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## **Virtual Technology in Museums and Art Galleries Business Practice – The Empirical Research**

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### **Abstract**

*Contemporary museums are much more than places devoted to the placement and the exhibition of collections and art works. One of the keys to the general public approach is the use of new technologies and different structuring according to the clients profile and preferences. Virtual reality (VR) is probably one of the most potentially effective technologies for this purpose. The main purpose of implementation of 3D technology in museums and art galleries business practice is to create system which museum visitors can offer an entertaining, informative and enjoyable experience. This paper presents a results of study that has been undertaken in order to explore use of virtual technology in museums and art galleries in the area of Dubrovnik as the well-known tourist destination, with rich cultural heritage.*

**Keywords:** *art galleries, Croatia, Dubrovnik, museums, virtual technology*

Track: *Management & Leadership*

Word Count: 4.915

### **1. Introduction**

The main directive of a museum is to provide an environment where art, science, history, and cultural objects can be displayed. The exhibit is designed to immerse the visitor and evoke emotions. New and innovative way in informing the clients was introduction of www sites, as a tool, which has influenced availability of collections in a attractive way. The World Wide Web (WWW) is often used for putting different information about museums/art galleries and in the hands of museum curator it can be powerful communication tool that can deliver in a fast, user-friendly and low-cost information about the museum to potential virtual visitors. The museums/ galleries in Croatia often use Website, so the total number of 241 museums/galleries have their Websites.

According to the Barbieri *et al.* (2017) virtual museum (VM) systems are a very effective solution for the communication of cultural contents, thanks to their playful and educational approach. The visitors can view digitized artworks and explore reconstructed historical places by means of VM-hosted installations. A significant number of museums/art galleries have created 2D, two dimensional space. E-visitors walk through “virtual museum/art gallerie”, on personal computer, tablets or smartphone VR headsets via museums/art gallerie websites. The main purpose of implementation of 3D technology in museums and art galleries business practice is to create system which can offer an entertaining, informative and enjoyable experience to virtual museum visitors. In a virtual museum/art gallerie environment , there are more learning opportunities via educational games than in a physical museum/art galleries.

The goal of the paper is to explore the application of virtual technology in the business practice of Dubrovnik museums/art galleries. This paper presents a results of study that has been undertaken in order to explore use of virtual technology in museums and art galleries in the area of Dubrovnik as the well-known tourist destination, with rich cultural heritage. The empirical research has been carried out in 10 art galleries in Dubrovnik. The secondary research regarding museums in Dubrovnik, has also been done.

## 2. Some specific features of virtual museums

The idea of virtual was introduced by Andre Malraux in 1947. as a concept of imaginary museum, that is museum without walls, location and spatial boundaries. Contemporary museum have to be more than places devoted to the placement and the exhibition of collections, so applying virtuality in museums and art galleries business practice can obtain museums(art galleries) better market position and long-term sustainability. Virtual technology (VR) can be defined as a complex technology which exploits more low-level technologies, such as computer science, 3D graphics, robotics and similar, in order to create a digital environment which users feel immersed inside and which they may interact with. Both immersion and interaction concur to realize what is one of the main goals of a virtual experience: presence, i.e. the belief of actually being in a virtual space (Carozzino, Bergamasco, 2010).

There are three categories of virtual museums on the Internet that are developed as extensions of physical museums: The brochure museum, the content museum and learning museum. The mission of brochure museum is to inform visitors about museum, in the first order about location, some events, opening hours. The content museum is a Website created with the purpose of making information about museum collections available, containing detailed information about collections presented in an object-oriented way. The learning museum is a website, which offers different points of access to its virtual visitors, taking into account that segments are different, so information is presented in a customer-oriented way, rather than object-oriented way, with the main goal to motivate visitors to learn more and to visit site again (Styliani *et al.*, 2009)

Wang (2000) identifies two objects related notions of authentic experience, that exist in the literature (objective and constructive authenticity) and introduces a new approach named existential authenticity which emphasizes clients' subjective activities. Existential authenticity corresponds to a potential existential state of being, which is activated by participant practices. According to this perspective, clients may feel that they themselves are much more authentic when they engage in nonordinary activities in which they are more freely self-expressed than in daily life (Wang, 2000). For example, if we visit the web site of the National gallery we can see the collections, we can learn about art, make shopping, listen music, see the places where we can eat and have café. We can also find the program for families (fun for all ages, audio tours, journey through the collection, find children's gallery where are artworks which have been done by children inspired by the collections, the place for interactive fun etc (<http://www.nationalgallery.org.uk>).

Museums are concerned that providing a VR experience of their museum to remote users will replace the need for a physical museum. This was a similar concern when museums were confronted with users expecting exhibits and objects to be available online. In a majority of cases online content has only served to increase interest and attendance to a physical museum. It's not a stretch to believe this will be true for remote VR museum experiences. Storytelling

for Virtual Reality serves as a bridge between new media, professionals and clients. Virtual immersion refers to the deep mental involvement while interactivity refers to the concept of two things/persons having influence and responding to one another. The cost of evolving VR technology is still high, especially given the bespoke nature of a currently unsustainable hardware and software setup. VIVE Arts is one example of how museums can find a resourceful partner to explore (in this case) VR-museum projects. The London's Royal Academy of Arts, National museum of Natural History in France have used Viva Arts program which ensure technical and content advisory assistance and marketing support (<https://www.arts.vive.com/us/>).

