiting emotional reactions during their narration of local stories of the objects in the room. Therefore, the storytelling experience is supported by the engagement with actual objects in the environment and the emotional conversation avatar thus bridging the real and virtual. But what makes this experience unique is the considerations of mapping the senses.

Moving beyond merely the visual, future cultural experiences will include multisensory interactions. The importance of all of the senses for a truly immersive experience has been well-documented [71, 72]. As such, a 2016 report of the Workshop in Cologne sought to understand how to map the senses and listed three steps [73]. The first step includes a researcher mapping a specific urban space to be recreated. The second includes the subjective experiences of visitors by capturing the emotions and feelings of the citizens connected to the location. And, finally, the third is the connection of the researcher to the local community. These steps shed light on the soundscape and smellscape that compliment a visual imagery of a place. Smells often provide a memory which helps identify a place and the effects of climate should be considered. For instance, cold weather reduces the expansion of smells whereas warm weather expands them [74]. Creating an adaptive experience that can not only

change based upon the environment represented, but also react to the physical and emotional states of visitors will become ever more important in crafting compelling virtual experiences.

Adaptive content and interactive storytelling will revolutionize museum experiences. In order to make such experiences possible, the collection of biometrics of visitors will be required. Furthermore, adaptive content that adjusts to the needs of diverse audiences through new paradigms of interaction will provide accessible digital content to a wide range of visitors [75]. Researchers will need to use the following strategies to collect data to personalize avatars to craft custom-made experiences associated with museum visits.

1. *Biometric data collection*: This can include collecting data such as facial features, body measurements, and voice samples from visitors. This data can be used to create a 3D avatar of the visitor, which can be used in virtual reality and augmented reality experiences.

2. *Surveys and questionnaires*: Museums can gather information about visitors' preferences, interests, and background through surveys and questionnaires. This information can be used to tailor the content and activities of the museum visit to the individual visitor.

3. *Tracking and monitoring*: Museums can use technology such as RFID tags and cameras to track visitors' movements and interactions within the museum. This data can be used to understand the visitor's behavior, interests, and preferences and personalize the experience accordingly.

4. *Social media integration*: Museums can collect data from visitors' social media profiles and use it to personalize the museum experience. For example, if a visitor has a history of visiting similar museums or expressing interest in a certain topic, the museum could suggest exhibits or activities that align with those interests.

5. *Personalized recommendations*: Museums can use the data collected from the above methods to provide personalized recommendations for exhibits, activities, and other experiences within the museum. This can include suggesting exhibits that align with the visitor's interests, providing personalized tours, or offering augmented reality experiences that bring the exhibits to life in a more interactive way.

6. *Feedback*: Museums can also gather feedback from visitors about their personalized experiences and use that feedback to improve and refine the personalized experience in the future.

Examples of this in practice can already be seen in research projects like CHESS (Cultural Heritage Experiences through Socio-personal interactions and Storytelling). CHESS (https://chess.diginext.fr/) applies constant adaptable and personalized content to enhance the experience of the Acropolis Museum, Athens [76]. The onsite engagement with objects in the museum personalizes interactive stories for each visitor. The project was created to further enhance a visit by personalizing an engaging and interactive storytelling experience by adapting information about

cultural artifacts for each individual visitor. Thus, the latest generation of state-of-the-art museum programming seeks to create cultural adventures that are driven by stories and narratives. Such experiences involve users in many roles of a scenario through multimodal interfaces and extends over time and space. This user-centered approach personalizes the educational experience with real-time adaptive capabilities using localization systems. The collapsing of space and time made possible through virtual connectivity means that one will also be able to engage in such experiences at home through various devices.

7. Conclusion

Museums will continue to adopt the latest emerging technology to engage with the all of their constituencies. As the goal of museums is to ensure accessibility for all, the needs of neurodiverse populations will continue to drive innovation and technological adoption. Digital storytelling strategies can now be used and experienced with various immersive and wearable devices. New immersive storymaps can provide support prior to the visit, onsite, and engage diverse audiences with personalized, story-driven narratives of museum collections, while supporting adaptive, multisensory experiences. The integration of narrative and storytelling in virtual environments encompasses both the needs to understand a given space physically and intellectually. Furthermore, these new digital tools are effective in visualizing and presenting historical and cultural heritage, and support staffing restrictions. The presentation through digital storytelling continues to evolve in use and methodology and is inherently multimedia. Through the medium storytelling, digitized objects and virtual reconstructions of environments allow visitors to engage with the culture and history of a location or subject like never before. The pedagogical device generates a narrative through the experience of interactive events and affords visitors the ability to direct their own story and visit, creating meaning and context [77]. Systems will continue to evolve that create emotional connections with visitors, allowing for the preferences to be known and storytelling activities to adapt and evolve [70]. For example, detecting children in a room, a system could modify the age level of content and appearance of the avatar presenting said content; mini games may encourage interaction with objects in a given exhibition or gallery, while an avatar employs storytelling to invest the visitor in their history or significance. Finally, as the multiverse of metaverses evolves, portals will be created that link museum collections of like content that can be easily traversed for an even more expanded and immersive experience with art and culture.

Conflict of interest

The authors declare no conflict of interest.

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Section 2

Application of Virtual Reality

Chapter 4

Perspective Chapter: Digitalization of Museums and Academic Benefits for Tourists (Slemani Museum as Case)

Rukhsar Ahmed

Abstract

New inventions of technology can become necessary means for museums. In the last decades, museums have used new technology more than ever to reach out to visitors worldwide. Online workshops in museums have shown that visitors at the museums want to use digital tools and interactions to search for information on the archeological pieces of museums. Museums are constantly trying to achieve their long-term goals for digitalization. Museums are part of these institutions that can use various technology to compete and provide their information for archeologists and readers who are keen to learn cultural heritage and archaeology. Because technological diversity is the way to make museums more attractive and more affordable, as well as easier access to information. The Slemani Museum has started the digitalization of its archeological pieces. In this regard, this study attempts to explain the methods and the benefits of digitalization and their future efforts to use technology in other areas of the museum. A key question that leads this study is: what are the strategic advantages of digitalization of Museums such as Slemani Museum?

Keywords: digital museums, cultural heritage, Kurdistan region, Slemani museum, archeological pieces

1. Introduction

In this era of rapid technological progress and change, the digital revolution with its amazing innovations gives different tools and opportunities to different institutions around the world to do their jobs more effectively and share their important information easily. So that, everyone can access information that was previously just available to experts from the libraries or museums. These constant technological changes and innovations have made institutions compete to adapt to technological innovations while maintaining their unique characteristics. Thus, no organization or institution will be immune to the changes caused by technological innovation. Museums and archives are some of the established organizations that will benefit from this technological revolution, but how can museums and archives prepare

to adjust digitalization for the future generations? Can they take advantage of the unlimited possibilities that digital technology creates throughout the years? It can be said that technology has provided a golden opportunity to access digital information, photos, recordings, and online publications. Thus, digital technology has significantly increased the ability of individuals to participate and take advantage of the opportunities it has provided. It facilitates allowing institutions to facilitate partnerships and collaborations between institutions because digital technology offers people an organized way to access information ([1], p. 1–3). The effects of technology and digital media have emerged in all aspects of society, economy, and culture in this era. However, the beginnings of the use of technology in the field of art and cultural activities did not have much information about how the content of the online show can encourage people to visit museums ([2], p. 8).

Before technological innovations, museums' efforts were to direct visitors to physical museums, but these changes brought about by the community of digital platforms allow museums to introduce themselves and provide useful information to people interested in archeological information. In general, smartphones, apps, websites, and social media have changed the way institutions and visitors communicate in a digital world that is cheaper and easier. Museums have had to adapt to this new way of communicating because the new communication tools are more suitable for museum visitors. The latest innovations in smartphones and the place they occupy in people's lives around the world allow interactions to happen wherever and whenever possible. This is in addition to various other technological innovations and applications in the museum field such as quick response codes (QR codes) augmented reality (AR) and virtual reality (VR). They can be used to identify and disseminate archeological information in a more modern and enjoyable way than the old ways of receiving and giving information in museums ([3], p. 25).

This paper attempts to explain the role and importance of contemporary technological innovations in museum management and the introduction of archeological pieces in digital form in one of the museums in the Iraqi Kurdistan Region (Slemani Museum). After collecting data and explaining the museum digitization project, the importance and impact of using technological innovations in museum management being discussed. Moreover, the academic benefits of the project are for tourists and archeologists to access information via online services.

2. The importance of museum digitalization

Two decades ago, Since the early 1990s, museums have begun to use the internet and put their information online, although initially, only a small portion of archeological information and images were available on the Internet. Archeological information enthusiasts have been waiting for all the information to be available online. However, museums have had difficulty developing their digital collections due to several laws and factors, including: lack of required resources and information, decisions on the type and quantity of information available, digital technical infrastructure, legal restrictions on museums' authority and contracts, and operations costs. With all of this, permission to publish information has expanded gradually. The free and online availability of museum information is expected to affect museum activities in terms of time and space. Museums can adopt digital forms to serve visitors by tourists looking for museum information and activities online, thus expanding visits and activities ([4], p. 201–208). Museums were important places for storing and preserving cultural

heritage and were important centers for teaching about the history of society by displaying archeological pieces and providing information about the artifacts collected in museums. With the advent of digital technology, the methods of activities of these centers have changed. Learning and access to information through digital museums have become available everywhere through online, websites, and cultural platforms. The digitization of cultural collections will be a rapid change in traditional models of management and access to information related to cultural heritage. The traditional model of museums has been based on a collection of physical objects. Their main task was to preserve the archeological pieces in the museums, catalog them, and develop them scientifically to transfer national and international culture to the public and provide material for scientific research. In the digital age, museums as managers of cultural materials have been able to radically change how culture is managed and produced. Museums should consider building relationships with viewers and users of archeological information digitally, which is economically cheaper for users, but for museum revenue, digital control of museums, community cultural assets, and cultural heritage in museums is likely to be possible it allows museums to generate new revenue and maintain their position as custodians of cultural content and trusted authorities. The traditional model of museums was based on physical objects in a building and was funded by the government. The function of museums has been different from that of the digital era, mainly to preserve and catalog archeological objects and to transmit national and global culture to the general public ([5], p. 1–4).

3. The newest technological trends in the museums

During the COVID-19 pandemic, museums have spent more on technology than before to adapt to people's needs and safely open their doors to tourists. Some museums are continuing to experiment with the digitization of museums. The most important trends used in the era of new technology are expected to become part of museums in the future.

4. Immersive augmented reality (AR) experiences

Augmented reality offers a near-realistic experience in museums using this technological innovation, which is considered one of the biggest technology trends for museums. It is expected to be used in different fields and in different ways in the future. Augmented reality (AR) is likely to completely change the field of museums and how the world sees them.

