

Gamification and Immersive Experiences in Museums as Audience Development Strategy – The Case of Croatian Museums

Igor Mavrin, Hrvoje Mesić, Alta Pavin Banović

Academy of Arts and Culture in Osijek, Josip Juraj Strossmayer University in Osijek

ABSTRACT

Technology has always been playing a significant role in interpretation and presentation of cultural heritage, both the objects exhibited in museums and heritage present in situ. Enhancement in the field of extended reality can be seen as the gamechanger for the heritage presentation, with the immersiveness and gamification having the potential of turning non-visitors into visitors. Cultural institutions, city governments, tourist offices and heritage sites are turning towards the concepts of immersive and gamified heritage, trying to reach new segments of visitors and tourists. The paper brings an extensive contemporary literature review on the immersive technologies in museums and heritage sites, and audience development trends in museums in general. The paper deals with the research problem of immersive technologies as audience development strategies of Croatian museums. The research questions are the following: Is the general population interested in current museums' offerings? Will the interest for the museums' offerings rise if they would offer an immersive and gamified experience? The research has been conducted on the general population as cultural audiences, exploring their attitudes towards museums, video games, immersive realities, and use of gamification and immersiveness in museum offerings.

Key words: museum management, immersive technologies, interactive media, heritage interpretation, marketing strategies

Introduction

Video games and immersive technologies are gaining significant importance in economic, social and cultural manner, with their influence overflowing other fields of human activities. Global video games market revenue reached 208,6 billion USD in 2022, with 1,7 mobile gamers worldwide and 81,9 % of internet users playing some form of video game, and estimated number of gamers reaching 3 billion people¹. In the first two decades of 21st Century, museums have slowly opened for video games in a try to reach wider audiences, with some of them, like Science Museum in London, Tate Museum, and American Museum of Natural History, expanding their offering with educational video games². Museums have also become part of video games' settings, both the ones existing in reality, and the ones created for the needs of a video game^{3,2}, and a part of museum exhibitions as significant phenomenon⁴.

The strong development and the rise of video games industry also lead towards the rise of its influence. Gamification as a term is gaining even more relevance and is becoming an important part of other cultural and creative industries. The term gamification emerged in the first decade of 21st Century, coined by McClain⁵ and it was popularized in 2010s. Gamification can be defined as the elements of (video) game design used within non-game contexts⁶, with several subordinated terms like gamefulness, used for the experiential and behavioral quality, the gameful interaction, including artifacts affording that quality, and gameful design, explaining design for gamefulness, by using game design elements. Serious games are also strongly connected to the gamification concept, and are defined as "...educational gaming as well as games, and virtual worlds that are specifically developed for educational purposes reveal the potential of these technologies to engage and motivate beyond leisure time activities"⁷. They have a strong educational and promotional potential

in several fields, including cultural heritage⁸ and museum exhibitions^{9,10}. Gamification will undoubtedly have even more significance in the future of heritage interpretation and promotion, both *in situ* and within museum institutions.

The use of extended realities as strategies of gamification implementation within museums will expectedly also rise. Museums have already entered the digitalization processes, which were only accelerated by the Covid-19 pandemic¹¹. Trends in 2023 introduce several different technological platforms impacting attractions industry, including AI immersive experiences, and time travel experiences¹², allowing museums to create polysensory experiences for their visitors, and become more inclusive, community oriented and personalized¹³. Global researches on museum trends suggest that museums are open towards implementation of new technologies¹³, leading towards potential of creating new museum audiences. Technological advancements and their implementation on heritage sites and in museums has a significant potential for further development of cultural tourism. Futuristic projections for the period until 2095 suggest that the cultural offer and the related tourism offer will be dominated by both AR and VR technologies¹⁴. In that context, it is also important to mention the developing concepts of immersive heritage tourism¹⁵ and immersive cultural tourism¹⁶, with both terms suggesting that immersive technologies and videogames will impact the future of the heritage experience and interpretation, and the future of cultural tourism.

The aim of this paper is to explore cultural audiences' attitudes in the Republic of Croatia towards immersive technologies and gamification in museums, and their motivations to visit. Research questions are the following:

- Is the general population interested in current museums' offerings?
- Will the interest for the museums' offerings rise if they would offer an immersive and gamified experience?

