TEME, Vol. L, Nº 1, January – March 2026, pp. 131–152

Review article
Received: April 9, 2025
Revised: June 10, 2025
Accepted: August 29, 2025

https://doi.org/10.22190/TEME250409010M
UDC 316.74:004.9(497.11)

IMMERSIVE TECHNOLOGIES FOR HERITAGE INTERPRETATION IN THE CULTURAL INSTITUTIONS OF SERBIA

Ivana Manevska*, Tatjana Pivac, Snežana Besermenji, Lenka Istijanović

University of Novi Sad, Faculty of Sciences,
Department of Geography, Tourism and Hotel Management, Novi Sad, Serbia

ORCID iDs: Ivana Manevska https://orcid.org/0009-0000-6927-1827
Tatjana Pivac https://orcid.org/0000-0002-1660-1295
Snežana Besermenji https://orcid.org/0009-0008-1163-3889
Lenka Istijanović https://orcid.org/0009-0006-3402-5697

Abstract

The interpretation of cultural heritage is a key component in preserving and promoting cultural identity, providing an opportunity for the audience to connect more deeply with cultural heritage content. Modern technologies, such as virtual reality (VR) and augmented reality (AR), enable new ways of presenting heritage through an interactive and engaging approach. This research was conducted in 14 cultural institutions in Serbia with the aim of examining the use of immersive technologies as tools for cultural heritage interpretation. The results indicate that, although most employees in these institutions recognise the potential of immersive technologies, their application remains limited. The main challenges include a lack of financial resources, technical infrastructure, and specialised employee training. Despite these limitations, cultural institution employees expressed openness to innovation and interest in improving their digital skills. The findings of the study suggest that the introduction of immersive technologies can significantly enhance visitor experiences and promote cultural heritage. At the same time, this research highlights the necessity of systematic investment in digitisation and employee training to ensure the broader implementation of these technologies in Serbian cultural institutions.

Key words: immersive technologies, virtual reality (VR), augmented reality (AR), cultural heritage interpretation, cultural heritage digitisation.

* Corresponding author: Ivana Manevska, University of Novi Sad, Faculty of Sciences, Department of Geography, Tourism and Hotel Management, Novi Sad, Serbia | ivanam1998.im@gmail.com

ИНТЕРПРЕТАЦИЈА ПУТЕМ ИМЕРЗИВНИХ ТЕХНОЛОГИЈА У КУЛТУРНИМ ИНСТИТУЦИЈАМА СРБИЈЕ

Апстракт

Интерпретација културног наслеђа представља кључну компоненту у очувању и промоцији културног идентитета, пружајући могућност да се публика дубље повезује са културним садржајем. Савремене технологије, као што су виртуелна реалност (ВР) и проширена реалност (АР), омогућавају нове начине представљања наслеђа, који укључују интерактиван и ангажујући приступ публици. Ово истраживање је спроведено у 14 културних институција у Србији, са циљем испитивања употребе имерзивних технологија као алата за интерпретацију културног наслеђа. Резултати указују да, иако већина запослених у овим установама препознаје потенцијал имерзивних технологија, њихова примена је ограничена. Главни изазови су недостатак финансијских средстава, техничке инфраструктуре и специјализоване обуке запослених. Упркос овим ограничењима, запослени у културним установама изразили су отвореност према иновацијама и заинтересованост за унапређење својих дигиталних вештина.Налази истраживања показују да увођење имерзивних технологија може значајно допринети побољшању искуства посетилаца и промоцији културног наслеђа. Истовремено, ово истраживање указује на неопходност систематског улагања у дигитализацију и обуку запослених, како би се обезбедила шира примена ових технологија у културним установама Србије.

Кључне речи: имерзивне технологије, виртуелна реалност (ВР), проширена реалност (АР), интерпретација културног наслеђа, дигитализација културног наслеђа.

INTRODUCTORY NOTES

With the rapid development of technology worldwide, the need has arisen to explore the relationship between interpretation and immersive technologies applied in cultural institutions. In line with this, the present study first aimed to determine how immersive technologies have been implemented in various cultural institutions across the globe. The focus was then placed on identifying how these technologies are utilised within cultural institutions in Serbia. The information obtained will provide insight into how immersive technologies can be implemented as an interpretative tool to enhance the quality of visitors' cultural experiences.

The concept of interpretation refers to a range of activities designed to raise public awareness and improve the understanding of cultural heritage sites. This includes printed and electronic publications, public lectures, on-site and off-site exhibitions, educational programs, community initiatives, as well as continuous research, training, and evaluation of the interpretation process itself (ICOMOS, 2008). Tilden (1997) defines interpretation as a means of communicating ideas and emotions to visitors, with the

intention of enriching their understanding and appreciation of the world, and their place in it.

Different approaches to cultural heritage interpretation can have a significant impact on visitors, by contributing to the development of awareness regarding the value of cultural heritage (Nyaupane, 2023), enabling a better understanding of one's own cultural identity, and strengthening connections with other cultures (Shalaginova, 2012). Technology has the potential to open new doors in terms of understanding, accessibility, and interaction between visitors, artworks, and cultural objects (Wang, 2024).

Modern technologies have had a profound impact on communities, culture, and spaces, enabling new modes of communication, interaction, and mediation between museums and visitors (MuseumNext, 2019). Numerous studies from Germany (Hess et al., 2018), Sweden (Boogh, 2013), and the Netherlands (Dijkshoorn et al., 2018) highlight the presence of digitalisation in museums. These encompass a wide range of activities, from collecting digital photographs, to maintaining interactive collections on websites. This has largely been facilitated by the commercialisation of numerous new technologies, such as smartphones, virtual and augmented reality, and the internet, allowing museums to integrate multiple media formats simultaneously in their interpretative efforts. The significance and value of such communication channels became particularly evident during the crisis caused by the COVID-19 pandemic, when technology served as a crucial link between people and culture (Ciecko, 2020). Interactive interpretation is a key strategy for attracting public interest and engagement, whether through interpreters or interpretative devices (Errichiello et al., 2019).

The impact of immersive technologies extends far beyond a single field and will undoubtedly have profound and far-reaching consequences across numerous sectors in the years to come (Load, 2023; Baltezarević, 2024). Their rapid development and applications open opportunities for revolutionary changes in accessing information, acquiring skills, and creating new forms of interaction. The transformation of traditional cultural institutions in Serbia into digitised institutions enriched with immersive technologies is still in its early stages. However, many museums have begun exploring the potential of these technologies, and their leadership and staff have expressed interest in implementing changes and modernising these institutions.

In this context, the aim of the survey conducted within this study was to assess the extent to which immersive technologies are utilised as interpretative tools in cultural institutions, and to determine the perception of managers and employees regarding the use of immersive technologies in these institutions.