5. Self-guided audio tours

The use of self-guided audio developments has increased in the past couple of years, especially after the use of this technology at the Walt Disney Family Museum. These museums use their own voice tour guide app to tell the stories. This is a new way of allowing tourists to use their own devices (for a more hygienic experience). On the other hand, the rent of sound equipment is removed from the museum. Museums that have used this technology are trying to make more use of it in the future by adding more information to their apps [6].

6. Museums trends shaped by the virtual reality (VR) culture

Virtual reality is a technological innovation that completely changes the way we look at things. You feel like you are in a certain place when you are not really there. This technological trend is used by museums and is likely to affect how they work. Imagine being able to virtually enter the majestic world of an art painting or learn about your country's history at home through the use of virtual reality. Museums can take advantage of these endless technological innovations in different ways.

7. Quick response codes (QR codes) galore

Quick response codes are a simple but important piece of technology for museums. By scanning this code on the museums' artifacts that use this new trend of technology, visitors can get the necessary information about the archeological pieces in the museum. Clearly, some of these technological trends are related to the COVID-19 pandemic. Others are generally applicable. In both cases, it is clear how these technological trends are affecting the development of the museum and museum industry [6, 7].

8. Online access and display of images

Museum websites are one of the most widely used methods of accessing images and information. Users can directly collect specific information and images related to archeological objects. Especially online access to digital collections may be able to be used as an innovation to reach museum visitors. Because it often increases access to relevant information, it complements the physical experiences of museum visitors. Perhaps, museums offer more information, higher-quality images, and more in-depth research and articles. These digital websites are designed online for seekers of museum photographs and information and have two features. Searching for photographs and information is easier and less expensive, or downloading photographs from museum websites is generally free. With this, museums should adapt to this digital investment model and aim to promote the collection of art and artifact pieces for their museums and increase visitor numbers. In some circumstances, museums may need to rely on a variety of technological protection measures, such as visible watermarks, disabling copy features, and saving them to their websites when necessary ([5], p. 11).

9. Historical background of Slemani museum

The Slemani Museum was established in 1961 and remains open to the public. After the Iraq Museum in Baghdad, it is academically the most significant museum in Iraq. The museum staff runs an education department, with a visitor program that engages with local schools, and scientific laboratories for documentation, conservation, and analysis of ancient materials. It is currently considered the second-largest museum in Iraq, the museum has about 60,000 artifacts that show visitors the history of different historical stages of Mesopotamia and will be an important scientific resource for archeologists and academics in the field of archaeology. The number

of these artifacts is constantly increasing because archeological teams are continuously conducting excavations in different archeological sites and the artifacts found are returned to the Slemani Museum. It shows the archeological collections of all Mesopotamian civilizations with unique artifacts from the Stone Age to the Islamic and Ottoman periods. On the fiftieth anniversary of its establishment, the master plan for the development of the Slemani Museum has been complemented with collaboration of UNESCO guaranteeing the museum's future as a vibrant cultural force in Kurdistan and Iraq. In 2011, a museum modernization project was launched with the assistance of UNESCO and the European Union. This includes: enhancing organization and management, educational programs, care and registration of collections and their restoration, and expansion of museum buildings and design of exhibits [8]. Slemani Museum, the second largest museum in Iraq, through exhibitions of their museum artifacts highlights the richness and cultural heritage of the region and Iraq in general. Including cuneiform masterpieces dating back to the 3rd Millennium BC. In partnership with UNESCO work on improving its management and education confirms UNESCO's commitment to making the Slemani Museum "a true regional landmark in the field of museology." In 2013, a pioneering initiative was launched by UNESCO with financial support from Sulaimani Governorate and the European Union through the UNDG Iraq Trust Fund. Modernization of Slemani Museum with the aim of taking the Slemani Museum into the 21st century, this project is considered to be one of the best projects of advanced museums [9, 10]. The museum consists of four halls, the prehistoric period hall (**Figure 1**), Paikuli Gallery Hall (**Figure 2**), the hall of writings or cuneiform writing (**Figure 3**), Warka period to the Ottoman Period Hall (**Figure 4**) with a specific section for children, which is called Slemani Museum Kids (**Figure 5**).

9.1 The prehistoric hall

It is one of the largest museum halls devoted to displaying artifacts dating back to prehistoric times. These artifacts have been found mainly in archeological excavations in Kurdistan and Iraq and show the entire history of ancient Mesopotamia.

Figure 1.
The prehistoric gallery at the Slemani museum, Iraq Kurdistan. https://trek.zone/en/iraq/places/166781/sulaymaniyah-museum

Figure 2.
Paikuli Gallary Sulaimani museum. https://www.pukmedia.com/EN/Home Slemani museum. The second largest museum in Iraq 26-8-2021.

Figure 3.
Writing and cuneiform tablet gallery. https://www.tripadvisor.com/ Slemani museum - picture of Slemani museum, Sulaymaniyah.

9.2 Paikuli gallery

It is one of the museum's newest galleries in 2019 sponsored by the Italian Ministry of Foreign Affairs and the Ministry of Cultural Heritage. This gallery consists of inscribed.

Figure 4.
Warka period to the ottoman period hall: https://slemanimuseum.org/default.aspx

Figure 5.
Kids Museum in Slemani Museum 2023 https://www.facebook.com/Slemanimuseum.org. 26-02-2018.

The Pakuli inscription was the text of the Parthian and Middle Persian inscriptions written on the stone blocks of the walls of the Paikuli tower. These inscribed stone blocks were found in southern Kurdistan/Iraq near the Barkal village in Sulaimani province, these stone blocks are now on display in a special hall in the Slemani Museum, which is called Paikuli Gallery. Stone blocks from the time of the Sassanian king Narseh around 293 AD. The Slemani Museum is a collection of inscribed stone blocks, including many newly discovered ones of the commemorative monument of the Sassanian king Narseh.

All the halls display archeological pieces and present the complete history of different periods of Mesopotamian civilization. The prehistoric hall contains archeological pieces dating back to the prehistoric period to the Abbasid period. The most important museum artifacts are displayed in this hall. Previously, a large number of archeological pieces were numbered with IM labels, but now with the beginning of the first step of digitizing the museum, all the pieces of the museum have been labeled with the SM label Slemani Museum.

10. Warka period to the ottoman period hall

Museum artifacts made of clay and pots displayed in this hall from the Warka period, which dates back about 9000 years to the archeological pieces of the Ottoman period [11].

10.1 Slemani museum kids

It is one of the new sections of the Slemani Museum and was opened in 2019. The aim of this section is to provide archeological information to children. The museum hall has many educational and exhibition facilities for children. It is considered the first archeological museum for children in Iraq. One of the programs of the museum to disseminate archeological information among different sections of society is to establish contacts with schools, according to a joint program of the museum and schools. Students and teachers of different stages will visit the museum according to a visit schedule determined by the museum. After giving a scientific seminar about the artifacts in the museum, with the help of several archaeologists of the museum staff, the visiting students will visit all the sections of the museum in order to get the necessary information [11].

11. The method of technology that Slemani museum starts to use in the nearest future

Presenting archeological information through digital museums has brought other options as a result of the conversion from analog to digital. The difference between the museums of the 21st century and those of the 17th, 18th, and 19th centuries was that they were systematized and fully organized in the 19th century. Twentyfirst-century museums are distinguished by trying to use the most technological innovations to display archeological pieces in museums and preserve their artifacts. Museum websites and digital archives are new dimensions in the way of practically looking at a unified story ([12], P. 26–28). Today, in the age of technological advances, museums are trying to display fewer of their artifacts in interaction, but rather present their display environments with the help of video, photography, and film technology. Museum websites and accounts have attracted all kinds of visitors from all groups and ages as interactive screens supported by technological innovations. In the context of modern museums, they can nowadays be considered places of life that produce information about different aspects of life from ancient times of human life to the present modern era. At the same time, they show and evaluate the history of different material objects around us. Their goal is to communicate information to all sections of society through educational activities ([13], p. 546). The technological method that Slemani Museum will use is an online access and display of images through the museum's website and Facebook account. Access to images and archeological information on museum websites is one of the most common and direct ways to use digital innovations. Through websites, museums communicate products and information to website visitors in a simple way. Thus, electronic evolutions have become a complete electronic experience. The relationship between museums and websites is positive and important for museum professionals and museum visitors. Through their websites, museums can attract visitors into museums thus visitors to physical museums should feel similarly inspired to visit museum websites. Museum visitors can use websites as a bridge to connect their activities before their visit. The purpose of the

visit is to learn more and get more information about this museum. If visitors accomplish these steps, feedback results will increase visitor rates and overall satisfaction. Building this relationship as well as encouraging museum visitors to make museum websites part of their daily lives and designing museum websites that complement physical museums can be difficult. It is important to know how museum professionals can use these websites to build stronger relationships with museum visitors before and after their visits ([14], p. 337–339). The Slemani Museum has begun its initial steps of digitization, which initially required all archeological pieces to be data with museum codes and separation numbers. More than fifty percent of their work has been completed in data. Electronic codes for museum artifacts are one of the most important tasks because they are used to identify archeological artifacts in the name of the Slemani Museum. It is used as an electronic identity card to protect museum artifacts from theft, looting, and smuggling. That will be part of the museum's digitization project in the future. Online and digital exhibitions are one way to attract visitors and build strong relationships between museums and their visitors. These projects end old barriers to access and eliminate time and space restrictions that historically restricted artifacts and collections to public museums and private galleries. Using digital surrogates archeologists and museum visitors have been able to interact with diverse collections regardless of place or time [15]. Slemani Museum has used its website and accounts to attract more tourists, especially after implementing a joint program between museums and schools to teach students about archaeology, museums, and the history of Mesopotamian civilizations. The number of museum visitors has increased significantly, especially since the end of the coronavirus pandemic. The number of visitors to the museum in 2022 increased to more than 24,000 people. The largest number of visitors are university and school students, people who want to spend time, and archeological enthusiasts. Some of the visitors were familiar with the history of the archeological pieces in the museum through digital websites and accounts before going to the museum. These digital websites motivated them to visit the museums physically. With the start of the initial steps of the museum digitization project and the use of websites and accounts, the staff of the museum has noticed an increase in the number of visitors, especially university students and academics in archeology and historical subjects. According to the staff and archeologists in the museum, they expect the number of visitors to increase unexpectedly after the completion of their project and the digitization of the archeological pieces of the museum and have online visitors worldwide. Since they plan to upload a high-quality photograph of each of museum's artifacts with a full description of the era, civilization, and artistic style of the archeological piece with the number and code of the Slemani Museum into the website of the museum (like **Figures 6** and 7), archeologists and academics can easily obtain basic information about the museum and its artifacts, even if they are far from the museum or even from another country or region of the world.