Hypotheses and methodology shall be explained in the separate chapter. The paper is composed of literature review, methodology explanation, research, and discussion and conclusion chapters.

Immersive technologies have been in the focus of scientists' interest since the 1990s, which coincides with their intensive emergence. Milgram and Kishino¹⁷ introduce the 'virtuality continuum' concept, with real environment on the one end of the continuum and the virtual environment on the other (Figure 1). Real environments consist of only real objects, while the virtual ones contain only virtual objects. Mixed Reality (MR) environments are the ones in which real world and virtual world objects coexist and are presented together in a single display.

Three immersive technology concepts could be considered as significant for tourism: Augmented Reality (AR), where virtual information is overlaid over the real world, Virtual Reality (VR), where real-life experience is de-

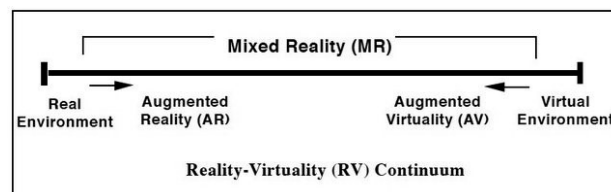


Fig. 1. Milgram and Kishino's Mixed Reality on the Reality-Virtuality Continuum¹⁷.

signed in the virtual environment, and Mixed Reality (MR), a technology that provides the possibility for the coexistence of both virtual and real worlds¹⁸. Building upon Milgram and Kishino's continuum model, recent studies¹⁹ introduce the concept of X Reality (XR) Continuum, with real environment on one side of the spectrum, and virtual environment, or desktop VR, on the other, and the X Reality – Virtuality Continuum in the middle, composed from mobile AR, untethered holographic AR, tethered holographic AR, and mobile VR.

The three concepts, VR, AR, and MR, could also be united within one term – Immersive Reality (IR), made from different features and functions enabling interaction with the virtual world²⁰. Immersivity as a concept denotes the inherent quality of objects in general, and also of mediated and delineated, both real and imagined spaces, and it could be monitored interdisciplinary and multidisciplinary, with incidence of immersive spaces in theme parks, films, theatre, video games, and learning environments²¹. Virtual reality is the focus of interest for many scientific fields and disciplines. Psychology, as one of those disciplines, deals with the issues of presence, in this case mediated by information technology, that provides the feeling of being in an external world²². VR has numerous social and psychological characteristics, like the ability to simulate activity, disembodied identity, but also anonymity, identity expansion, deliberate impersonality, the ability to have multiple virtual personalities, etc.²³.

Museums in extended realities' context

Museums, as cultural heritage institutions, offer new experiences of heritage information in the expanded, digital environment in which they normally reside every day²⁴. "In contemporary museology and tourism, it has become both relatively simple and commonplace to utilise computer visualisations for communicating heritage"²⁴. Murphy, Carew and Stapleton²⁵ define Industry 5.0 as a "partnership" of man with technology to achieve memorable experiences for museum visitors using personalized cultural heritage content. The offer of cultural heritage museum content enriches museum spaces by introducing immersive technologies that include virtual reality (VR) and augmented reality (AR)²⁶. "Museums are adopting immersive technologies to allow visitors to explore their collections. There are many challenges to create experiences which engage users in a meaningful way from the origination stage, through design and content creation to

delivery, all of which bring together practitioners from disparate fields²⁷. “Immersive design” is a process used in environments such as architecture, video games, art, education, and has been adopted in the context of museums where it needs to be adapted to the criteria of museology²⁷.

Demetriou²⁸ noted the difference between interactivity and immersion. He interprets interactivity as “paying attention to cues”, and immersion “occurs when cues disappear” because, “for an experience to be considered immersive, it must be more than a three-dimensional image that surrounds the user.” Popoli and Derda²⁹ point out that the term “immersion” has been used for a long time and is associated with the gaming industry. Cultural heritage institutions, museums aim to use techniques of total user immersion³⁰. Bekele and Champion³¹ comparing immersive reality technologies and interaction methods, proposed the integration of collaborative and multimodal interaction methods in a mixed reality (MxR) scenario that can be applied to VH applications to enhance learning about cultural content. Augmented reality technologies have contributed to the design of immersive experiences that influence the interrelationships between the technical, aesthetic and institutional characteristics of art and design³². Immersive methods with interactive features provide a new aesthetic experience to the user, and at the same time transcend the relationship between man and technology²⁹. By using virtual reality (VR) and AR immersive techniques, visitors can be given the experience of “visiting” distant cultural heritage sites, creating a new dimension of experience for them³³.