Theoretical Frameworks for Understanding Immersive Technologies in Cultural Heritage Interpretation

Examining the results of previous research, it can be concluded that technology has played a significant role in the development of cultural institutions (Poulopoulos & Wallace, 2022; Bakhshi & Throsby, 2012). During the 1960s, technology in museums was primarily used for documentation and collection management. Later, with the advancement of information and communication technologies, the focus of museums shifted from collection objects to visitor experiences. This shift served as a driving force in the debate on the connection between newly developed technologies, museum interpretation, and visitor experiences (Ch'ng et al., 2019; King et al., 2016). According to previous studies, museums have redefined their purpose and adopted a 'visitor-oriented' approach, to provide audiences with an immersive experience. Thanks to the implementation of new technologies, modern museums have been rebranded as 'digital virtual museums' (Elgammal et al., 2020; Shaharir & Zanuddin, 2018).

The term 'immersion' in the context of technology describes the extent to which computer displays can provide a compelling illusion of reality, by stimulating human senses (Slater & Wilbur, 1997; Baltezarević, 2024). In today's constantly connected and dynamic world, immersive technologies have the potential to transform the daily lives of billions of people. From a global economic perspective, virtual and augmented reality are becoming increasingly important worldwide, rapidly emerging as standard approaches to learning, training, and practical applications across various sectors, including education, the military, healthcare, and other fields (Baltezarević, 2024). Thanks to innovative immersive technologies, visitors can interact with museum exhibits (Zhang et al., 2024). Additionally, through dynamic visual displays, lighting, and sound effects created using immersive technologies such as augmented reality, 3D projections, and holography, visitors gain the impression of being transported into a different environment (Yin, 2024; Ma et al., 2023).

Exponential technological advancements offer increased internet speeds and accessibility, further bridging the digital and physical worlds through interconnected devices, including mobile phones. These developments present new opportunities for the preservation, archiving, promotion, utilisation, and reuse of cultural heritage (Damala et al., 2019; Devine & Tarr, 2019; Zhou et al., 2019).

Previous research has also highlighted that cultural organisations are engaging in new and more frequent interactions with users, as they are now two integral parts of the same process. For the first time in history, users and institutions managing information share a common informational space through the internet. This has created new opportunities for cultural organisations to explore, leverage, and connect cultural information with a global online audience. The use of digital technologies and networks can

significantly enhance the perceived value of cultural heritage collections among visitors (Ch'ng et al., 2019; Ghani & Shamsuddin, 2020).

Tilden's principles of interpretation (Tilden, 1957) provide a valuable foundation for creating engaging and effective interpretive experiences. By combining these principles with immersive technologies such as virtual and augmented reality, it is possible to develop even more powerful and meaningful interpretive experiences.

Peng highlighted that smart museums utilise immersive technologies that break the limitations of information collection. In the past, data collection relied on semi-automated and manual approaches, which had long cycles and specific spatial requirements. In contrast, the data collection process in smart museums is based on a fully automated system that includes data acquisition, storage, management, and sharing, transforming it into a dynamic method. According to Peng, a smart museum focuses on visitor needs, and by acknowledging their perspectives and preferences, it strives to provide a pleasant service that stimulates visitors' enthusiasm and encourages their participation (Peng, 2022).

According to Barbieri et al. (2017), virtual museum (VM) systems represent a highly effective solution for conveying cultural content, thanks to their engaging and educational approach. E-visitors have the opportunity to explore virtual museums and galleries using their computers, tablets, and smartphones. Through VM installations, visitors can view digitised artworks and explore reconstructed historical sites. The goal of implementing 3D technologies in museums and galleries is to create a system that provides an enjoyable, informative, and immersive experience for virtual museum visitors. In such an environment, there are more opportunities for learning through educational games, than in traditional museums and galleries (Barbieri et al., 2017).

There are also studies that analyse the impact of immersive technologies as interpretation tools in working with children. One study found that the application of digital technologies in museums influences children's critical thinking about history, stimulates their curiosity, creates memorable moments, initiates discussions, and fosters a desire for further exploration of museum exhibits of all types (Andre, Durksen & Volman, 2017). Another study emphasised that interaction between schoolchildren and AR applications encourages children to actively explore the museum and engage with objects and artefacts in new ways (Moorhouse, Tom Dieck & Jung, 2019).

Previous research has identified several methods of interpretation used in virtual exhibitions. Initially, the trend was to employ static exhibition methods that relied on text or images, resembling digitised collections or books. More recently, by integrating various media and communication technologies, more effective and compelling exhibition methods have gained popularity. A significant difference in exhibition methods can be observed in terms of visualisation and user interaction, including high-resolution images, video and hypermedia presentations, Web3D, VR, AR, virtual

exhibitions, immersive worlds, sensors used to collect visitor data, and educational applications designed to enhance or create new experiences during virtual tours (Amato et al., 2017; Ch'ng et al., 2019; Damala et al., 2019).

Virtual Reality as a Tool for Interpretation in Cultural Institutions

Romanelli argues that technology enables museums to design virtual museums as digital projections of traditional museums, while also creating opportunities for promoting social values and innovation, engaging users in the process of generating cultural content (Romanelli, 2021). Pavithra highlights that the first prototypes of technology enabling virtual reality emerged in the 1970s, and defines virtual reality as a simulated experience that can be either similar to or completely different from the real world. The roots of virtual reality lie in a combination of 3D still images, computer games, computer-assisted instruction, simulator equipment, and more. Some VR installations present immersive environments through specialised headsets that replace or supplement the view of the real world. Virtual reality can simulate both real and imaginary events, ranging from a walk in the park, to an exploration of Mars (Pavithra, 2020).

Conducted analyses indicate that in virtual displays, digitised artefacts can be observed from any desired angle, with zooming capabilities allowing viewers to see even the smallest details, such as fine cracks or brushstroke traces. Additionally, archaeological remains can be reconstructed and visualised using computer-generated imagery (Amato et al., 2017; Kim, 2018).

Romanelli identifies three categories of virtual museums. The **brochure museum** is a website that provides future visitors with administrative information about the museum, such as opening hours, available services, collection types, room layouts, displayed objects, and contact details. The **content museum** is a website that makes museum collections accessible, presenting content in an object-oriented manner. The **learning museum** is a website that establishes a personalised relationship between visitors and the museum, offering different entry points for virtual visitors based on age, background, and prior knowledge (Romanelli, 2021).

Dragičević and Bagarić examined the attitudes of ten managers and employees in art galleries in Dubrovnik toward virtuality, through an empirical study conducted in 2015. Their findings indicate that visitors of virtual art galleries can positively contribute to the promotion of traditional art galleries, despite the absence of specific promotional messages on their websites. A notable example is the Apolon Online Art Gallery in Croatia, which offers virtual tours and promotional activities for its visitors (http://galerija-apolon); (Dragičević & Bagarić, 2019).

It is evident that virtual reality can be utilised to experiment with new forms of interpretation, storytelling, and creative expression, offering visitors of cultural institutions the opportunity to engage with art, history,

and science in novel and fascinating ways. A compelling example is the virtual tour of ancient Pompeii, which was brought to life in a virtual video guide created at Lund University in Sweden, and made available on the YouTube platform (2016).