12. Conclusion

As it is experienced, the relationship between museums and museum websites is complimentary. This is mostly explained by online and physical visitors to museums. They visit the museum websites before or after visiting the museums and have high expectations met after accessing the information. It is important for museum professionals to understand that the needs of visitors, whether visiting an online or

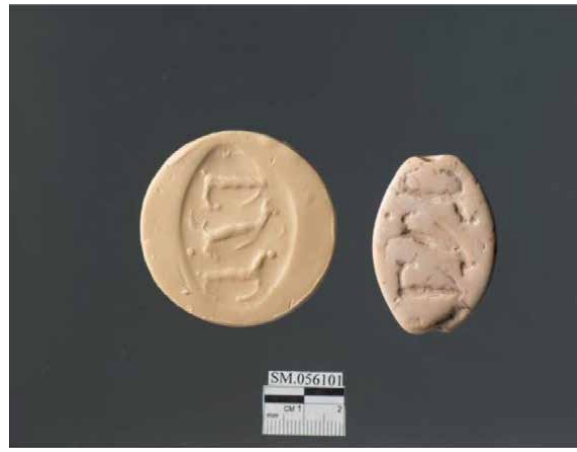

Figure 6.
A Jemdet Nasr period stamp.

Figure 7.
A coin of the Sassanid period. Sulaimani museum 2023.

local museum, change with the changing times and technological advances ([14], p. 337–339). According to Navarrete [4], digital technology allows the rediscovery of communities through new applications of digital technology in different fields. Museums are implementing digital applications in order to develop new products and services. The use of digital technology in a large museum requires more resources than in a small museum, especially in practical work. Therefore, a small museum can be more innovative in the use of social media and its own website can create a wonderful environment for the virtual visitors. But the same work for a large museum might take decades. The use of the Internet and digital technologies such as smartphones and virtual reality and the availability of all these technological innovations to the public and archaeological institutions, especially museums, has led to the integration of many different media platforms with museums. They are also a good helper to establish a continuous relationship with tourists and archaeologists and museum enthusiasts. Especially during the global crises, it appears how important these websites, such as during COVID-19 pandemic. Nowadays, it is important for

museums to see how they change their ways to reach their visitors. One of the characteristics of the digital museum is that the actions of museums and visitors are limited. Using different technologies of QR-Codes, VR, and AR, they give unique experiences that are not repeated. The ultimate goal of the museums in the use of digital websites, along with attracting visitors, is to distribute information and educational experience of the physical museums in common and different units belonging to the museums ([3], p. 31–34). The Slemani Museum at the beginning of their efforts to digitize the museum, one of their goals is to distribute educational and academic experiences for visitors and archeologists, especially through their websites and accounts. By providing information about their museum artifacts and historical information, they have attracted the attention of tourists and facilitated archaeological researchers to obtain the necessary information. This is clear especially in many museums of countries, such as Iraq and countries that are in war zones and they have not stable security situations, that they cannot display all the archeological pieces either in the physical museums or on websites due to public security. But the use of websites helps museums to attract attention. Archeological academy, which is a major motivation for researchers to visit the museum and receive information directly from experts in museums regarding the Slemani Museum, their joint programs with schools and visits to different stages and children's departments in museums, known as the children's museum, are two important factors to attract tourists to their museums. On the other hand, the Slemani Museum, the museum's library, the museum artifacts, and information on archeological pieces uploading on their website became important sources for archeological and ancient history researchers. They are also a factor in attracting the attention of foreign archeological teams to come to Kurdistan and obtain permission to excavate archeological excavations in the archeological sites of Kurdistan. Eventually, by returning their archeological pieces to the Slemani Museum, they will increase the number of their museum artifacts on a regular basis and will be new sources for researchers. All of these actions are easier to do with the digitalization of the museum and attract more tourists. Both types of visitors, such as tourists or visitors with the aim of academic and scientific activities, display new archeological pieces discovered in the latest work of the region.

Finally, it was a study on the digitalization of the Slemani Museum and its effects and benefits for tourists and academics in the field of archaeology. It has also been an investigation into the obstacles and strategies to use in the management of the digital museum. Because the environment of the digital network with the advancement of technology may change, on the one hand, the museum is constantly increasing the number of archeological pieces due to the continuous archeological excavations in the region and returning archeological pieces to the museum. This is how to update information on the latest pieces of archeological sites on museum websites and accounts. It attracts academic attention to further research in the field of Mesopotamian archaeology in general and Kurdistan in particular.

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Chapter 5

Perspective Chapter: The Integration Narrative of Media and Space in Museum

Lie Zhang, Husheng Pan, Guobin Wang and Wen Zhang

Abstract

With the increasing popularity of digital presentation and narrative means in museum display design, the role of media art in museum space design has become increasingly prominent. The integration narrative of media and space will deconstruct our design and understanding of exhibition space, thus bringing a new design paradigm. This chapter will discuss the ways and methods of innovative design of museum space in combination with the design case study of new museum space; It tells about the new design concept of the integration of media and space, discusses the integration way of media and exhibits, media and space, and how to use the characteristics of media art with great appeal and guidance to realize the digital innovation of museum exhibition.

Keywords: museum, space, media, integration narrative, display design

1. Introduction

With the rapid development of digital media technology, the application of media art in the public cultural space such as museums and relics has become increasingly widespread and popular. It is pointed out by the International Council of Museums in the interpretation of the theme for International Museum Day 2022 that museums "have the power of innovating on digitalisation and accessibility, museums have become innovative playing-grounds where new technologies can be developed and applied to everyday life. Digital innovation can make museums more accessible and engaging, helping audiences understand complex and nuanced concepts" [1]. It can be seen that the integration and display of new technologies in new media in the museum space has not only become a new technical means attached to the museum space, but become an active builder in the museum space as well. In this way, more exhibits have been displayed, which are diverse, vivid and attractive. The traditional space narratives and construction methods of the museums have been reshaped. The learning mechanism and behavior mode of the audience in the museum space have been changed. New possibilities and opportunities have been brought to contemporary museum space and display design. New technologies are undoubtedly of great value and significance.

However, as new technologies and new media have been continuously applied to the traditional exhibition space of museums, disharmony arises between traditional space and modern media as a result of their rapid development. Exhibition designs of

museum space are confronted with new challenges. To address this issue, this paper adopts the research methods of case study and documentary analysis and studies the design idea of the integration of exhibition space in museums, aiming to provide today's frontier exploration and thinking for the design path of contemporary exhibition space.

2. Literature review

It is a great trend and focus in the current work of exhibit display in museums across the world to plan, discuss, interpret and study the exhibit display with the relevant theories of narratology. It is an effective method widely recognized by the relevant industry and academia in the world as well.

Before narrative theories were formally introduced as the organization forms or means of the exhibit display, museum exhibitions, particularly thematic exhibitions with the timeline sequence, implied "narrative budding" [2]. For example, Steven Lubar pointed out in the article Timelines in Exhibitions that timeline is a natural and intuitive way to present and understand the past, and is highly capable of staging the historical narratives [3]. Edward Bedno, an American scholar, also stated in his article Museum Exhibitions: Past Imperfect, Future Tense: "Many thematic exhibitions have basic narrative clues. A story can connect all exhibits or all perceptible exhibition elementss, which is more powerful than creating a simple theme including all exhibits" [4]. In 1998, an academic concept of "systematic exhibition" in the exhibition design of world museums was put forward by the academic circle of Japanese museums, that is, the design methods of exhibition scripts with information structures are established on the basis of a good understanding of exhibits' information [5]. The "information structure" here has nearly the same meaning as the structure research of traditional texts in the narrative theories.

Spatial narrative theories have been used for the relevant academic analysis of museum exhibitions, growing like mushrooms. However, the early academic analysis paid more attention to studying the relationship between museum exhibitions and narratives as well as their significance while the later placed more emphasis on studying with museum exhibitions as the structures and methods of narrative texts. For example, Mick Barr used narrative theories such as narrative voices, narrative focus and narrative time to analyze the exhibition of the American Museum of Natural History for the first time in the first chapter Telling, Showing, Showing off of Double Exposures [6]. Mieke Bal believes that the narrative perspective provides a significance that cannot be obtained by other methods. Such analysis can be utilized to read the museum and its exhibits rather than the objects on display alone [7]. Liu Jiaying and Song Xiangguang explored the relationship advantages and feasibility of museums and narratives through the analysis of the advantages of museums' "sense of existence," "cultural" and "entertainment" in their article Media Advantages of Museums—A Trial Analysis of Museum Exhibitions from the Perspective of Structuralist Narratology and combining the research perspective and theoretical framework of structuralist narratology [8]. However, the real in-depth analysis of the relationship between exhibitions and narratives should pay attention to Museum Making: Narratives, Architectures, Exhibitions [9], a work co-authored by Suzanne Macleod and others, and Narrative Turn of Contemporary Museum Exhibitions authored by Zhang Wanzhen [10]. Since then on, with the collision of narrative theories and design disciplines, narrative theories have also started to combine with

exhibition design space, forming a research trend in the narratives of museum exhibition space. At this stage, it is believed by some researchers that the theme and spatial form conveyed by the exhibition bear similarity to the expression or logic of the narrative, therefore, it is feasible to take the museum as the narrative text and conduct the research of spatial narratives around it [11]. For example, Li Nvxian analyzed the relationship between the sequence of museum display space and the narrative of exhibition theme and explored the design methods of museum display space with narrative characteristics [12] through the spatial narrative theories.

Over the past decade, with the vigorous development of information technology, digital technology and intelligent technology, we see an increased use of digital media products in all aspects of human society. The expression and interactive narrative of media art have gradually become one of the means of cultural and artistic communication that enjoy the most popularity. So are the museum exhibitions. At present, the narrative means and digital form of museum exhibition media have become important ways to achieve "getting cultural relics alive" and "getting cultural relics fashionable," and have become the consensus of the academic circle and industry in this field [13]. Overall, it is more often to see application cases of digital media narrative expression in museums; however, the writings on relevant academic and theoretical researches are rarely seen. The former includes WeChat widgets such as Digital Palace Museum and Traveling in Dunhuang, Decorative Pattens Carry the Great Truth- The Palace Museum Tencent Digital Experience Exhibition, and Beijing 2022 Olympic Winter Games Digital Museum, of which the author participated in the planning and design, as well as the National First Robot Stage Drama that integrates technology, culture and art, etc. [14]. The latter, for example, Zhao Ling, conducts a study [15] of the applications of media in the museums from the narrative perspective with the narrative expression of digital media in the museums as the object of study in the article Digital Representation to the Integration of Feelings and Setting—A Study of Museum Digital Media Exhibition in the Context of Narration. In 2022, the National Cultural Heritage Administration of China issued the new version of the official document Evaluation Criteria for Museum Operations, formally proposing that "the situation of using auxiliary exhibits and modern information technology to improve the level of cultural communication in the representative temporary exhibitions will be regarded as an indicator for the assessment of museums" [16]. The guiding value and incentive effect brought by this policy will produce a profound effect on the follow-up development of museum exhibitions.