Immersive museum exhibitions aim to “immerse” the visitor in a three-dimensional space that does not have to be the result of the use of digital technologies²⁹. Charitonidou³² explores the use of augmented reality and interactive digital technologies to influence the design of exhibition spaces with the aim of integrating immersive experiences for visitors through exhibition design and art dissemination methods. Popoli and Derda²⁹ offered a two-sided model in the creation of immersive exhibitions based on the initial phase, the concept phase, the design phase, the production phase, and the opening phase, which are realized by the collaboration of museologists and designers. Burlingame³⁴ emphasizes the value of integrating digital technologies into cultural heritage institutions that are spaces of interaction of the past, present and future, because they improve and introduce new ways of these interactions and thus enhance the visitor's encounter with history. “In a world where the museum industry can seldom compete with the digital aesthetics of the entertainment industry in terms of digital renderings of space, evincing a critical commitment to sources, the procedures of creation, and the politics of presentation becomes a necessity²⁴”. The use of digital tools in the cultural heritage environment presents a challenge in relation to time, Internet access, mobile services, visitor participation as well as the involvement of younger visitors³⁴. The use of virtual reality in museums is an extension of the

immersive turn into the digital realm, and “VR is a spatial technology, which, when combined with historical subject matter, is often promoted by its developers as a vehicle for ‘time-travelling’³⁵. Shein³⁶ points out that “digital technologies such as virtual reality (VR), augmented reality (AR), and three-dimensional (3D) graphics are making it possible for museums and other institutions to preserve historical events and tell the stories of those events in an engaging way. In the case of VR, the technology actually takes them to another time or place away from where they physically are”. Institutions of culture and heritage, using the digitization of collections, want to archive, preserve, present and make their collections accessible to all types of users³⁷.

“The development of the 4.0 museography that understands the synthesis between traditional exhibition forms and their fusion with digital media can help museums to effectively use new technologies with the aim of successfully incorporating new audiences³⁷. One of the first museums to include VR technology in its educational program is the British Museum³⁷. Swords²⁷ examine how disciplinary differences create tensions, challenges and productive outcomes in the creation and design of immersive experiences intended to take heritage out of the museum to allow the public to experience it within the built environment. Mallia et al.³⁸ observe the challenge of creating virtual museums so that users can achieve new experiences of a transformed museum environment using an augmented reality museum application. The pilot project of creating a virtual museum on demand of users resonated positively among users who were interested in using the transformational museum environment of the digital image gallery on demand³⁸. Burlingame³⁴ cites the value of digital cultural heritage to create presence through interactive experiences where 3D telepresence through immersive environments is combined with visual and audio elements to bring museum objects to life.

The goal of museums is to get a new audience, ie. young generation. The integration of the emotional component, through the use of scenographic and theatrical techniques, interactivity and empathy, plays a major role in this²⁷. In the application, users can experience a new way of telling stories about cultural heritage and achieve interactivity because the content is adapted to the visitor's profile. In addition, the application was developed by adding gamification techniques to encourage visitors to establish a relationship between the real and the virtual²⁷.

The use of new technologies enabled the planning and organization of innovative immersive content and digital museums that provide visitors with new experiences compared to traditional museums. “The key issues for all communities caring for changeable objects are how to preserve the intangible sensory, cultural, and immersive experiences created by change, and how the practical actions required to maintain this intangible heritage interact with concepts of authenticity, performativity, and intention³⁹”. The answers to these questions can be found in previous research that is the result of the literature review in this

article. The Web of Science and Taylor & Francis databases were reviewed, in which articles were published in the period from 2019 to 2023 with open access to the complete work, and the search keywords were: immersive techniques, users in museums, gamification and museums.