Augmented Reality as a Tool for Interpretation in Cultural Institutions

Pavithra defines augmented reality (AR) as a technology that enhances the physical world by adding layers of digital information. Unlike virtual reality (VR), AR does not create artificial environments to replace the real world. Instead, AR appears within a direct view of the existing environment, adding sounds, videos, and graphics. A view of the physical environment of the real world with superimposed computer-generated images, thereby altering the perception of reality, constitutes AR (Pavithra, 2020).

Ding explains that augmented reality is a mobile technology attracting increasing attention from museum professionals, researchers, and educators, due to its ability to enhance visitor engagement and create additional value in the learning process (Ding, 2017). According to Ding (2017), AR applications benefit both visitors and museums for three main reasons:

- **Provides multiple layers of information**

AR tools enable visitors to transform their smartphones into pocket-sized screens that turn surrounding spaces into a stage for endless additional layers of information. Furthermore, compared to the widely used mobile option of scanning QR codes, which typically requires a manual tracking system, AR options in museum applications operate on an automatic image recognition system, allowing objects from the real world to be scanned (Ding, 2017).

- **A powerful tool for increasing interaction**

By offering AR applications that utilise location-based services, museums allow visitors to independently gather information and observe details of exhibited artworks. This way, visitors do not only acquire basic knowledge about the displayed artworks or exhibitions with the help of texts on gallery walls, but also gain access to an additional layer of information. When more information is made available in this manner, it facilitates discussions among visitors, and strengthens the connection between museums and their audiences (Ding, 2017).

- **A creative tool for education**

AR applications allow visitors to gain knowledge about exhibited artworks in an engaging and informative way. Additionally, they can encourage visitors to discover details about the displayed works, and deepen their reflections (Ding, 2017).

AR applications for cultural institutions serve as remarkable interpretation tools that encourage visitors to independently explore artworks,

and interact with them in an imaginative and engaging way. With the help of these applications, visitors can examine artworks more closely and learn more about them. AR applications can also present the story behind a given artwork, making the experience even more enjoyable and interesting for visitors. Cianciarulo (2015) found in his research that museums offering AR experiences positively influence individuals' curiosity to try new technologies, with people visiting museums specifically to experience AR, thereby increasing museum attendance. In this study, AR was particularly enjoyable for young children (Cianciarulo, 2015).

Conversely, web-based AR is another type of augmented reality that is more practical compared to application-based AR, primarily due to its accessibility and convenience. It can be used on any device with a web browser and does not require any additional AR application downloads. Many popular museums, such as the Louvre, the British Museum, the Metropolitan Museum of Art, the National Gallery, and the Smithsonian National Museum of Natural History, offer web-based AR on their websites.

Augmented reality is undoubtedly a valuable technological advancement that cultural institutions worldwide are beginning to adopt, to attract and further educate visitors about cultural heritage.

Mixed Reality as a Tool for Interpretation in Cultural Institutions

Pavithra defines mixed reality (MR) as a combination of the real and virtual worlds, where physical and digital objects coexist and interact in real-time. MR possesses numerous functionalities, such as physical environment mapping, gesture monitoring, language processing for voice recognition, and more, offering a real-life experience (Pavithra, 2020).

The motivation behind the development of MR systems lies not only in the desire to 'see' a virtual or digital layer or object, as is the case with AR systems, but also in enabling physical interaction and manipulation (Maas & Hughes, 2020). This very capability of interaction between virtual objects and the real world is what distinguishes AR from MR. However, many researchers and scholars view MR as synonymous with AR (Lungu et al., 2021). Pavithra argues that enterprises, in this case, cultural institutions, that implement MR achieve a high level of efficiency, as it provides an immersive experience and a personalised perspective without any distractions (Pavithra, 2020).

Examining the findings of previous studies, it can be concluded that augmented, virtual, and mixed reality are becoming standard in the ongoing transformation within tourism, hospitality, and cultural heritage management (Bae et al., 2020; Buhalis et al., 2019; Guttentag, 2010; Loureiro et al., 2020; Yung & Khoo-Lattimore, 2019). Although further research on mixed reality is necessary, it can be concluded that, with all its characteristics, it holds great potential for application in the interpretation of cultural heritage.

Immersive Games as a Tool for Interpretation in Cultural Institutions

Immersive games are defined as video games that transport the player into an alternative world, where, through the use of specific techniques, they achieve a higher level of identification with the character they are playing. This is accomplished through a combination of well-structured gameplay, a fully developed narrative, and extreme realism enabled by cutting-edge graphics. A realistic, open-world environment, enhanced by outstanding graphics, is a crucial element that makes these games captivating. As technology advances, with 5G becoming increasingly dominant and buffering issues diminishing, game development studios are now able to create a seamless user experience, even when transitioning between consoles, laptops, and mobile devices. The world of video games is evolving. Sensory stimulation is rapidly becoming an integral part of the gaming experience, rendering traditional handheld controllers obsolete and less appealing. To attract users, designers now incorporate significantly enhanced, full-body sensory experiences that include augmented reality and complete virtual reality simulations (www.arm.com/glossary/immersive-gaming).

A perfect example of cultural heritage interpretation through gaming was achieved in 2017 with the release of *Assassin's Creed Origins*, which recreated ancient Egypt. In addition to its fictional storyline, the game introduced a 'museum mode,' allowing players to participate in virtual tours of ancient Egyptian cities such as Alexandria, Thebes, and Memphis, guided by museum curators and historians (Nielsen, 2017; Ore, 2017).

Pavithra argues that new AR games offer a significantly improved experience for players. Game environments are no longer confined to the virtual sphere, but instead extend into real life, where players engage in specific activities (Pavithra, 2020). In cultural institutions, immersive games serve as an effective way to spark interest among individuals of all ages and backgrounds. These interactive exhibits enable visitors to learn at their own pace. Moreover, such games, which utilise virtual and augmented reality as well as interactive storytelling, can be tailored to each individual, allowing them to explore and discover cultural heritage from the comfort of their homes. As the gamification industry expands, cultural institutions seize the opportunity to showcase their heritage to a wider audience. These applications aim to actively and practically engage specific target groups of visitors in interacting with museum content and collections, through experimental activities designed to achieve educational and other objectives (Damala et al., 2019; Doukianou et al., 2020; Pescarin et al., 2018, 2020).

Gamification in cultural institutions aligns with all of Tilden's (1957) principles of interpretation. It is not a sterile process, as players have the ability to choose their character, environment, and difficulty levels. Additionally, the challenges they must overcome to advance to the next level stimulate learning, and the acquisition of information in an enjoyable way. The purpose of interpretation is to encourage the participation of diverse

groups, varying in age and interests. Since interpretation aims to present a comprehensive picture, games can incorporate a retrospective review of a historical event or artefact, and bring it back to life, allowing for a comparison between its role in the past and its significance today. Furthermore, gamification meets Tilden's final principle that interpretation should differ for children and adults. Some games contribute to strengthening the connection between cultural heritage and younger audiences, fostering faster learning and stimulating their curiosity to explore further as they grow older. This demonstrates that gamification represents a modern approach to interpreting cultural heritage for audiences.