At present, a tidal wave of digital technology is showing a rapid spread in global museum exhibitions, but not a few museum exhibitions do not have enough time to think about the relevance between digital technologies and their exhibitions under such an explosive development. Without corresponding theoretical discussions and a summary of methods, they are involved in the flood of digital technology in an instant. As a result, a number of problems arise from practical operations, such as the incompatibility of the content and form of media and space, the hybrid sequencing of space organization and structure, as well as the follow-up maintenance and operation of media equipment [17]. To overcome these problems, some researchers have also paid attention to the necessity and importance of the study of integrating media into the design of space. For example, Lin Shaoxiong stated in his article Physical Narration and Space Integration in Museum Phase 4.0: The current and future museum phase 4.0 museums are based on the creation of integration experience space in the future tense, which place more emphasis on the organic integration of real space and virtual space, physical space and psychological space, aiming to the

construction of the self-growing integration fields [18]. Here, the virtual and psychological space refers to the media space of the museum exhibition, while the real and physical space refers to the real physical space of the museum. Some researchers have done something further, namely, taking the visitor guiding display system in museum exhibitions as an example. They explored the problems and applications of the complementary functions and the shortcomings of the traditional guiding system and modern digital media and came to a clear conclusion that the visitor guiding display system innovates, improves and upgrades the original visitor guiding system, which is really a cutting-edge idea [19]. Therefore, the relevant studies of the integration narrative design of media and space in museum is not just a cutting-edge academic issue that needs to be further explored. The relevant studies and explorations are urgently needed due to their values to a certain extent.

To sum up, the studies of digital applications have started with a bang in the museum exhibitions across the world. The space narrative and media narrative methods of the exhibition have also respectively demonstrated their important values and roles. However, media narrative in the museums are developing too explosively; moreover, media narrative and space narrative are limited by their respective knowledge characteristics and scopes. Due to this fact, lots of disharmony problems arise inevitably from the hybrid application of media narrative and space narrative in the museum exhibitions, thus requiring the study of the interrelated whole for the purpose of integration. Therefore, this paper attempts to take the lead in exploring the challenges faced by the narrative and design methods of museum exhibitions and their new design ideas after the integration of media and the space which traditionally focuses on objects. It is hoped that the study in this paper can be the first to fill this nearly blank field, realize the integration and innovation in the museum exhibitions, and thus produce a new design paradigm, which are our research objectives and values as well.

3. The proposal of the narrative design methods that integrate space and media

The integration narrative space refers to a new spatial form brought by the integration of multiple media means and physical space. The narrative of traditional museum display space is connected by cultural relics and space. The presentation of objects and the construction of architectural space jointly determine the narrative logic of museum display. However, digital media plays an increasingly important role in museum narrative, which will greatly affect the changes in the structure of traditional display space, thus bringing a new integration narrative space.

3.1 Several elements of integration narrative space

3.1.1 Space

Space is the most basic and the most important material basis of museums, and a key elements that distinguishes physical exhibitions from the experience of the online cultural heritage communication. The existence of space is an important prerequisite for the attraction of visitors. Personal experience of space is one of the most effective ways to collect information. Compared with ordinary "objects," it is omni-directional and multi-channel to exchange information with space and obtain perception from space.

It is natural for people to emotionally depend and become interested in space. As Norberg-Schulz Christian, a well-known architectural theorist, said in Existence, Space and Architecture, "the root of people's interest in space is existence" [20]. The relevant evidence is found from the research results of cognitive psychology and linguistics. Experts have identified a great relationship between space and human cognition and emotional formation. People interact with the external space through their own bodies from childhood. An image schema based on spatial perception of the external world is the basic structure for understanding and recognizing more complex categories and concepts [21]. The cognition of one's own body and the surrounding space is the most basic cognitive activity of human beings, so image schema mostly reflects a spatial relationship between human beings and the external world. This abstract understanding of spatial relationship forms the empirical basis for people's understanding and reasoning of anything. Therefore, space is not only the basis for the formation of cognition, but also the basis for human behavior and emotion. It is also an important prerequisite for the development of the indispensable attachment to a place and a sense of belonging in their minds.

In addition, the significance of space to museums and people is also reflected in the aspects such as space and narrative logic, space and environmental cognition, and the cultural spirit of space. The museum space is constructed to meet the needs of functional logic, structural logic, behavioral logic, and spiritual logic. Once the spaces are constructed, they conversely construct the audience's behavior in the museum and guide their emotional clues and changes during the visit. It is an important elements of museum experience to create environmental experience in the museum space. Human senses are very keen. Beyond the traditional five senses such as vision and hearing, we also develop perceptions of ourselves, space environment, changes of light, air flow, changes of temperature, vibration, etc., and every cell of our body is even communicating with the surroundings. As Margravial Opera House Bayreuth described in Michael Haim's From Interface to Cyberspace: The Metaphysics of Virtual Reality, the creation of space and atmosphere "mobilizes all human senses: visual, auditory, tactile, plot, and even the smell of incense and candles [22]. The audience of Bayreuth is the pilgrim of exploration, immersed in an artificial reality, that is, a holistic experience." The layout and creation of the space also reflect a certain cultural and spiritual connotation, such as gardens in the south of China and courtyards in the north of China. They contain the traditional Chinese values and ideas that are reserved and aggregated, and reflect a number of dialog relationships between humans and the external environment such as heaven, earth, nature, cities and towns, as well as between the family members.

As a result of the essential status and multiple attributes of space, the audience develop an overall perception of the image and cultural spirit created by the space environment through the conscious creation of the space so that the space becomes a "field" to guide their emotions and display their spiritual power. Under the guidance of the narrative logic planned by the space, the audience's learning and experience behaviors are constructed as well.

3.1.2 Objects

The significance of "objects" is self-evident in the display activities of cultural heritage. Sima Qian described the Confucius temple he saw in Qufu and Confucius' remains such as "clothes, hats, zithers, carriages and books" in the Historical Records

of Confucius Aristocratic Family [23]; the "carriages, clothes and ritual vessels" enabled Sima Qian to imagine Confucius' conducts. He was so attracted that he forgot to return. This is probably one of the earliest descriptions of the significance of "objects" on museum exhibitions. The presentation of "objects" directly proves the real existence in history. Additionally, but the uniqueness of heritage is often an important elements to arouse the audience's strong interest and exploration spirit. The so-called "prove history by material evidence" has always been one of the important concepts of museum construction.

Digital technology has brought a new way of display; however, it cannot completely replace the position of "objects" in people's minds. Although we can easily get access to the high-definition pictures of the Mysterious Smile of the Mona Lisa online, millions of people still go to the Louvre Museum to see the Mona Lisa every year. People can roam freely in the real space of the ancient city, and appreciate the cultural relics and treasures in close proximity, marveling at the wise ancestors' craftsmanship. This sense of reality produced by the existence of reality as well as the emotional and spiritual guidance and infection given by the size and turns are still irreplaceable by digital means. Digital technology will not eliminate people's desire for "reality"; conversely, it may act as a bridge between people's minds and the real objects, stimulating their desire to explore the real objects.

Objects are the realistic basis of human cognitive system. A variety of states of "objects," natural laws, and interactions and exchanges between objects and people are also the foundation for us to understand this world. Objects are also an important link between human emotions and the cultural world, as well as the important carriers and symbols of human cultural system. The remembrance and worship of "objects" universally exist in human civilization, which are the direct presentation of cultural symbols, and the external expression of profound and abstract cultural connotation and spiritual world. Culture is a collective memory. This converging behaviors and mode of thinking are usually maintained and symbolized by "objects" in a certain forms.

It is one of human instincts to pursue materiality. From the perspective of physiology, the operation and play of objects stimulates the secretion of adrenal hormone and brings excitement and pleasure to the cerebral cortex nerves, keeps people unceasingly relying on objects and chasing objects and communicating and interacting with the objects. Animals are curious about objects and eager to play with objects, which is actually an instinctive expression to exercise their predatory skills and survival ability. Likewise, human's desire to understand, control, conquer and collect objects also comes from the born instinct.

Therefore, "objects" are not only physically visible and touchable. They exist in our spiritual and cultural world as well. The display of "objects" in museums is of irreplaceable significance.

3.1.3 Media

Interactive digital media is known for its characteristics such as sensible, interactive, narrative and interrelated, which can bring extremely strong experience and extremely strong communication and produce fundamental changes to culture communication, education and other areas.

Through sight, hearing and touch, digital media can generate super-infective power which is immersive, full-view, and media-rich. Particularly, when media is applicable to everything today, digital media brings so great infection that it has

broken people's imagination time and time again. Interaction is another aspect of the extremely strong experience. It is one of the most basic ways for humans' development of cognition to interact. The interactive media endows everything with spirituality through the cognition of various sensors of language, movement, orientation, eyes, EEG, touch, etc., interactive media, so that the object can talk with us. Interaction brings pleasure, experience, emotion and recognition to people.

Interactive media is also known for its narrative. It is a form of art about time and narrative. As Roger C. Schank, an American cognitive scientist, pointed out that Humans are not ideally set up to understand logic; they are ideally set up to understand stories [24]. Mark Turner also wrote in his book The Literary Mind: "Storytelling is a basic way of thinking, and most of our experiences, knowledge and thoughts are organized in the form of stories" [25]. Digital media is naturally born with narrative characteristics, which makes it have an edge in the area of communication. At the same time, the Internet, the Internet of Things, artificial intelligence, big data, cross-media, O2O and other technical means have not only brought about subversive and explosive growth in communication capacity, but brought about the transformation of communication paradigm and discourse system as well, leaving endless space for possibilities and imagination.

Boosting with unique advantages in the area of communication, interactive digital media has gradually integrated into the new museum space. It is no longer an optional auxiliary means ranging from small interactions to big experience. Instead, it will an important part of the new integration narrative space and an important link in the museum narrative. In the construction of the new museum space, the space narrative that integrates media will generate more inspiration and creativity for architects and space designers and become the leader of an important trend of museum construction in the future.

3.1.4 People

People are the complex existence and ultimate goal in this system, but they are also the elements that can be most easily overlooked. Museum exhibitions communicate information to people, and the needs of people are multi-level and multi-dimensional.