Previous research

Through a SWOT analysis of museums, the authors Ponsard and Desmet⁴⁰ observed the strengths, weaknesses, opportunities and threats of using digital technologies in the provision of museum services, which must be adapted to users through digital transformation in offering new user experiences. One of the new forms of user experiences is the technique of immersive design by Swords et al.²⁷ presented on an example of Almoine, where the storytelling is tailored for visitors who are at the center of the event. The interactivity of users and media enables the personalization of content according to the visitor's profile, and the use of audio, video and animated 3D recreations introduces the user to experiences of “immersion and travel into the past”. An example of offering new user experiences is the metaverse platform. Hwang and Koo⁴¹ investigated the relationship between the user's attitude about the value of content on the metaverse platform and the intention to use the same platform, and they concluded that the presence of aesthetic elements on the platform is important, which depends on viewing and using the platform. Silva and Teixeira⁴² cite an example of a project in the Serralves Museum and Coa Archaeological Park, in which the goal of integrating augmented reality into the user experience was realized using immersive techniques and tools, on the basis of which the idea of developing a digital user experience platform that provides an immersive experience in an interesting way was realized experiences and experiences of cultural heritage. An example of museum adaptation in communication with users is the presentation of the cultural heritage of the virtual city of Gothenburg from the 17th century, on the occasion of the 400th anniversary, on the basis of which the author Illsley²⁴ analyzed three representations of the model of virtual Gothenburg, in relation to the guidelines created on the basis of the London Charter and the Principles of Seville, through the exhibition “Birth of Gothenburg”, a virtual installation at the entrance to the Museum and the Tourist Information Center at Kungsporsplatsennu. Gothenburg, as a cultural and historical city, enters from its physical space into a 4D space at the marked places of the pedestrian zones, where visitors get to know its sights in six languages with AR recordings on which the timestamp of the use of archival images is recorded in order to enhance the user experience through the visualization process and deepen the understanding of history “3D architectural model”²⁴.

Leopardi et al.⁴³ analyzed and compared the characteristics of VM systems for the visualization of digital museum and archaeological exhibitions, from PC desktop, holographic display, 3D stereoscopic projection, head-mounted display and mobile augmented reality, in

order to expand the visitor's experience and encourage the revival and prolongation of those same experiences in repeated visits. Verbeek, Leemans and Fleming⁴⁴ explore the immersion of visitors to the Rijks Museum in Amsterdam in the realm of sensory and olfactory experiences based on a collaboration between academics, heritage experts and the fragrance industry. Visitors' experiences of immersive experiences influenced by intelligent lighting systems designed in museums were investigated by Xu et al.⁴⁵ with an emphasis on motion capture technology applied to museum lighting design to protect museum exhibits. Garro, Sundstedt and Sandahl³⁸ highlight the integration of digital media into museum exhibition setups to enhance the actual works of art on display over traditional display methods. By using immersive technologies in the presentation of cultural heritage, digital 3D artistic replicas are created, presented in virtual and augmented reality. With the help of a mobile application with integrated AR technology that enables the experience of realism, users can visit artifacts such as the Mjallby Crucifixion regardless of their location³⁸.

Liao and Bartie⁴⁶ analyzed the use of audio guides at Edinburgh Castle. The authors base their analysis on three approaches that include language analysis of audio guides in English and Chinese, interviews with visitors after visiting the castle, and analysis of a mobile application that tracks visitors' movements. Based on the experience of visitors Lund et al.⁴⁷ analyzed an interactive theater performance, *Hamlet live*, in the Danish castle of Kronborg with which visitors achieved unforgettable transformative experiences of the visit. These authors recommend the implementation of various immersive techniques that enable users to experience cultural heritage as an attraction. Karageorgiou et al.⁴⁸ analyse the extent to which museum visitors are interested in actively participating in museum exhibition displays in which the Internet of Things (IoT) is integrated, i.e. IoT-escape room games that provide an immersive experience.