METHODOLOGICAL FRAMEWORK OF THE RESEARCH

The aim of this research is twofold: first, to analyse the ways in which immersive technologies are implemented in cultural institutions worldwide, and second, to examine the current state of their application in Serbia. This was achieved through a review of relevant literature, which provides insight into global trends and examples of best practices. By doing so, the research aims to identify both the potential and the challenges of using immersive technologies as tools for interpretation. Based on the collected data, the study will offer guidelines for improving interpretative practices, and enhancing the visitor experience in Serbian cultural institutions.

To develop a questionnaire suited to the needs of this research, it was first necessary to identify questions that would be appropriate for the study. As a starting point, the doctoral dissertation by Stojšić (2020), *The Possibility of Applying Augmented and Virtual Reality in Geography Teaching and Learning*, was used. The questions from this study were modified to assess the perspectives of managers and employees in cultural institutions regarding the use of immersive technologies as tools for cultural heritage interpretation. The questionnaire consisted of two parts[1]. The first part covered the sociodemographic characteristics of respondents, such as age, gender, the cultural institution they represent, and their professional position. The second part of the research focused on examining the attitudes of managers and employees toward the digital competencies of their work teams. These questions aimed to determine whether respondents' colleagues, for instance, can confidently, critically, and creatively use information and communication technologies (ICT) in both their professional and personal lives. Additionally, managers and employees were asked how frequently they would like to use ICT, and whether their cultural institutions possess the necessary equipment for ICT implementation.

This set of questions was designed to better identify the digital skills of work teams across different cultural institutions. Furthermore, the questionnaire sought to assess the familiarity of managers and employees with

[1] https://docs.google.com/forms/d/1HJ1khqYhKBKihG197bscozVZ8UNI58UdS6J55a9ndA

the potential of immersive technologies, such as virtual and augmented reality devices, as well as the frequency of their use within these institutions. The questionnaire helped determine the extent to which web-based AR, AR applications, VR interactive exhibitions, VR gamification, and VR tours have been utilised, as well as the degree and number of 360° video recordings implemented by cultural institutions.

For the purposes of data collection and analysis, Google Forms and its data processing options were used. Microsoft Excel was applied for graphical representations, while the SPSS software was employed for conducting descriptive statistics.

RESULTS

The research was conducted in January 2023 by distributing a newly developed questionnaire via email to 50 cultural institutions in Serbia. A total of 14 cultural institutions responded to the request for participation: *The National Museum of Požarevac, The National Museum of Leskovac, The City Museum of Sombor, The Center for Fine and Applied Arts Terra – Kikinda, The Gallery of Fine Arts – Rajko Mamuzić Gift Collection, The National Museum of Niš, The National Museum of Pančevo, The Jewish Historical Museum, The Gallery of Matica Srpska, The Museum of Naïve Art Ilijanum, The Homeland Museum of Petrovac na Mlavi, The Homeland Museum of Jagodina, The National Museum of Serbia,* and *The Homeland Museum – Belimarković Castle in Vrnjačka Banja.*

During the data collection process, cultural institutions were contacted multiple times to encourage participation. A total of 50 institutions were reached through official email correspondence, with additional attempts made via telephone communication. Despite these repeated efforts, only 14 institutions responded and completed the questionnaire, while no responses were received from the remaining institutions. The research sample was predominantly female, with women comprising 78.6% of respondents, compared to 21.4% male participants. The largest proportion of respondents (42.9%) belonged to the 41–50 age group, followed by 28.6% in the 31–40 age group. The youngest (18–30) and oldest (51–65) age groups each accounted for 14.3% of respondents.

The questionnaire was designed to assess employees' digital competencies, their perception of the impact of ICT on cultural institutions, and the potential for implementing AR and VR technologies. Questions related to digital competencies were based on a Likert scale (1–10), where participants rated their team's confidence in using ICT with an average score of 7.8, their critical thinking with 7.7, and their creativity with 7.5.

Furthermore, the responses indicated that the use of ICT in cultural institutions had a positive impact on visitors' understanding of exhibits, as well as their motivation to revisit the institution. Managers and employees

expressed their intention to increase the use of information and communication technologies in the future, with 50% of respondents stating they would use them continuously, while 42.9% reported they would use them frequently.

A descriptive statistical analysis was conducted using SPSS, and the results are presented in Table 1. The table displays mean values and standard deviations for various items related to the use of ICT and immersive technologies in cultural institutions. The analysis included questions regarding the application of AR and VR technologies, as well as the possibilities for their implementation in institutional operations.

Table 1. Descriptive statistics on the use of information and communication technologies and immersive technologies in cultural institutions

Statement	Mean	Std. Deviation
The use of ICT in the cultural institution where I work facilitates visitors' understanding of cultural heritage.	4	0.784
The use of ICT in the cultural institution where I work increases visitor motivation.	4	0.961
If the cultural institution had the necessary ICT equipment, it would be able to plan for more frequent ICT use in the future.	4.36	0.633
I am familiar with AR technology.	3.57	1.016
The cultural institution where I work has developed AR applications for mobile devices (smartphones or tablets).	2	1.038
The website of the cultural institution where I work has the capability to implement Web AR interaction.	1.5	0.519
AR content is frequently used in the cultural institution where I work.	1.86	1.167
The cultural institution where I work possesses various types of AR smart glasses (e.g., Microsoft HoloLens 2, Magic Leap One).	1.86	0.363
I am familiar with VR technology.	3.57	1.222
The cultural institution where I work owns a VR headset.	1.71	0.469
A VR headset is frequently used in the cultural institution where I work.	1.79	1.188
VR interactive applications related to museum or exhibition displays are frequently used in the cultural institution where I work.	1.86	1.231
VR gamified content related to exhibitions is frequently used in the cultural institution where I work.	1.57	1.158
VR tours are frequently used in the cultural institution where I work.	1.79	0.975
The cultural institution where I work has created 360° films.	2.71	1.541

In the section of the questionnaire related to AR, participants rated their knowledge of AR potential on a scale from 1 to 5, with an average score of 4. Figure 1 presents the number of AR applications for mobile

devices (phones or tablets) created by the cultural institutions where the respondents are employed.

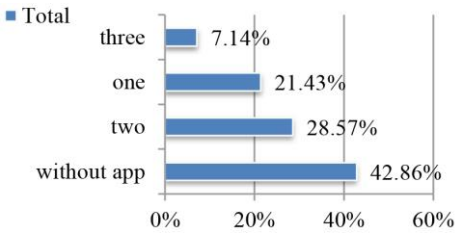

Figure 1. Number of AR applications created for mobile devices (phones or tablets)

Half of the respondents stated that their institution's website has the potential for Web AR integration, while the other half reported otherwise. Figure 2 illustrates the frequency of AR content usage in cultural institutions.