On the one hand, the characteristics of the audience as the object of communication should be considered. The characteristics and ability of the audience in receiving information largely determine the effectiveness of communication. The knowledge system is asymmetric at both ends of the communication. The sender is better at the expert knowledge system, while the receiver often does not have the knowledge reserve in this respect. Therefore, there is a key part of transforming from knowledge text to exhibition script in the link of exhibition planning and text design.

On the other hand, in addition to specific information transmission, it is important to consider the visiting process and behaviors of individual visitors, and the possible visiting mode of group visitors. The designer should handle the key issues to realize stronger spiritual appeal and information transmission, namely, how to mobilize the audience's emotions and expectations by the entire space field that integrates information and atmosphere, guide their behaviors, shape the emotional curves with the specific space plot, construct their behaviors with rich interactions and dialogs, and guide them to the preset situations. Media and interaction have

particularly outstanding advantages in guiding the audience's emotions as a result of more active dialog ability. Meanwhile, as an open public cultural service facility, people also have diversified activities and needs in the museum space. The integration and satisfaction of more needs and participation in activities such as visiting exhibition, reading, learning, taking a rest and social interactions will also complement and change the construction and understanding of the future integration narrative space.

3.2 Narrative design methods that integrate space and media

The narrative design method that integrates space and media attempts to organically integrate "objects," "media," "space" and "people" to form a new type of display space that is very attractive, communication-oriented, narrative-centered, carried by space, media breakthrough, and the combination of the real and the virtual. Here, communication and education remain the goal orientation of integration narrative space in the museums as well as the major part of museum space open to the public. Narrative is the core means and basic process of the museum's display space, as well as an important basis for organization of exhibits and media and space design in the museum. It tells stories through cultural relics, commemorates great people and past events, reveals the cultural phenomenon behind the people and events, shows the laws and characteristics of human survival and development, and expresses the spirit and significance. Space is the basic carrier. The museum, as a physical space, distinguishes itself significantly from the complete online virtual space, which is also an important factor for the audience to acquire rich and real experience. Media has become an organic part of the space, performing the important functions of time narration and theme narration.

Therefore, in the narrative design method integrating space and media, we should, from the very beginning of the conceptual design, consider with emphasis the possibility of new media artistic expression forms, the possibility of space and media combination, as well as the possibility of media guiding emotional changes of the audience during the visiting process. Key exhibition items that are condensed in response to the narrative needs and suitable for media expression, in combination with important and large exhibits that are mainly shown in traditional museums, become key elements that need to be considered first in the "point" and "line" relationship of the museum space organization. What's more, through the logic and clues organized by spatial and emotional narratives, these points are used as key points and memory points to form a complete exhibition route for visits and experiences, thereby forming the basic paradigm of museums' innovative design.

4. Design case of integration narrative

In recent years, under the guidance of the above design ideas, the author's team have made an effort to apply such ideas and concepts to the design of new museum exhibitions. They have achieved positive results and won wide recognition by the cultural and museum circles and the public. The exhibition designs of the Confucius Museum and the China National Pavilion of the 2019 Beijing World Horticultural Exposition are taken as examples in this paper to introduce the application and thinking of relevant methods in practice.

4.1 Confucius Museum

4.1.1 Theme and planning

The theme of the exhibition in the Confucius Museum is "The Great Sage: Confucius." As a representative of the Axis era, Confucius and his thoughts have had a profound impact on Chinese civilization and even world civilization. The exhibition design of the Confucius Museum demonstrates great cultural significance and contemporary values, but it also creates a tough problem and a big challenge for the designer. According to the conventional narrative logic to honor celebrities, text narratives are divided into five parts, namely, Confucius' Era, Confucius' Life, Confucius' Wisdom, Confucius and Chinese Civilization, Confucius and World Civilization. But how to better attract the audience in a journey of space? How to produce stronger pertinence and guidance for audience's emotions and expectations? The author team have organized a new integration narrative logic for the museum based on the spatial conditions, content logic and emotional clues.

What kind of person Confucius should be told? Liang Shuming said, "The Chinese culture before the era of Confucius was almost in the hands of Confucius, and that after the era of Confucius almost originated from Confucius" [26]. Just as the ancients used to describe Confucius as "His lofty conduct is like a high mountain, which is regarded as the code of conduct by people." We believe the audience's admiration to be the most important goal in the museum of such a sage. The corresponding content is called "preface."

Secondly, it is cognition. Admiration is emotional while cognition is rational. It is necessary for the audience to develop a complete understanding of the background and the whole life of Confucius. The corresponding contents are Confucius' Era and Confucius Life, the first and second parts of the exhibition. We attach great importance to Confucius not only due to his position as a great man in history but also due to the valuable enlightenment and instructions given by his thoughts thousands of years later. Then, how can we effectively draw nutrition from his thoughts? We come up with another word, "dialog." We should help the audience to learn and think through dialogs. The Lunyu (Analects), the most important carrier of Confucius' thoughts, was compiled by the succeeding generations of Confucius's disciples in the form of dialogs. A dialog situation is created and dialog behaviors are constructed to make the interactive "dialogs" become a way for the audience to experience and learn in the visit. It is our third goal. The corresponding content is the sacred map in the special experience hall and Confucius Wisdom, the third part of the exhibition.

We expect the audience to gain something valuable and be touched and inspired finally after admiring Confucius and creating dialogs with him, understanding his life and important thoughts, as well as his broad and profound impact on Chinese civilization and world civilization. Therefore, the fourth goal is "baptism." In particular, we expect to infect the audience through the exemplary power of the deeds of the people with lofty ideals who have been infiltrated by Confucianism that demonstrates self-cultivation, family-regulation, state-ordering and land governance in the history since then as well as to deduct Confucius' understanding and interpretation of "a gentleman" in the Phantom Theater. It corresponds to Confucius and Chinese Civilization, the fourth part of the exhibition, and the Gentleman's Hall of the special experience hall.

In Confucius and World Civilization, the fifth part of the exhibition, large art installations are used to present the international influence of Confucius' thoughts. We achieve the fifth goal, namely, "paying respects to" knowledge and to Confucius by building the last hall, the Permanent Confucius, into a professional Confucius library.

The basic thread of the Confucius Museum exhibition narrative and the overall keynote of the exhibition design are formed by developing from admiration, cognition, dialog, baptism to respect and integrating the communication intention and the audience experience.

4.1.2 Space and media

The Confucius Museum is a very special, as very few cultural relics are directly related to Confucius. It is the most important to display Confucius thoughts, wisdom and contemporary values in the Confucius Museum, but all of them are abstract concepts. How to interpret abstract concepts and show the power of spirit in the museum? It requires us to transform these abstract contents into perceptible elements and atmosphere through creativity, and to tell the truth and explore the spirit through stories, and to express his ambitions by means of things and metaphors the combination of space, media and various artistic techniques. Because of the powerful infective characteristics, new media has also become a prominent means for the Confucius Museum to reflect the interpretation and experience of the key contents of the five goals as above, and has generated apparent rhythm changes in space. The most important highlight is the mapping projection of "The Great Sage: Confucius" in the prolog hall, the interactive long scroll of the sacred map, and the Youlan Cao of the Gentleman's Hall of Phantom Theatre.

The prolog hall is the space to achieve the goal of "admiration." In the tall and broad theme space, light is used to shape the great figure of Confucius in the arms of the mountains, presenting the meaning of "softy conduct as high mountains." By projecting the shocking video and audio effects of "The Great Sage: Confucius" through the 80-second ring immersive mapping, the designer generalizes the contribution and influence of Confucius, and finally shapes the prolog hall into a solemn, pure, and soul-shaking ultimate space (**Figure 1**).

The Confucius Museum has a total of 36 pieces of authentic relics of the holy signs drawn by the Ming people. Through the combination of art and technology, the stories of the sacred map have been redrawn into a dynamic digital scroll, which are projected on the wall and also on the long table below the scroll in an interactive way.

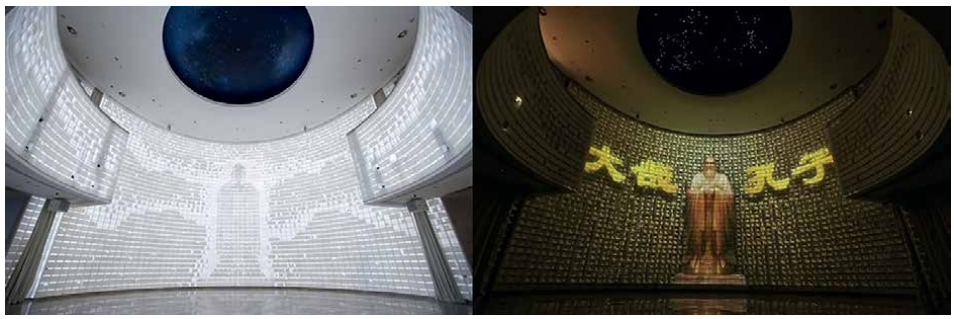

Figure 1.
"Great Confucius" light sculpture and media narrative fusion scene in the lobby of the Confucius Museum.

When the audience clicks on the characters in the image, it will trigger a story, as if talking with Confucius, shortening the distance between Confucius and the audience, thus forming the integration of the virtual and the real and an integrated space of "a dialog" between the ancient and the modern (**Figure 2**).

The Gentleman's Hall is a deductive space using multi-screen phantom stage technology. Centering on the theme of "The Way of the Scholar," it allows the audience to understand and think about how to cultivate themselves through the continuously updated repertoire, so as to achieve the purpose of education and "baptism." "Youlan Cao" is our first show. It is said that the zither music of "Youlan Cao" was composed by Confucius. Confucius used orchids as a metaphor to express his praise of the character of a gentleman, as well as his confidence and generosity in facing difficulties. With this as the creative theme, dance design attempts to reconstruct and interpret the charm of traditional Chinese culture by using modern digital means such as sound, light and electricity. The addition of bamboo flute playing robots adds a different style to the Phantom stage. Combining the traditional elements with the cutting-edge technology, harmonizing the piano and flute, dialog between ancient and modern, and leaving a deep memory for the audience through surreal and novel experience (**Figure 3**).

Finally, the key media means of the Confucius Museum became an organic part of the space narrative logic and integrated harmoniously with the whole building.

Figure 2.
Interactive digital fusion scene of the "Drawings of Confucius Saint Deeds" in the Confucius Museum.