Popoli and Derda²⁹ note the need to change the role of visitors to museum exhibitions. In order to move from passive to active visitors and participants, it is necessary to change the design of museum exhibitions using immersive techniques. Burlingame³⁴, using the examples of museum exhibitions of heritage from the Viking Age in Germany and Switzerland, writes about the user experiences of visitors who, through the “high touch” method that bridges the boundaries of the physical museum exhibition, is offered a new way of gaining experience through multisensory immersive revival the past that visitors, after their visit to the museum, simply remember. Rhee et al.⁴⁹ conducted research on the behaviour of users, i.e. visitors to the Yumi's Cell Special Exhibition in South Korea. Visitors have their experience of the exhibition which include limitation and participation in immersive interactive events photographed and published on Instagram. “Instagrammable exhibitions offer new possibilities to curators who would like to attract young visitors, but there are also

challenges related to the embedding of aesthetic and cultural values within social and entertaining experiences⁷⁴⁹.

Blumenthal and Gjerald⁵⁰ investigate the process of immersion in virtual visitor experiences in the context of a managed visitor attraction and propose a framework with four mechanisms that enhance the process of immersion through virtual games set up in a commercial game centre in Oslo, Norway. The process of immersion consists of the phase of engagement, preoccupation and transcended involvements on the basis of which the experiences of 'real world' and virtual visitors are compared. Varutti⁵¹ questions the value and impact of the affective effects that museum activities, exhibitions, designs and senses leave on visitors, and in these effects, he recognizes a new role for museums that must respond to the emotional needs of the times in which their visitors live. Schultz⁵² analyses two interactive digital exhibitions 'The Forever Project' and 'New Dimensions in Technology', organized by the National Holocaust Center and the Shoah Foundation, which aim to awaken the empathy of visitors based on an emotional interactive encounter with "virtual witnesses", digital avatars, who are survivors of the Holocaust and who answer the questions. Also, the author Kazlauskaitė⁵³ investigates how the use of virtual reality and immersive digital media, integrated in the Museum of the Second World War in Gdańsk, Poland, affects the revival of negative emotions of visitors who want to realize their own dignity despite the sacrifice made.

Iacovino, De Paolis and Ndou⁵⁴ state the value of using developed virtual and augmented reality technologies in the tourist presentation of cultural heritage in museums, national parks and cultural heritage sites where visitors can immerse themselves in the digital world with immersive techniques. A concrete tool in the offering of immersive virtual reality by Iacovino et al.⁵⁵ analyzed an application used by students, Erasmus ambassadors, in the promotion of national cultural heritage. Leow and Ch'ng⁵⁴ explored the user narrative after experiencing a virtual journey 800 years into the history of 'Sanjiangkou', in Ningbo, China, and observed four indispensable elements for designing digital displays with engaging, reflective, connecting and elaborative details that users enable easier learning about cultural heritage.

Bilbao⁵⁵ stands out *Museum of European Normality* as a valuable result of an immersive installation by artists Maria Theresa Alves and Jimmie Durham that open up the colonial cultural heritage of Latin America using maps showing migration patterns in Europe, images from books, magazines, videos and other documentation. The value of the physical presence and presentation of the local community in the native autochthonous language in which they present the "testimonies" of colonial histories a Recovering Voices initiative at the Smithsonian Institution researched by the authors Isaac et al.⁵⁶. Pettersson and Müller⁵⁷ emphasize the value of the existence and operation of museums in peripheral places in the north, such as Arctic museums, which play a central role in the presen-

tation of indigenous cultural heritage that is attractive and interesting to visitors.

Resta et al.⁵⁸ investigate whether, due to the Covid-19 pandemic, museums have managed to adapt their remote exhibition platforms to their users by providing them with new ways of visiting, i.e. virtual remote visits such as virtual tours and conversations with curators, online performances by artists, virtual museum openings and the like, and whether the museums gained new visitors through such offered virtual tours. Resta et al.⁵⁸ cite research from the Network of European Museum Organizations (NEMO) from 2020, which confirms a loss of museum revenues of 75% to 80% and redistributed jobs both in relation to traditional and in relation to digital (virtual) services they provide to their visitors.

Materials and Methods

As it was mentioned in the introduction chapter, the paper deals with the Croatian cultural audiences' attitudes towards gamification and immersive technologies in museums. Two research questions emerged:

- Is the general population interested in current museums' offerings?
- Will the interest for the museums' offerings rise if they would offer an immersive and gamified experience?