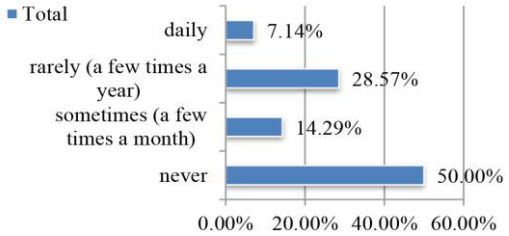

Figure 2. Frequency of AR content usage

Regarding VR-related questions, participants also rated their knowledge of VR potential on a scale from 1 to 5, with an average score of 4. Despite this level of familiarity, 71.4% of respondents stated that their institution does not own a VR headset, while 28.6% reported that their institution possesses this device. The use of VR content (such as VR applications, gamification, and virtual tours) was assessed as infrequent, typically occurring only a few times per year. Figure 3 shows the number of 360° films created by the cultural institutions where the respondents work.

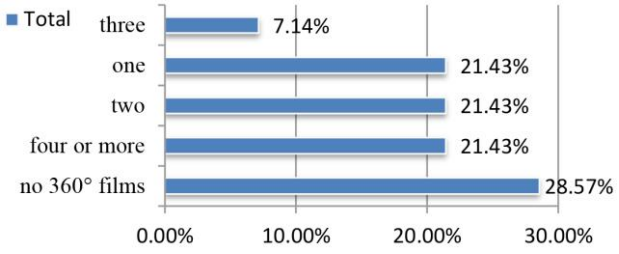

Figure 3. Number of 360° films created in cultural institutions

DISCUSSION

The research results indicate that ICT, including VR and AR, has the potential to enhance visitor experiences in cultural institutions; however, certain challenges in their implementation have also been identified. Employees in cultural institutions in Serbia reported a moderate to high self-assessment of their colleagues' digital competencies, suggesting a general readiness to adopt digital tools. However, the perception of creativity as the weakest component highlights the need for additional training in this area, particularly focused on the innovative use of new technologies. The findings emphasise the necessity of investment and education to improve the digital capacities of institutions. It is important to note that continuous education and technical support for employees will enable the more effective implementation of new technologies, making this aspect a crucial consideration in the strategic planning of cultural institutions. Similar findings were reported by Wang and Liu in their study, where they emphasised the importance of ongoing employee education for the successful digital transformation of museums (Wang & Liu, 2019). This underscores education as a key component in realising the full potential of these technologies.

Despite a strong awareness of the potential of VR technology, only a very small number of cultural institutions in Serbia possess VR equipment, indicating a lack of infrastructure. Even when VR content is used, such as 360° films and virtual tours, it is rarely integrated into the daily programs of institutions, limiting the potential for applying innovative approaches that enhance understanding and engagement with cultural content.

A study conducted by Shehade and Stylianou-Lambert included interviews with fifteen museum professionals worldwide to examine the ways in which VR is used in museums (Shehade & Stylianou-Lambert, 2020). Their research revealed that the majority of respondents (nine museums) use VR sporadically, primarily in the context of temporary exhibitions, while the remaining six museums have integrated VR technology into their daily operations. In two of the surveyed museums, the significant success of VR in temporary exhibitions influenced the decision to make this technology a permanent feature of their institutions. Respondents also shared their perspectives on the use of VR technology in museums. Half of them emphasised that VR provides a new mode of interpretation, allowing visitors to become personally engaged in the experience. They also highlighted that this technology helps people better understand art, objects, and concepts, while also encouraging them to re-evaluate their perspectives on a given topic (Shehade & Stylianou-Lambert, 2020).

Research by Pei et al. suggests that while VR can offer a more immersive experience, its successful implementation requires greater initiative in terms of development and application. It is particularly important for institutions to ensure adequate infrastructure that facilitates the effective use of VR technology, so that its full potential can be realised. The

quantitative analysis of their study showed that VR technology—both desktop and mobile—helps users recognise information more easily, while mobile VR provides a higher level of user satisfaction. Furthermore, desktop VR was rated as easier to use and learn, which may be a critical factor when deciding which technology to implement in specific contexts (Pei et al., 2023). The qualitative analysis, on the other hand, highlighted that mobile VR museums provide a greater sense of 'immersion,' while desktop VR museums offer better guidance through content. It is essential for each institution to carefully consider which technology best suits its specific needs and those of its visitors. Each VR format has its own advantages in presenting museum content (Pei et al., 2023).

Although half of the cultural institutions in Serbia have not integrated web AR on their websites, research has shown that employees recognise the potential of AR technology. The results indicate that, while there is a basic understanding of this technology, its practical application is limited. This situation is most likely due to financial and technological constraints, as well as a lack of expertise in developing and maintaining AR applications. It also points to the need for increased investment in the development of AR tools, as well as education on how to apply them.

In this regard, Ifeanyi believes that augmented reality has great potential to enhance visitor engagement and learning in museums, by providing personalised and interactive experiences. However, challenges such as technological limitations and the need for seamless integration remain. Ifeanyi argues that future research should focus on overcoming these obstacles to allow AR to contribute to the quality of museum exhibitions (Ifeanyi, 2024).

It is particularly important to consider the aspects related to the integration of this technology on the websites of cultural institutions, as such an approach can significantly improve accessibility and interaction with content. Piva, in his research on the "Ara Pacis" museum, reveals that the implementation of virtual and augmented reality in the exhibition of the family of Emperor Augustus and the city of Rome was a great success. In the first three months, 11,000 visitors came to enjoy the technology applied to one of the most important Roman artworks (Piva, 2017). These examples indicate that immersive technologies are redefining museum and gallery interpretation.

Recent studies underline that immersive technologies entail ethical and legal challenges, particularly regarding privacy, data security, accessibility, and psychological impact (Shadowen & Hosfelt, 2020; Slater & Haggard, 2020; Cox et al., 2024). In Serbia, the Strategy for the Development of the Electronic Communications System until 2027 stresses that technological adoption in public institutions must ensure information security and regulatory compliance (Government of the Republic of Serbia, 2024). Accordingly, immersive practices in cultural institutions should be

framed not only as innovative tools of interpretation, but also as processes requiring robust governance and ethical oversight.

Comprehensive research clearly shows that there is potential and interest among cultural institution employees for the application of immersive technologies. However, further investigation is needed to identify the key challenges cultural institutions face. A question arises as to whether the problem lies in management, the lack of skilled personnel to implement and maintain these technologies, or in government programs and policies that do not allocate sufficient budgets for their implementation.

Although some employees had not previously encountered these technologies, their responses showed initiative and a willingness to learn and adapt. Additionally, it is important to note that responses were received from only 14 institutions, which raises the question of why the other institutions were unwilling to participate in the research. It is possible that the reason lies in insufficient knowledge of these technologies, or a reluctance to publicly acknowledge that they are not up to date with current trends.