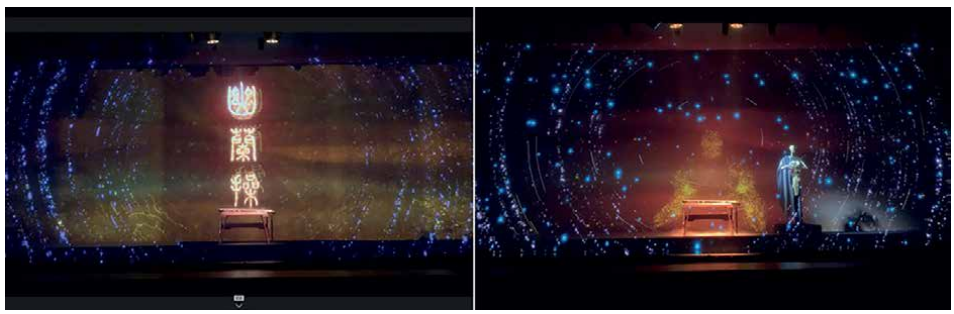

Figure 3.
Orchid parade robot phantom technology theater in the Scholar's Academy of the Confucius Museum.

4.2 The China National Pavilion of the 2019 Beijing World Horticultural Exposition (the China National Pavilion in short)

4.2.1 Theme and planning

The theme exhibition of the World Horticultural Exposition is "Living forever - China Ecological Culture Exhibition." According to the characteristics of the theme, we put forward an overall idea, emphasizing the combination of dynamic interpretation and static display, the combination of virtual artistic conception and physical flowers, the integration of contemporary science and technology and traditional art, the expression of the Chinese ecological culture spirit of harmonious coexistence between human and nature in poetic Chinese language, the display of green water and green mountains and gardening masterpieces, and the demonstration of the achievements of contemporary ecological civilization construction. In this way, cultural confidence and national image are demonstrated. Combined with the space conditions, we explore a narrative clue that is mainly based on logical relations and supplemented by temporal relations. From the origin of ecological concept to macro development, system composition to mesoscopic phenomenon, and from traditional concept to current innovation and development. The "six harmonies" narrative clues of "harmony between heaven, earth and man," "harmony between four seasons," "harmony between mountains and rivers," "harmony between spring and river winds," "peaceful and comfortable living," and "harmony and symbiosis" were put forward, respectively representing the traditional ecological concept of harmony and simplicity, the green development concept of beautiful rivers and mountains, the ecological overall concept of harmonious symbiosis of mountains, forests, fields, lakes and grass, the concept of people's livelihood and universal benefits of sharing ecological achievements, and the win-win global view of conspiring to build ecological systems. From philosophy to scenery, landscape and human settlements, and then to the global perspective, layout in order and step by step.

4.2.2 Space and media

The theme exhibition is located on the basement of the China National Pavilion. The architectural layout has been more restrictive. The entrance and exit are located in a fan-shaped hall, connecting a circular patio and a relatively small fan-shaped space through two corridors. On the one hand, we need to consider the space streamline, on the other hand, we need to consider the relationship between the space and the expression of the exhibition content under the limited conditions.

The prolog hall is quiet space compared with other halls. Through the combination of ramming earth, astrology and plant seeds, the poetic landscape painting skillfully composed of the three elements tamps the earth wall, reflecting the theme of the exhibition "endless life," reflecting the philosophical thinking of Chinese ancestors on the harmony and unity of heaven, earth and man. "Harmony between Heaven, Earth and Man," reflects the hazy cognition and simple emotion of Chinese ancestors on natural plants and reflects the simple natural view of harmonious coexistence between man and nature through the words related to plants in Chinese oracle bone inscriptions and the chapters eulogizing plants in the Book of Songs. Through AR technology to expand the knowledge of plants in the Book of Songs, the media began to participate in our exhibition. "Four Seasonal Scenes and Harmony," is located on one of the corridors. We take the long scroll of the famous blue-green landscape "A

Thousand Miles of Rivers and Mountains" as the theme, use the immortal moss as the painting material to reproduce the classic scroll, and use the projection technology to perform dynamic light and shadow interpretation on it, depicting the combination of mountains and rivers, living between vegetation, and the benign interaction between human and nature, highlighting the cultural origin of the green development concept of "green water and green mountains are golden mountains and silver mountains." "Landscape Harmony," is located on the central axis of the building. In combination with the architectural space characteristics of the circular submerged courtyard, the audience moves from the quiet corridor to the bright open space, and the mood is mobilized to reach a small climax of the exhibition. The Shuiyuan Mountain Hall respectively displays 24 landmark and rare and characteristic plants in the history of Chinese horticulture. On the central axis of the building, the dialog between ancient and modern times, the harmony of mountains and rivers, and the formation of interesting landscape space, show the ecological holistic view of the symbiosis of mountains, forests, fields, lakes and grass. "Spring River Wind and Harmony," echoes the exhibition hall of "Four Seasons Scenery and Harmony," and is located on another corridor. With the title of The Dwelling in Fuchun Mountains, it vividly represents the ink and water artistic conception of The Dwelling in Fuchun Mountains by combining the plant art installation with the transparent light and shadow technology of electrified glass, and reveals the Chinese people's pursuit of an ideal living environment full of poetic charm and the unity of nature and man. "Xianghe Yiju" is an innovative space progressive panoramic image space, with multi-layer gauze and image light and shadow strengthening the level and depth of space. With the representative themes of The Painting of the Eighteen Scholars and The Painting of the Forty Scenes of the Summer Palace, the audience is immersed and traversed in depth, making the audience feel like stepping into the painting, from the rhythm of the twigs and leaves and the breathing of flowers and birds, from the ecological interest of the literati residence to the royal garden, from the four seasons of spring, summer, autumn and winter, to feel the close combination of gardening and life, highlighting that a good ecological environment is the most inclusive well-being of the people's livelihood. "harmony and symbiosis" reflects the innovative development of contemporary ecological civilization. The space is transformed from a symmetrical progressive traditional Chinese space to a modern landscape image space that emphasizes block changes. The audience is like walking on a huge blueprint, overlooking green mountains and waters, and full of vitality. Scenarios of major achievements in the protection and construction of contemporary ecological civilization in China are immediately visible, affirming China's sense of ecological responsibility of "harmonious coexistence" and the win-win global view of "embracing all rivers." The whole exhibition also reached a climax.

As shown in, the opening and closing changes of the whole spatial pattern and the involvement of the media are integrated with the space, and the media changes from point to line and then to immersion in the space, leading the audience to change their emotions from exploration to immersion, from pursuit to sudden openness, thus forming a novel and overall narrative experience (**Figure 4**).

5. Discussion

To summarize, this paper summarizes the four core elements of "space," "matter," "media" and "people" by combing and analyzing the evolution trend of academic

Figure 4.
Space and media narration of the Ecological Culture Exhibition in China Pavilion of the International Horticultural Expo.

development related to integration narrative design, and demonstrates the landing of the proposed integration narrative design ideas and methods through detailed discussion and exploration, as well as the exploration of theories and methods oriented to media and space integration narrative It is practical, scientific and of great forward-looking value. For example, the exhibition design of the Confucius Museum and the China National Pavilion of the World Horticultural Exposition has won more than 10 important design awards at home and abroad, and has become one of the important topics for media reports and discussion in the cultural and museum circles. Among them, the total number of visitors to the design series of the China Pavilion of the World Horticultural Exposition by China Xinhua has exceeded 2 million, and the number of on-site visitors has also exceeded 5 million during the half-year session, which has become an important phenomenal work in China's cultural and museum industry in recent years. In addition, the following five points of thinking and inspiration have also been formed in the process of the rich practical experience of the front line.

5.1 The importance of curators' "media literacy": Increasingly prominent

In the exhibitions of the museum, communication is the purpose, and planning is the overall planning process to achieve the purpose. The success of the planning largely determines the attraction and success of the exhibition. Planning is a logical thinking that precedes text compilation and artistic design. It is a blueprint planning after comprehensive consideration of the theme, content, communication purpose, spatial structure and media means. In the current new exhibition planning activities, the understanding and understanding of the media has become an important quality of the curators, an important factor determining whether the exhibition planning is attractive and progressiveness, and an important reference and measurement factor for the later official and public evaluation criteria.

5.2 Integration narrative design method has become a key link in contemporary exhibition design

Text narration has a relatively mature mode. The first step of thinking and work of exhibition planning often starts from text narration. For example, for celebrity introductions, it is often explained from the character's life background, life experience,

intellectual contribution, influence of later generations and other aspects, which is natural and logical. But in museums, we need stronger emotional guidance and more focused interpretation paradigm. This kind of narration starts from the understanding of the main characteristics and characteristics of the exhibition theme and content, and comprehensively considers the purpose of exhibition communication, the conditions of architectural space, the possibility of exhibition streamline, the natural tendency of audience behavior, the guidance of audience emotion, the use of large space media and other elements, and echoes the logical narration and emotional clues, and integrates the space narration and media experience, so as to achieve the effective reconstruction of the integrated narration.

5.3 Design trend of museum exhibition under integration narrative: theater and theme

With the help of media means, the museum space tends to be a "mobile drama stage." The audience walks through scenes one by one, feels different spatial expressions, accepts the information conveyed by different media, perceives the turning changes of the narrative plot, and participates in various activities to guide the audience's cognitive and emotional experience. In the integration narrative, the "theatrical" and "thematic" approach has become an effective means used in the industry. It also uses the concept of "screen" in the stage language to connect the structure and logic of the narrative and guide the audience's behavior (activities, emotions) actively and unconsciously.

5.4 Cross-disciplinary cooperation is an important way to stimulate new ideas

The design and research of integration narrative space involves many disciplines, such as history, archaeology, museum, communication, architecture, art design, new media, and so on. It requires interdisciplinary and cooperative research and personnel training with complex knowledge structure to realize the integrated, systematic and event-based comprehensive narrative mode and new knowledge dissemination system. In the interdisciplinary team, designers' space awareness, visual thinking and media literacy play a key role in the creative transformation from text narration to integrated narration, but at the same time, attention and experience accumulation from the perspective of content creation, narrative logic and communication audience cannot be ignored. These organic integration with space, media and vision can help the design team to promote more targeted, innovative and diversified creative transformation and generation.

5.5 Training of new creative talents oriented to integrated narrative: Imminent

The process of transformation from knowledge text to exhibition script is an important stage of creative transformation, and many breakthrough and important ideas are often generated at this stage. Traditionally, the transformation of this stage is often completed by experts who provide knowledge, but this often leads to the little difference between the exhibition script and the knowledge text, which is still limited to the text narrative thinking, and has not effectively completed the transformation to the integrated space exhibition language, and it is difficult to effectively stimulate the large design creativity. In the future, the chief director of integrating narrative space needs content and story creators with space and esthetic experience, or space

designers with macro logic consciousness and narrative ability, content creativity and exhibition thinking. Only by breaking through the inherent professional category and thinking paradigm and integrating multidisciplinary knowledge and experience can we play a leading role in the integration of narrative space and bring creative breakthroughs and systematic innovation. Therefore, the guidance and training of cross-creative talents and the discussion, setting and teaching of relevant courses or discipline systems are the initial core and focus of the current work in this field, and are also in urgent need.