The hypotheses derived from the research questions are the following:

- Hypothesis 1 (H1): Croatian cultural audiences are less likely to prefer museum visits in comparison to other cultural contents.
- Hypothesis 2 (H2): Croatian cultural audiences would visit museums more if they contained gamification elements and immersive technologies in their offerings.

For the purpose of the research the questionnaire has been designed based upon the Theory of Planned Behaviour (TPB)⁵⁹, with the aim to define the following elements: attitude, subjective norms, perceived behavioural control, intention, and past behaviour (see Figure 2).

The questionnaire was adapted to the cultural context in the Republic of Croatia, and the common Likert scale ranging from 1 to 7, was replaced by the Likert scale ranging from 1 to 5 (1 – strongly disagree, 5 – strongly agree), which are more common in Croatian researches. It was divided in following sets of questions concerning attitudes and behaviour related to museums, video games, and immersive technologies:

- Attitude (7 questions);
- Perceived norm (5 questions);
- Perceived behavioural control (5 questions);
- Intention (5 questions);
- Past behaviour (5 questions).

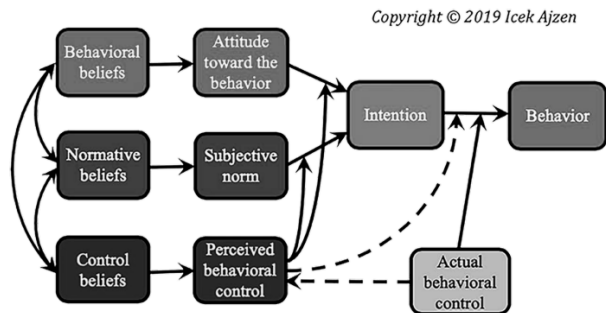


Fig. 2. Schematic presentation of Theory of Planned Behaviour60.

Additional questions were asked in separated sets – one comprising the importance of different cultural contents, and one dealing with demographic information. The survey was conducted through the online form (Google Forms), from 14th of April to 11th of May 2023. The results are analysed and interpreted in the next chapter.

Results

Research: Croatian museum audiences’ attitudes and behaviour in the context of gamification and immersive technologies - total of 268 respondents entered the online survey, with 32,5 % male, and 67,5 % female respondents, and 0,4 % respondents refusing to answer. Baby boomers (born from 1946 to 1964) were represented with 5,6 % of respondents, Generation X (born from 1965 to 1980) with 25 % of respondents, Generation Y (born from 1981 to 1996) with 23,9 %, and Generation Z (born from 1997 to 2012) with most respondents – 45,9 %. Most of the respondents were either full employed (53,4 %) or students (44,8 %).

Key findings

Key findings: in the Attitude set of questions in TBP questionnaire the following findings are indicative (Table 1):

- 90 % of the respondents consider museums as important cultural institutions (agree or strongly agree) and 65 % of them like to visit museums (agree or strongly agree);
- 58 % of the respondents consider museums as fun (agree or strongly agree), 45 % consider see them as interactive, but only 22 percent claim that they visit museums often;
- 34 % of the respondents claim that they like to play video games, and 38 % like to use immersive or extended realities.

In the Perceived norm set of questions, there are several key findings (Table 2):

- 43 % of the respondents claim that most of the people they know consider museums as important cultural institutions;
- 56 % disagree or strongly disagree that most of the people they know visit museums often;
- 40 % think that most of the people they know like to play video games, and 29 % think that most people they know like immersive technologies.

In the Perceived behavioural control set of questions, the key findings are (Table 3):

- 46 % of the respondents agree or strongly agree that they will visit museum in the next three months;
- 36 % would visit museums more often if they used immersive technologies in their exhibitions, 50 % would like to see more interactive content in museums, and 29 % would visit museums more often if they would offer more gamified contents.

In the Intention set of questions, the main finding is related to 62 % percent of people that agree or strongly agree they would visit a museum in the next six months. Part of them plan to visit museums with interactive and/or gamified contents (Table 4).