Despite these challenges, cultural institutions in Serbia enjoy great respect, both among the local population and internationally, as guardians of cultural heritage. This is precisely why this research emphasises the importance of finding ways to implement immersive technologies on multiple levels, as they have proven to be highly effective tools for interpreting cultural heritage in global practice.

CONCLUSION

Considering all available literature, it can be concluded that the implementation of immersive technologies as a tool for interpretation in cultural institutions yields very positive effects. Recognising the significance it holds in bringing cultural heritage closer to visitors, it is of great importance for cultural institutions to embrace immersive technologies as their ally on the path to higher-quality interpretation. Based on the data obtained from this research, it can be concluded that only a small number of cultural institutions in Serbia are utilising immersive technologies. However, despite this, the cultural institutions that participated in this study showed interest in their implementation.

It is important to note that the frequency of immersive technology usage is largely limited due to the lack of necessary equipment. This is primarily a result of the limited budgets allocated to these institutions, which are state-owned. Museums in Serbia are only beginning to adopt a new mindset oriented towards technological innovations, and investing in technological innovations within these institutions can be seen as a national investment in the cultural sector, which will create new opportunities for its further development. Therefore, there is both a reason and a need for further research into the advantages and disadvantages of using digital

technologies as tools for interpretation in the context of cultural institutions in Serbia. The adoption of AI demands a balanced approach that harmonises human, legal, managerial, and ethical factors. In addition, the development of new policies and protective mechanisms, as well as interdisciplinary collaboration among experts in informatics and related fields, is crucial to prevent biases and human rights violations in these new technologies (Škorić & Galetin, 2024).

The main limitation of this research was the small number of cultural institutions in Serbia that responded to the survey. The relatively small number of respondents prevented a realistic understanding of the attitudes of managers and employees in cultural institutions in Serbia toward the use of immersive technologies as a tool for interpreting cultural heritage. In line with this, future research could focus on overcoming this issue through face-to-face interviews with managers and staff in cultural institutions, as well as by examining the current application of immersive technologies in these institutions.

REFERENCES

Amato, F., Moscato, V., Picariello, A., Colace, F., De Santo, M., Schreiber, F. A., & Tanca, L. (2017). Big data meets digital cultural heritage: Design and implementation of SCRABS, a smart context-aware browsing assistant for cultural environments. ACM Journals – Journal on Computing and Cultural Heritage (JOCCH), 10(1), Article No. 6, 1–23. https://doi.org/10.1145/3012286

Andre, L., Durksen, T., & Volman, M. L. (2017). Museums as avenues of learning for children: A decade of research. Learning Environments Research, 20, 47–76. https://doi.org/10.1007/s10984-016-9182-0

Bae, S., Jung, T. H., Moorhouse, N., Suh, M., & Kwon, O. (2020). The influence of mixed reality on satisfaction and brand loyalty in cultural heritage attractions: A brand equity perspective. Sustainability, 12(7), 2956. https://doi.org/10.3390/su12072956

Bakhshi, H., & Throsby, D. (2011). New technologies in cultural institutions: Theory, evidence, and policy implications. International Journal of Cultural Policy, 18(2), 205–222. https://doi.org/10.1080/10286632.2011.587878

Baltezarević, R. V. (2024). Efekti imerzivnih tehnologija na globalnu ekonomiju. Baština, 63, 1–23. https://doi.org/10.5937/bastina34-51334

Barbieri, L., Bruno, F., & Muzzupappa, M. (2017). Virtual museum system evaluation through user studies. Journal of Cultural Heritage, 26, 101–108. https://doi.org/10.1016/j.culher.2017.02.005

Boogh, E. (2015). Samtidsbild/Contemporary images – A method of collecting vernacular photography in the digital age. Muse, 22 May. https://doi.org/10.1111/muse.12033

Buhalis, D., Harwood, T., Bogicevic, V., Viglia, G., Beldona, S., & Hofacker, C. (2019). Technological disruptions in services: Lessons from tourism and hospitality. Journal of Service Management, 30(4), 484–506. https://doi.org/10.1108/JOSM-12-2018-0398

Ch'ng, E., Cai, S., Leow, F. T., & Zhang, T. E. (2018). Adoption and use of emerging cultural technologies in China's museums. Journal of Cultural Heritage, 37, 170–180. https://doi.org/10.1016/j.culher.2018.11.016

Cianciarulo, D. (2015). From local traditions to 'augmented reality': The MUVIG Museum of Viggiano (Italy). Procedia - Social and Behavioral Sciences, 188, 138-143. https://doi.org/10.1016/j.sbspro.2015.03.349.

Ciecko, B. (2020). 4 ways museums can successfully leverage digital content and channels during coronavirus (COVID-19). Alliance Blog. Retrieved from: https://www.aam-us.org/2020/03/25/4-ways-museums-can-successfully-leverage-digital-content-and-channels-during-coronavirus-covid-19/

Cox, S., Kadlubsky, A., Svarverud, E., Adams, J., Baraas, R. C., & Bernabe, R. D. L. C. (2024). A scoping review of the ethics frameworks describing issues related to the use of extended reality. Open Research Europe. https://doi.org/10.12688/openreseurope.17283.1

Damala, A., Ruthven, I., & Hornecker, E. (2019). The MUSETECH model: A comprehensive evaluation framework for museum technology. Journal on Computing and Cultural Heritage (JOCCH), 12(1), Article no. 7, 1-22. https://doi.org/10.1145/3297717.

Devine, C., & Tarr, M. (2019). The digital layer in the museum experience. In [Editor's Name] (Ed.), Prolactin Disorders (pp. 295-307). Springer. https://doi.org/10.1007/978-3-319-97457-6_14.

Dijkshoorn, C., Jongma, L., Aroyo, L., van Ossenbruggen, J., Schreiber, G., ter Weele, W., & Wielemaker, J. (2018). The Rijksmuseum collection as linked data. Semantic Web, 9(2), 221-230. https://doi.org/10.3233/SW-170257.

Ding, M. (2017). Augmented reality in museums. Arts Management and Technology Laboratory, 1–12. Retrieved from: https://static1.squarespace.com/static/51d98be2e4b05a25fc200cbc/t/5908d019f5e2314ab790c269/1493749785593/Augmented+Reality+in+Museums.pdf

Doukianou, S., Daylamani-Zad, D., & Paraskevopoulos, I. (2020). Beyond virtual museums: Adopting serious games and extended reality (XR) for user-centred cultural experiences. Visual Computing for Cultural Heritage. https://doi.org/10.1007/978-3-030-37191-3_15.

Dragicevic, M., & Bagarić, A. (2019). Virtual technology in museums and art galleries business practice – The empirical research. In D. Tipurić & D. Hruška (Eds.), 7th International OFEL Conference on Governance, Management and Entrepreneurship: Embracing Diversity in Organisations (pp. 175-183). Governance Research and Development Centre (CIRU).