6. Conclusion

In conclusion, the idea and method of integrating space and media narrative proposed in this paper is a relatively new solution and design understanding put forward by the author's team in view of the cutting-edge changes in the development of the industry in the face of new technological challenges in museums over the years. Although it has the meaning of preliminary exploration, it has also obtained good feedback and verification. Therefore, the participation of digital media and other elements is not only a useful supplement to the new museum space, but also an active builder of the new museum space. Its involvement will reconstruct our understanding of the narrative system of museum space, and bring new ideas and creativity in narrative mode, space construction and even museum architectural design. Looking forward to the future, with the media narrative occupying an increasingly important position and role in the museum space narrative, the designers' understanding of the museum's social education value and attention to the audience's behavior are becoming clearer and clearer. In combination with the systematic training of interdisciplinary disciplines and the designers' cross-learning, we believe that the future will be more systematic and systematic integration of narrative design ideas, concepts, strategies, methods and even systems and paradigms, It will take shape gradually. On the other hand, we also hope to have close communication and partnership with more relevant research teams abroad, so as to make greater research contributions.

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Chapter 6

Building a Museum Facility at the Local Level in the Conditions of the Slovak Republic, Example of the Town of Považská Bystrica

Karol Janas, Michaela Haladejová and Zuzana Haladejová

Abstract

The Town of Považská Bystrica is currently establishing a museum facility, which will be considered a key cultural institution under the municipality administration. Its purpose will be to make available local history, archeological findings and archival documents as well as various educational activities for schools and public using modern digital technologies.

Keywords: museum facility, modern technologies, education, exposure, Považská Bystrica

1. Introduction

The protection and promotion of cultural diversity is a great challenge of the twenty-first century. In this context, museums and museum facilities are considered the main means of protecting tangible and intangible heritage. Museums represent a place of cultural mediation, intercultural dialog, learning, discussion and education. In addition, they play an important role in formal, informal and lifelong learning as well as in the field of sustainable development.

Museums are living public spaces having potential to address the general public and therefore play an important role in developing social ties, building active citizenship and collective identity. Museums should be available to everyone and should strive to be physically and culturally accessible to everyone, supporting social inclusion. They create space for reflections and discussions on historical, social, cultural and scientific topics. Moreover, they have a huge potential to build public awareness of the value of cultural heritage, support economic development, especially through cultural and creative industries and tourism.

In the Slovak Republic, several towns and municipalities have decided to build their own museum or museum facility in recent years. Since the functioning of museums is mostly ensured by the state or self-governing regions, towns and municipalities opt for museum facilities. From the point of view of organization of operation and also of establishment or operating costs, simpler criteria are imposed on museum

facilities. Also, the operation is less complicated and the operational costs are less demanding for scientific or professional activity.

From the point of view of the current legislation, a museum facility functions as a specialized legal entity or an organizational unit of a legal entity or a specialized facility that acquires objects of cultural value and makes them available to the public for the purpose of knowledge and esthetic experience through specific means of museum presentation. Its founder is authorized to apply to the Slovak National Museum for registration in the Register of Museum Facilities and to request professional guidance.

A similar kind of museum facility is planned and currently being created also in the Town of Považská Bystrica. The content of the work of the museum facility will be to make local history, archeological findings and archival documents available to the residents of the given municipality and region. An important role that museum facilities focus on is pedagogical activity in cooperation with local schools, as these institutions play an important educational role. Changes related to the development of information and communication technologies (ICT) are currently opening up new opportunities for museums in the field of care, study, building and dissemination of heritage and related knowledge. They are currently penetrating every area of life; therefore, it is important to adapt to this trend in museum education as well.

The museum facility works closely with the local state archive, from which it acquired many local history documents which are about to be digitized. It also cooperates with higher museums at the level of the self-governing region, from which it obtained materials of archeological and natural history provenance. From the professional point of view, the museum facility cooperates with the Alexander Dubček University of Trenčín. The Town of Považská Bystrica provides the exhibition space for the operation of the museum facility and also fully covers its operation.

2. The idea of creating a museum facility in Považská Bystrica

The idea of creating a museum facility in Považská Bystrica emerged in 2020. It followed the previously accepted concept of protecting the town's cultural heritage. This was reflected in the adoption of a Generally Binding Regulation of the Town of Považská Bystrica, which adopted the principles of protection of cultural monuments in the town, not protected by the state with special regulations. This adopted regulation represented an extension of legal obligations at the local level. Despite the requirements these extended regulations brought to the owners (a large part of the monuments was not owned by the town, but by private individuals or churches) of cultural monuments, this principle met with general support.

The decision to establish a museum facility in Považská Bystrica arose at the beginning of 2021. It assumed a 2-year preparatory process. Part of it was the decision of the mayor of the town, who decided to establish a working group, which was to determine the content and scope of the professional focus and scientific activities of the town museum facility. The commission was made up of employees of the municipality, whose agenda includes culture, communication, and town development. To the commission were invited as expert advisors the director of the State Archive in Považská Bystrica and the director of the National Museum, managed by the Trenčín Self-Governing Region, where Považská Bystrica as a town belongs administratively. With these institutions, long-term professional cooperation is planned for the museum workplace.

The participation of employees of the Town Development Department was also important. After determining the professional and scientific focus of the museum, they were to prepare suitable spaces and ensure the necessary material background for the exhibited items. The working group also proposed some specific solutions. The group designed the concept of the museum facility as a priority historical museum, focused on the history of the Town of Považská Bystrica. It suggested to place in the entrance hall the heraldic symbols of the town, from the oldest to the youngest ones. As part of the museum, a reference library containing all the books published in the past and referring to the Town of Považská Bystrica was proposed. In addition, all promotional materials referring to the town and its subjects printed in the past should be placed here. It is assumed that the library will be progressively supplemented in a long-term and complementary manner and will thus create an important base for scientific workers and students dealing with the Town of Považská Bystrica. The working group proposed to include in the museum facilities special exhibitions dedicated to the history of the town in the twentieth century, important personalities acting in the Town of Považská Bystrica as well as an exhibition dedicated to the Engineering company Považské strojárne, which significantly influenced the development of the town. The state archive has committed to borrow for the expositions of the museum facility historical maps, authentic instruments and documents related to the history and development of the town. The study room is also planned to be developed; this room should serve as lecture room for researchers, museum staff and external experts for primary and secondary schools located in the town.

"It was also decided that folk costumes, which map the folklore traditions of the town and its immediate surroundings, will also be part of the museum exposures. They complement other funds appropriately, even if they do not form the main sphere of research of the museum facility. The costumes are an integral part of the culture and history of the town's inhabitants" [1]. "The costumes are interesting in their decoration and point to local and regional specifics due to their local and regional origin" [2]. The museum facility of the Town of Považská Bystrica acquired them as a gift from collectors and also through long-term purposeful activity, as they form patterns for today's sewn costumes used by folklore ensembles acting in the town. "The folk costumes are placed in a special depository. The museum facility must comply with strict conditions for their protection and exposure" [3].

3. The establishment and structure of the museum facility in Považská Bystrica

"Since the creation of a unified network of museums and galleries, town museums have been specialized in town history or natural and social phenomena related to its historical and cultural needs" [4]. Despite the disintegration of the unified network, the focus and specialization of town museums and museum facilities remained unchanged. Today, the activities of museums and museum facilities are governed by legislation that determines their activities. "This legislation directly regulates their tasks, activity and operation as well as the conditions of their creation and dissolution. At the same time, the legislation defines basic professional activities they must respect and follow" [5].

According to the current legislation, the role of towns and municipalities is to ensure the construction and operation of cultural facilities, establish cultural organizations and create suitable conditions for cultural, educational and artistic activities.

"An important task of the municipalities is also to inventory and make cultural heritage available. Scientific research will play an important role in the process of preservation, protection and evaluation of museum exposures" [6]. However, the preservation must be connected with other important activities that the museum facility in Považská Bystrica will fulfill. "Since the museum facilities will be considered a key cultural institution, it should focus on documentation, collection-building, scientific-research, methodological-advisory, cultural-educational, project, information, presentation, organizational and publication activities" [7].

The museum facility in Považská Bystrica will have a classic structure of working professions in the area of administration, care of collections, operation, services and education. Since it is a newly built museum facility, initially several job positions will be accumulated. After completion and putting into full operation, individual work professions are expected to become independent. "For professional education, the museum facility will follow the basic curriculum for the education of museum professions, defined by the International Committee for the Training and Personnel" [8]. "The International Commission operates within the framework of the International Council of Museums, whose activities focus mainly on cooperation, exchange of knowledge, dissemination of knowledge and awareness about museums, education of museum workers, improvement of professional standards, creation and promotion of professional ethics and protection of cultural heritage" [9]. "It is characterized by five areas of professional competences. These include general competences, museological competences, managerial competences, museum-pedagogical competences and competences for collection management" [10].

4. The main task of the museum facility in Považská Bystrica

Permanent exhibitions will be a key medium for the fulfillment of the main task of the museum, which is to preserve collections in the interest of the development of society and the interpretation and promotion of cultural heritage. It will be focused on the history of the Town of Považská Bystrica and its nearby region. It will be made up of objects of material cultural heritage and also archival documents related to the history of the town. "The museum facility of the town is not interested in creating its own public archive, as there are strict legislative conditions for such an activity" [11]. In its activities, the museum facility will closely cooperate with the state archive, which will take over the professional care of the exhibited archival documents. The borrowed archival documents will complement the other collection funds that the museum facility will exhibit. They will be supplemented with photographs capturing the development of the town.

"The permanent exhibition will also include paintings from the collections of regional academic painters Imro Weiner Kráľ and Ján Rojko, capturing the town in various stages of its development" [12]. The permanent historical exposition will thus enable visitors to understand and accept the cultural heritage of the Town of Považská Bystrica. Thus "the most important collection items will be permanently available to visitors of the museum facility" [13]. "In order to achieve the expected attendance and fulfill the professional goals, it will be necessary to harmonize the professional focus with marketing and work with the public" [14]. Since the majority of society welcomes the existence of a museum facility in Považská Bystrica, communication with the public will be an important part of its tasks. The public considers museum facilities to be important in learning about the past, collecting, protection and

presentation of cultural heritage. "Therefore, it is important for the museum facility to directly shape the public's relationship to the museum through the marketing activities. Although the basic activity in the presentation of collection funds will be permanent exhibitions, the museum facility in Považská Bystrica will not avoid non-traditional forms of presentations that have the potential to attract to the museum facility further visitors" [15].