As for the Past behaviour set of questions is considered, 46 % of the respondents haven’t visited a museum in the past six months, while 48 % have visited a museum. At

TABLE 1
THEORY OF PLANNED BEHAVIOUR – ATTITUDE TOWARDS MUSEUMS, VIDEO GAMES, AND IMMERSIVE REALITIES

Claims	Min	Max	Arithmetic means	Median	SD
Museums are important cultural institutions.	1	5	4.585	5	0.766
I like visiting museums.	1	5	3.876	4	1.149
I often visit museums.	1	5	2.638	3	1.183
Museums are fun.	1	5	3.604	4	1.013
Museums are interactive.	1	5	3.361	3	1.041
I like playing video games.	1	5	2.817	3	1.504
I like to use technological augmented reality (virtual reality, altered reality and/or mixed reality).	1	5	3.059	3	1.322

Min – Minimum, Max – Maximum, SD – Statistical derivation

TABLE 2
THEORY OF PLANNED BEHAVIOUR – PERCEIVED NORMS ON MUSEUMS, VIDEO GAMES,
AND IMMERSIVE REALITIES

Claims	Min	Max	Arithmetic mean	Median	SD
Most people I know consider museums to be important cultural institutions.	1	5	3.305	3	1.089
Most people I know like to visit museums.	1	5	2.813	3	1.064
Most people I know visit museums often.	1	5	2.373	2	1.006
Most people I know like to play video games.	1	5	3.149	3	1.189
Most people I know like to use technologically altered reality (virtual reality, augmented reality, mixed reality).	1	5	2.981	3	1.103

Min – Minimum, Max – Maximum, SD – Statistical derivation

TABLE 3
THEORY OF PLANNED BEHAVIOUR – PERCEIVED BEHAVIOURAL CONTROL ON MUSEUMS, VIDEO GAMES,
AND IMMERSIVE REALITIES

Claims	Min	Max	Arithmetic mean	Median	SD
I am sure that I will visit the museum in the next three months.	1	5	3.279	3	1.461
I would visit museums more often if they had contents enriched with virtual reality, altered reality and/or mixed reality.	1	5	2.902	3	1.370
I would visit museums more often if they had interactive content.	1	5	3.291	3	1.337
I would visit museums more often if they offered content that encouraged play.	1	5	2.75	3	1.318
I would visit museums more often if they had contents reminiscent of video games.	1	5	2.432	2	1.309

Min – Minimum, Max – Maximum, SD – Statistical derivation

TABLE 4
THEORY OF PLANNED BEHAVIOUR – INTENTIONS RELATED TO MUSEUMS, VIDEO GAMES,
AND IMMERSIVE REALITIES

Claims	Min	Max	Arithmetic mean	Median	SD
I will be visiting the museum for the next six months.	1	5	3.682	4	1.371
I will visit a museum that uses technology based on virtual, altered or mixed reality in the next six months.	1	5	2.783	3	1.244
I will visit a museum that uses interactive content in the next six months.	1	5	2.992	3	1.208
I will visit a museum that offers content that encourages play in the next six months.	1	5	2.712	3	1.197
I will be visiting a museum that has content reminiscent of video games in the next six months.	1	5	2.488	2	1.200

Min – Minimum, Max – Maximum, SD – Statistical derivation

the same period 26 % of the respondents have had an immersive experience, and 41 % have played a video game (Table 5).

General cultural preferences of the respondents are mostly oriented towards concerts and music festivals, cinema, streaming platforms. Libraries and theatre also rank better than museums on the preference list. However, museums rank better than opera, ballet, contemporary dance, and cultural centres, and, significantly, better than immersive realities and video games (Table 6).

Discussion and conclusion

The two hypotheses of the research were the following: Hypothesis 1 (H1): Croatian cultural audiences are less likely to prefer museum visits in comparison to other cultural contents. Hypothesis 2 (H2): Croatian cultural audiences would visit museums more if they contained gamification elements and immersive technologies in their offerings. The findings from the research lead towards the following conclusions:

TABLE 5

THEORY OF PLANNED BEHAVIOUR – PAST BEHAVIOUR RELATED TO MUSEUMS, VIDEO GAMES, AND IMMERSIVE REALITIES

Claims	Min	Max	Arithmetic mean	Median	SD
I have visited the museum in the past six months.	1	5	3.037	3	1.841
In the past six months, I have had an augmented reality experience (virtual reality, altered reality and/or mixed reality).	1	5	2.339	2	1.553
I have been playing video games for the past six months.	1	5	2.858	2	1.763
In the past six months, I have visited a museum that contains elements of augmented reality (virtual, altered or mixed reality).	1	5	1.955	1	1.478
In the past six months, I have visited a museum that contains interactive elements.	1	5	2.335	1	1.635
In the past six months, I have visited a museum that contains elements that encourage play.	1	5	2.014	1	1.483
In the past six months, I have visited a museum that contains elements reminiscent of a video game.	1	5	1.794	1	1.334