Errichiello, L., Micera, R., Atzeni, M., & Del Chiappa, G. (2019). Exploring the implications of wearable virtual reality technology for museum visitors' experience: A cluster analysis. International Journal of Tourism Research, 21(2), 179-188. https://doi.org/10.1002/jtr.2283.

Ghani, M. S. A. A. (2020). A systematic literature review: User experience (UX) elements in digital application for virtual museum. International Journal of Advanced Trends in Computer Science and Engineering, 9(3), 2801-2807. https://doi.org/10.30534/ijatcse/2020/49932020.

Hess, M., Colson, A., & Hindmarch, J. (2018). Capacity building and knowledge exchange of digital technologies in cultural heritage institutions. Museum International, 70(1-2), 48-61. https://doi.org/10.1111/muse.12192.

ICOMOS. (2008). The ICOMOS Charter for the Interpretation and Presentation of Cultural Heritage Sites, ratified by the 16th General Assembly of ICOMOS, Quebec, Canada.

Ifeanyi, A. J. (2024). The role of augmented reality in museum exhibitions: Enhancing visitor engagement and learning. Journal of Arts and Management, 3(2), August 2024. ISSN: 1115-6112.

Kim, S. (2018). Virtual exhibitions and communication factors. Museum Management and Curatorship, 33(3), 243-260. https://doi.org/10.1080/09647775.2018.1466190.

King, L., Stark, J. F., & Cooke, P. (2016). Experiencing the digital world: The cultural value of digital engagement with heritage. Heritage & Society, 9(1), 76-101. https://doi.org/10.1080/2159032X.2016.1246156.

Load. (2023). The 4 key benefits of implementing VR/AR in your company. Retrieved from: https://load.digital/blog/the-4-key-benefits-of-implementing-vr-ar-in-your-company.

Loureiro, S. M. C., Guerreiro, J., & Ali, F. (2020). 20 years of research on virtual reality and augmented reality in the tourism context: A text-mining approach. Tourism Management, 77, 104028. https://doi.org/10.1016/j.tourman.2019.104028.

Lungu, C. C. (2021). Emerging technologies in museums and the prospects for cultural heritage presentation. Sustainability, 13, 3732. https://doi.org/10.3390/su13073732.

Maas, M. J., & Hughes, J. M. (2020). Virtual, augmented and mixed reality in K–12 education: A review of the literature. Technology, Pedagogy and Education, 29(2), 231-249. https://doi.org/10.1080/1475939X.2020.1737210.

Ma, D., Pan, Y., & Qian, H. (2023). Enhancing museum visiting experience: Investigating the relationships between augmented reality quality, immersion, and TAM using PLS-SEM. International Journal of Human-Computer Interaction, 1-12. https://doi.org/10.1080/10447318.2023.2227832.

McManus, P. (2015). Designing new media to enhance the visitor experience. Museum International, 67(1-4), 1469797315Y. https://doi.org/10.1179/1469797315Y.0000000006.

Morgan, M., Pile, S., Evans, M., & England, P. (2017). Digital technologies, heritage interpretation and engagement: A literature review and synthesis. Journal of Tourism and Cultural Change, 15(4). https://doi.org/10.1080/14766825.2017.1281263.

MuseumNext. (2019). How museums can use social media? MuseumNext. Retrieved from: https://www.museumnext.com/article/museums-can-use-social-media/.

Moorhouse, N., tom Dieck, M. C., & Jung, T. (2019). An experiential view to children learning in museums with augmented reality. Museum Management and Curatorship, 34(4), 402-418. https://doi.org/10.1080/09647775.2019.1578991.

Nielsen, H. (2017). Assassin's Creed Origins: How Ubisoft painstakingly recreated ancient Egypt. The Guardian. Retrieved from: https://www.theguardian.com/technology/2017/oct/05/assassins-creed-origins-recreated-ancient-egypt-ubisoft.

Nyaupane, P. (2023). Heritage interpretation techniques and its epistemology of the world heritage site, Lumbini, birthplace of Lord Buddha. Nepalese Culture, 16(1), 9-24. https://doi.org/10.3126/nc.v16i1.54124.

Ore, J. (2017). How historians helped recreate ancient Egypt in Assassin's Creed: Origins. CBC News. Retrieved from: https://www.cbc.ca/news/entertainment/assassins-creed-origins-historian-1.4382255.

Pavithra, A., Kowsalya, J., Keerthi Priya, S., Jayasree, G., & Kiruba Nandhini, T. (2020). An emerging immersive technology – A survey. International Journal of Innovative Research in Technology, 6(8), 119-123. DOI: 10.36261/ijirt.148937.

Pei, X., Fu, S., & Jiang, T. (2023). An empirical study on user experience evaluation of VR interface in digital museums. Data and Information Management, 7(4), 2023. DOI: 10.1016/j.dim.2023.100057.

Peng, J. (2022). Research on the transformation of smart museums under the internet thinking: A case study on the Palace Museum. Art and Society, 1(1), 37. Retrieved from: https://doi.org/10.56397/AS.2022.08.05.

Pescarin, S., d'Annibale, E., Fanini, B., & Ferdani, D. (2018). Prototyping on-site virtual museums: The case study of the co-design approach to the Palatine Hill in Rome (Barberini Vineyard) exhibition. In 2018 3rd Digital Heritage International

Congress (Digital Heritage) held jointly with 2018 24th International Conference on Virtual Systems & Multimedia (VSMM 2018), San Francisco. DOI: 10.1109/DigitalHeritage.2018.8810135.

Piva, M. E. (2017). Museums in the digital era: Technology and innovation. Dipartimento di Economia e Finanza, Cattedra di Entrepreneurship, Innovation, and Technology, Academic Year 2016-2017. Retrieved from: https://tesi.luiss.it/21405/1/190401_PIVA_MARIA%20ELEONORA.pdf.

Poulopoulos, V., & Wallace, M. (2022). Digital technologies and the role of data in cultural heritage: The past, the present, and the future. Big Data and Cognitive Computing, 6(3), Article 73. DOI: 10.3390/bdcc6030073.

Romanelli, M. (2021). Becoming social museums by being virtual-oriented and technology-driven organisations. Culture. Society. Economy. Politics, 1(1), 79-92. DOI: 10.2478/csep-2021-0006.

Shadowen, N., & Hosfelt, D. (2020). Addressing the privacy implications of mixed reality: A regulatory approach. *arXiv*. https://arxiv.org/abs/2007.10246

Shaharir, S. A., & Zanuddin, H. (2018). Museum institutions in the digital age: The insights of Malaysian museums' use of Facebook. The Journal of Social Sciences Research, Academic Research Publishing Group, 357-366. Retrieved from: https://RePEc:arp:tjssrr:2018:p:357-366.

Shalaginova, I. (2012). Understanding heritage: A constructivist approach to heritage interpretation as a mechanism for understanding heritage sites. Universitätsbibliothek der BTU Cottbus.

Shehade, M., & Stylianou-Lambert, T. (2020). Virtual reality in museums: Exploring the experiences of museum professionals. Applied Sciences, 10(11), Article 4031. DOI: 10.3390/app10114031.