Cultural offerings of the collections from the museum facility will also be exhibited outside its premises. "Part of the collection materials will be exhibited in the premises of the Municipal Office in Považská Bystrica. It will be a part of the collections of fine arts, paintings and sculptures. In agreement with the state monument institute, in the premises of the municipal office will also be an exhibition of artefacts from parts of the original Stations of the Cross, saved before its complex reconstruction, which could not be reconstructed" [16]. Collection items related to the history of sports in Považská Bystrica will be permanently loaned and exposed in the Hall of Fame of Municipal Sports Clubs. The newly built social and business center Galéria in the town expressed interest in creating an exhibition that would consist of photographs in the form of large-scale posters from the time of the construction of Považská Bystrica. "The distribution of cultural offerings to such unusual spaces will enable the museum facility to raise awareness of cultural values in an innovative way" [17].

4.1 Educational and cultural activities in museum facility in Považská Bystrica

Currently, great emphasis is placed on raising the level of education in Slovak museums and galleries. "Many professionals are deepening their professional qualifications, especially in the field of art education in the context of contemporary art, new media, electronic media using the alternative and virtual educational space of museums. However, it should cover not only the field of art education, but all areas of education" [18].

Since in the case of the museum facility in Považská Bystrica it is an institution established by the municipality, this fact also determines the basic parameters of its activity. An important and integral part of the museum facility will be educational activities for pupils and students as well as for the public. The Town of Považská Bystrica considers activity in the field of museum pedagogy and cooperation with local elementary schools to be very important. "After all, especially school groups from preschool children to adolescents represent an important target group for museums and have the potential to create the highest percentage of regular visitors" [19]. Cooperation with schools will not be limited to one-time activities, but will be permanent. Our goal is to create special programs in which the visitors themselves can actively participate in the processes. By using ICT technologies, we will be able to explain, supplement, enhance or improve the education process in our museum. The aim of the lessons in the museums is to lead young people to think about the place where they live. "Pupils should acquire knowledge and skills that will enable them to overcome stereotypes, develop critical thinking and understand the symbols of objects and phenomena" [20].

Museum facility in Považská Bystrica can rely on the state educational program, which is the highest curricular document of Slovak education, when cooperating with schools. It is an open document that gives schools the opportunity to complete their own educational program based on specific regional and local conditions and requirements. "These regional and local conditions give great scope for the educational activity of regional museum facilities" [21]. In the case of the museum facility in Považská Bystrica,

focus will be on pupils and students who are usually visiting the museum for the first time, and there is the potential for repeat visits and long-term mutual interaction.

"Teachers, who are also in the position of visitors, have important role in this process. However, they expect help from the museum facility in filling gaps in knowledge. Cooperation between teachers and museum workers is therefore very important" [22]. The Town of Považská Bystrica considers educational activity as one of the main and irreplaceable task of the newly created museum facility. Education should take place in classical as well as modern methods. In addition to tours of the museum's exhibits combined with expert interpretation, model lessons in the museum's congress center are also planned. An important task will be the creation of joint long-term educational programs for museum facilities and elementary schools.

"Projects based on oral history, which are already successfully implemented in other museums, can be very attractive" [23]. "It will thus be possible to enrich period artifacts with the stories of the survivors, which will give them greater narrative value" [24]. Online education on the website as well as through digital technologies are also considered important. "Since in the case of museum pedagogue it will be a cumulative function with other professional activities, great emphasis is placed on quality education and professional training" [25]. Initially, the position will be combined with the public relations and museum marketing position. However, the goal is to create an independent position of museum pedagogue in the future. His task will be to make accessible the contents and topics of the cultural heritage of the Town of Považská Bystrica, especially exhibitions and expositions. Although in practice the museum pedagogue will deal mainly with partial and operational goals related to individual exhibitions and specific educational programs, in the long term the goals of museum pedagogy in the museum facility in Považská Bystrica must be more general. "They must be related to the overall educational strategy of the museum facility, the aim of which is to mediate the exhibits, their interpretation and building a relationship with them" [26]. It is intended to educate visitors of various target groups in an appropriate way by providing information about objects of cultural value, specimens, past and present events. "Qualification prerequisites are a master's degree in the field of history, theory and history of art or pedagogy" [27].

"Great emphasis in museum pedagogy is placed on the digitization of the collection fund, especially museum documentation, books, plans, maps, personal correspondence, archival documents, photographs and the painting collection of authors originating from the town" [28]. It is also planned to digitize one of the most endangered collection items, which consists of film recordings related to the Town of Považská Bystrica. The goal of digitization in the museum facility in Považská Bystrica will be to simplify and streamline access to cultural objects and facilitate their communication to the lay and professional public. It will enable fast and comprehensive inspections via a computer network. It will make the most frequently asked questions for museum workers available on the website. "The digitalization is also expected to make better use of the collections and provide significant assistance in educational activities. Digitized materials will be able to be used directly in schools during the educational process" [29].

5. Use of digital technologies

When creating museum facilities, our goal is to respond to the high expectations of visitors who are interested in simple and interactive information acquisition.

We want to interpret the information in an interesting and effective way. Our goal is to connect documented history with the present and use modern technology to engage all the senses, so that visitors can become a part of the history of our region for a while. In the museum, we want to implement interactive technologies, through which we will introduce parts of our collections to the public in an interesting way in the form of exhibitions or permanent expositions with the aim of increasing the positive relationship between the institution and the visitor. During the on-site visit of younger generation, we want to fulfill their expectations by adapting innovative technologies to communicate with them.

At the entrance to the museum facility, we plan to install an interactive kiosk, which is a very good aid in orienting the visitor during the first visit to the museum. It will be a source of information on the layout of individual exhibitions or expositions, providing basic information. The kiosk aims to replace the form of a paper guide. We plan to install further multi-touch screens in the museum premises, so that they provide greater openness to social sharing and will serve for interactive communication of the visitor with the museum's topics.

Moreover, we wish to deepen the experience of visiting the museum facility by using 3D glasses, through which the visitors will gain new experiences of entering virtual spaces. Through 3D visualization, we want to enable the visitor to walk through the historic center of the town, merge with the history of our municipality in multimedia form and experience the most beautiful period of the town's history.

Interesting and innovative projects of the museum will be a relaxation zone where the visitor can read bonus content about the exhibits or listen to various stories related to the history of our region. Another innovative tool will be a virtual mirror; thanks to this device the museum visitor can try out what she or he would look like dressed, for example, in period clothing or folk costume.

In the future, we also want to use a mobile application in the museum, which will create an engaged approach to the museum's topics and allow the public to use this application to move around the museum space and thereby mediate the acquisition of knowledge in an entertaining way. This application will encourage visitors to take tours focusing on the physical objects, not on their mobile device screens. The mentioned application will allow the visitor to listen to unique object descriptions and audio stories that adjust their content depending on the visitor's location and will direct them to a relevant place in the building.

6. Conclusion

We live in an era where people spend most of their time in front of device screens and have an almost always available internet connection. Therefore, it is important to understand that as society changes, so do the visitor's demands on the cultural institutions, including museums. The current internationally recognized definition of a museum according to ICOM1 states: "A museum is a not-for-profit, permanent institution in the service of society that researches, collects, conserves, interprets and exhibits tangible and intangible heritage. Open to the public, accessible and inclusive, museums foster diversity and sustainability. They operate and communicate ethically, professionally and with the participation of communities, offering varied experiences for education, enjoyment, reflection and knowledge sharing" [30]. However, the question is whether the above definition of a museum as an institution reflects the needs and possibilities of the current digital age. Therefore, when planning the museum

facility, the Town of Považská Bystrica is interested in providing non-traditional informal educational experiences with an effort to meet the increasingly demanding expectations of visitors of all age categories by adapting innovative technologies to the activities of the museum. The municipality perceives that ICT technologies are very widespread among museum visitors today and therefore wants to benefit from this fact. Information and communication technologies have been the most dynamic and very intensively growing sector in Europe in recent years. Their development gradually affects all areas of society's life, not excluding institutions that manage objects of cultural value and make them available to the public for the purpose of learning. Technical devices such as kiosks, tablets and multi-touch devices allow the condensation of information in a limited space, thus improving its accessibility without overcrowding the physical space.

Nowadays, museum tours have to respond to the high expectations of visitors. They are interested in simple and, if possible, interactive acquisition of information, but at the same time, it must be interpreted in an interesting and effective way. However, it is important to realize that the museum artifacts themselves, as well as the themes of the exhibitions, must remain a permanent area of attention at all levels, regardless of what technology is used to increase public interest.

According to the currently valid legislation in the Slovak Republic, the task of local governments is to ensure the construction and operation of cultural facilities, establish cultural organizations and create suitable conditions for their cultural, educational and artistic activities. An important task of local governments is also to preserve and convey the cultural heritage of previous generations, which is an inseparable part of culture and history.

For the Town of Považská Bystrica it is a great challenge and responsibility to establish a museum facility, since the initiator of the establishment of the facility is the municipality itself. The municipality will provide suitable representative spaces and ensure the necessary material background for the exhibited objects. The museum facility in Považská Bystrica will be considered a key cultural institution focused on documentation, collection-building, scientific, educational, cultural, presentation, publication and information activities.

In order to develop and increase the historical awareness of the population of the entire region and work with the younger generation, it is important not to limit the functioning of the museum to one-time activities. On the contrary, the cooperation must be permanent. In the current, dynamically changing world, museums have their specific position. On the one hand, they are a stable, highly professional institution, on the other hand, they are forced to defend their position in a highly competitive environment. It is essential that the museum facility in the Town of Považská Bystrica will be able to effectively and permanently communicate with the public, especially visitors, and effectively use the possibilities of the virtual environment and social networks in order to become a center of community life and reaching new visitors. Therefore it is important, that the museum facility, through its marketing activities, directly shapes the public's relationship to its activities also through the systematic building of its identity.

Despite the fact that the public perceives traditionally museums as a symbol of conservatism and stability, the museums have undergone significant changes in terms of setting priorities and forms of operation. "Today, we are working together to ensure that museums are perceived as interesting institutions that purposefully communicate with the public through the entire complex of their activities" [31]. The task of the newly established museum facility will be to attract the young generation and

thus support their interest in the history of the town and create a positive relationship with the municipality where they live.

We believe that the museum facility in Považská Bystrica will contribute to the interest of the professional and lay public, and especially young people, in visiting this modern institution and thus, we will be able to contribute to the preservation of the history of our region and the transmission of real values from generation to generation.

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This book presents perspectives of the virtual world in the sphere of cultural heritage presentations in the museum environment. Virtual reality can be used in museums to not only present and educate but also help to protect cultural heritage assets for future generations.

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