Min – Minimum, Max – Maximum, SD – Statistical derivation

TABLE 6

GENERAL CULTURAL PREFERENCES OF THE CROATIAN RESPONDENTS

Cultural preferences	Min	Max	Arithmetic mean	Median	SD
Movies in cinemas	1	5	3.794	4	1.147
Movies and series on TV	1	5	3.712	4	1.225
Movies and series on streaming platforms	1	5	3.760	4	1.269
Video games	1	5	2.546	2	1.484
Virtual, altered and/or mixed reality	1	5	2.518	2,5	1.270
Museums	1	5	3.623	4	1.267
Galleries	1	5	3.417	4	1.350
Libraries	1	5	3.910	4	1.238
Concerts	1	5	4.131	4	1.085
Music festivals	1	5	3.917	4	1.190
Theatre plays	1	5	3.699	4	1.303
Operas	1	5	2.858	3	1.449
Ballet	1	5	2.883	3	1.473
Contemporary dance	1	5	3.074	3	1.420
Cultural centers	1	5	3.559	4	1.298

Min – Minimum, Max – Maximum, SD – Statistical derivation

- H1 is accepted, because, as it can be seen in Graph 1, museums have less popularity than music, cinema, libraries, and theatre.
- H2 is accepted, as the answers from Perceived behavioural control show, because half of the respondents have intention of visiting the museums with more interactive content, and about one third of them claiming they would visit museums more often if they offered immersive realities, or gamified content.

Although the museums represent an important issue in the lives of the respondents, the visiting preferences do not follow their perceptions of the museums' significance. Some of the findings are also interesting. Although the

major age group of the respondents fall within younger population, especially Generation Z, rather small percentage of the respondents claim that they play video games. This could be the result of a lack of desire to declare the practice of this activity, or even the result of the predominance of female respondents in the research. However, Croatian museums should consider adding immersive technologies and gamification elements to reach both local audiences, and global tourists. The numbers claiming there are at least 3 billion gamers worldwide are the best motivation for those adaptations and modernization in general.

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I. Mavrin

Academy of Arts and Culture in Osijek, Josip Juraj Strossmayer University in Osijek, Osijek, Croatia
e-mail: imavrin@gmail.com

GAMIFIKACIJA I IMERZIVNA ISKUSTVA U MUZEJIMA KAO STRATEGIJA RAZVOJA PUBLIKE - SLUČAJ HRVATSKIH MUZEJA

SAŽETAK

Tehnologija je oduvijek imala značajnu ulogu u interpretaciji i prezentaciji kulturne baštine, kako predmeta izloženih u muzejima tako i baštine prisutne in situ. Poboljšanje u području proširene stvarnosti može se smatrati mjenjačem igre za prezentaciju baštine, s uživljavanjem i igranjem koji imaju potencijal pretvaranja ne posjetitelja u posjetitelje. Kulturne institucije, gradske uprave, turistički uredi i lokaliteti baštine okreću se konceptima imerzivne i gamificirane baštine, pokušavajući doprijeti do novih segmenata posjetitelja i turista. Rad donosi opsežan pregled suvremene literature o imerzivnim tehnologijama u muzejima i na mjestima baštine te trendovima razvoja publike u muzejima općenito. Rad se bavi problemom istraživanja imerzivnih tehnologija kao strategije razvoja publike hrvatskih muzeja. Istraživačka pitanja su sljedeća: Je li opća populacija zainteresirana za aktualnu ponudu muzeja? Hoće li interes za ponudu muzeja porasti ako će nuditi imerzivno i gamificirano iskustvo? Istraživanje je provedeno na općoj populaciji kao kulturnoj publici, istražujući njihove stavove prema muzejima, video igrama, imerzivnim stvarnostima i korištenju gamifikacije i imerzivnosti u muzejskoj ponudi.