Shen, J., Yin, M., Wang, W., Hua, M., Choi, Y., Garaj, V., Lam, B., & Kwon, H. (2024). Dwells in museum: The restorative potential of augmented reality. Telematics and Informatics Reports, 14, 100136. https://doi.org/10.1016/j.teler.2024.100136.

Slater, M., & Wilbur, S. (1997). A framework for immersive virtual environments (FIVE): Speculations on the role of presence in virtual environments. Presence: Teleoperators & Virtual Environments, 6, 603-616.

Slater, M., & Haggard, P. (2020). The ethics of realism in virtual and augmented reality. Frontiers in Virtual Reality, 1, 1. https://doi.org/10.3389/frvir.2020.00001

Sorrentino, A., Elgammal, I., Ferretti, M., & Risitano, M. (2020). Does digital technology improve the visitor experience? A comparative study in the museum context. International Journal of Tourism Policy, 10(1), January 2020. https://doi.org/10.1504/IJTP.2020.10029192.

Stojšić, I. (2020). The possibilities of using augmented and virtual reality in teaching and learning geography (Doctoral dissertation). University of Novi Sad, Faculty of Sciences, Department of Geography, Tourism, and Hotel Management, Novi Sad, Serbia.

Tilden, F. (1977). Interpreting our heritage (3rd ed.). Chapel Hill: University of North Carolina Press.

Tilden, F. (1957). Interpreting our heritage (3rd ed.). Chapel Hill: The University of North Carolina Press. ISBN 0-8078-4016-5. Library of Congress Catalog Number 67-27763. All rights reserved. Manufactured in the United States of America.

Wang, B., & Liu, Y. (2019). The research on application of virtual reality technology in museums. Journal of Physics: Conference Series, 1302, 042049. https://doi.org/10.1088/1742-6596/1302/4/042049.

Wang, J. (2024). Interaction and exploration: How digital technology contributes to narrative construction in museums. Proceedings of the 2024 IEEE International

Conference on Electronics, Communication, and Information Technology (ECEI 2024), 270-275. https://doi.org/10.1109/ecei60433.2024.10510858.
Yung, R., & Khoo-Lattimore, C. (2017). New realities: A systematic literature review on virtual reality and augmented reality in tourism research. Current Issues in Tourism, 22(1), 1-26. https://doi.org/10.1080/13683500.2017.1417359.
Zhang, R., Peng, F., & Gwilt, I. (2024). Exploring the role of immersive technology in digitally representing contemporary crafts within hybrid museum exhibitions: A scoping review. Digital Creativity, 35(4), 355-377. https://doi.org/10.1080/14626268.2024.2398457.
Zhou, Y., Sun, J., & Huang, Y. (2019). The digital preservation of intangible cultural heritage in China: A survey. Preservation, Digital Technology & Culture, 28(3), 185-205. https://doi.org/10.1515/pdtc-2019-0004.
Škorić, J., & Galetin, M. (2024). Artificial intelligence and social work: Ethical dilemmas and challenges in the protection of human rights. *TEME*, 48(3), 563-575. https://doi.org/10.22190/TEME230309032S

Internet Addresses and Links

www.arm.com/glossary/immersive-gaming
www.v-must.net
https://www.youtube.com/watch?v=
https://www.youtube.com/watch?v=ETd7pszxhnc
Google Questionnaire:
https://docs.google.com/forms/d/1HJ1khqYhKBKihG197bscozVZ8UNI58UdS6J55a9ndA

ИНТЕРПРЕТАЦИЈА ПУТЕМ ИМЕРЗИВНИХ ТЕХНОЛОГИЈА У КУЛТУРНИМ ИНСТИТУЦИЈАМА СРБИЈЕ

Ивана Маневска, Татјана Пивац, Снежана Бесермењи Ленка Истијановић
Универзитет у Новом Саду, Природно-математички факултет, Нови Сад, Србија

Резиме

Интерпретација наслеђа је кључна компонента у очувању и промоцији културног идентитета, пружајући публици могућност да се дубље ангажује са културним садржајем. Савремене технологије, попут виртуелне стварности (ВР) и проширене стварности (АР), омогућавају нове начине представљања наслеђа, укључујући интерактивне и ангажујуће приступе за публику. Брзи развој и примена имерзивних технологија отварају могућности за револуционарне промене у приступу информацијама и интеракцији.

Истраживање је имало два циља анализу примене имерзивних технологија у свету и испитивање стања у Србији. Преглед литературе омогућио је увид у глобалне трендове и изазове примене ових технологија у културним институцијама. Анкета је креирана на основу докторске дисертације Стојшића (2020) и прилагођена за испитивање ставова менаџера и запослених у културним установама. Упитник је обухватио социодемографске карактеристике испитаника, дигиталне компетенције њихових колектива и учесталост употребе имерзивних технологија. За анализу података коришћени су Google Forms, Microsoft Excel и SPSS.

Истраживање је спроведено у јануару 2023. године, а упитник је послат на 50 културних институција у Србији. Одговорило је 14 институција, док остале нису дале повратну информацију. Резултати указују на то да, иако већина запослених у овим установама препознаје потенцијал имерзивних технологија, њихова примена је и даље ограничена. Главни изазови су недостатак финансијских средстава, техничке инфраструктуре и специјализоване обуке за особље. Технолошка компетентност запослених је оцењена као задовољавајућа, али је употреба проширене стварности ретка, што указује на потребу за унапређењем технолошких ресурса.

Упркос овим ограничењима, запослени у културним установама исказали су отвореност према иновацијама и спремност да унапреде своје дигиталне вештине. Налази такође наглашавају да су континуирана едукација и техничка подршка запосленима од суштинског значаја за успешну имплементацију имерзивних технологија. Претходна истраживања истичу да континуирана обука игра кључну улогу у дигиталној трансформацији музеја, што додатно наглашава неопходност стратешког планирања за усвајање технологија.

Резултати овог истраживања сугеришу да увођење имерзивних технологија може значајно допринети побољшању искуства посетилаца и промоцији културног наслеђа. Поред тога, студија наглашава потребу за систематским улагањем у дигитализацију и обуку запослених како би се омогућила шира примена ових технологија у српским културним установама. Решавањем ових изазова, културне установе могу осигурати одрживију и ефикаснију интеграцију имерзивних технологија, што би у коначници могло да редефинише музејску и галеријску интерпретацију. Ово истраживање представља основу за даљи развој стратегија усмерених на интеграцију имерзивних технологија у музеје и галерије, унапређење интерпретације наслеђа и повећање доступности културног садржаја.

Улагање у технолошке иновације у културним институцијама може се посматрати као стратешка инвестиција у будућност културног наслеђа. Будућа истраживања требало би да продубе разумевање овог феномена кроз директне разговоре са стручњацима и анализу постојећих пракси, доприносећи даљем развоју и иновативним приступима у интерпретацији културе.