On February 2011. Project was launched by Google in cooperation with 17 international museums, including the Tate Gallery in London, the Metropolitan Museum of Art in New York and Uffizi In Florence . It has enabled virtually tour partner museums' galleries, to find information about artwork and compile their own virtual collections. The images of many of the artworks were produced with very high quality, and each partner museum selected one artwork to be captured as a gigapixel image (with over 1 billion pixels). On April 2012 in this project have been included 151 museums in 40 countries. Through the Virtual Gallery Tour users can virtually "walk through" the galleries of each partner museum, using the same controls as Google Street View or by clicking on the gallery's floor plan. The Google team created an indoor-version of the Google street View 360-degree camera system to capture gallery images by pushing the camera "trolley" through a museum. It also used professional panoramic heads CLAUSS RODEON VR Head HD and CLAUSS VR Head ST to take high resolution photos of the artworks within a gallery. This technology allowed to achieve the excellent attention to detail and this highest image resolution. Each partner museum has selected one artwork to be captured at ultra-high resolution , approximately 1000 times more detailed than average<sup>3</sup> digital camera. The largest image, Alexander Andreyevich Ivanov's The Apparition of Crist to the People was over 12 gigapixels. The Tate Gallery has applied the technique of the natural light in the dark. The Tate has suggested this method , so that the Art Project could capture the painting's hidden phosphorescent image , which glows in the dark. The Google camera team had to adapt their method and keep the camera shutter open for 8 seconds in the dark to capture a distinct enough image. So, visitors can view the paintings in both light settings. Luc Vincent, the director of engineering at Google and head of the team responsible for Street View for the Art Project , stated concern over the quality of panorama cameras . He has believed that improved aperture control would enable more consistent quality of gallery images. Some artwork was especially difficult to capture and represent accurately as virtual, two-dimensional images. For example, Hans Holbein the Younger's the Ambassadors. This was due to anamorphic techniques distorting the image of a skull in the foreground of the painting. When looking at the original painting at the National Gallery in London, the depiction of the skull appears distorted until the viewer physically steps to the side of painting. Once the viewer is looking at the shape from the intended vantage point , the lifelike depiction of the skull materializes. Google stated that the effect was apparent in the gigapixel version of the painting, but was less pronounced in the "walk-through" function . This can be used in market focusing on the segment of professional artists, who expect high level of resolution (<http://www.googleartproject.com>).

The Oriental Institute Museum in Chicago has 360° interactive virtual tour. This tour was completed 2014 by Virtually Anywhere, a virtual tour production company, in collaboration with the Oriental Institute Museum's Curators. The Oriental Institute Museum is a showcase of the history, art, and archaeology of the ancient Near East. An integral part of the University of Chicago's Oriental Institute, the Museum displays objects recovered by Oriental Institute excavations in permanent galleries devoted to ancient Egypt, Nubia, Persia, Mesopotamia,

Syria, Anatolia, and the ancient site of Megiddo, as well as rotating special exhibits. This tour provides viewers a chance to preview our galleries and includes a number of archival images of highlighted objects from our collections. They have programs for children and seniors (<https://oi.uchicago.edu>).

The goal of the three-year project in the Archaeological Museum in Zagreb is the 3D scanning of archeological objects and the creation of a virtual and interactive museum as well as a scientific archive of highly accurate models for archeologists and experts of other disciplines. Digital models of cultural heritage achieved by 3D scanning techniques are equally used for virtual reconstruction, copy and replica production, scientific analysis, and detailed recording of damage to objects and monuments. Scanned items are available in a digital copy for a large number of users. The creation of a virtual museum achieves promotion on a global scale. In 2012, the Ministry of Culture of the Republic of Croatia approved funds for the project "3D scanning of selected objects of the A category of fundraisons of the Archaeological Museum in Zagreb and stone monuments exhibited at the Lapidarium of the Museum (<http://www.amz.hr/home/virtual-museum/3d-amz.aspx>)

INSIDDE (INtegration of cost-effective Solutions for Imaging, Detection, and Digitisation of hidden Elements in paintings) as project of European museums has also included innovative solution for capturing, imaging, and digitising unknown details of paintings and 3D artworks by means of terahertz technology in a unique approach, with the purpose of going beyond our present knowledge and adding value to the cultural content. It has helped in providing a complete set of images of the paintings and sealed objects, revealing complementary information about its hidden features— such as underlying contents, pigment/substance identification, brushstroke texture, defects – through various processing techniques. The resulting enriched images and 3D models will have been exploited in two manners: integrating them into the professional knowledge-sharing platform Europeana and developing an innovative smartphone application based on Augmented Reality. The curators and art researchers benefit from the project. The key of INSIDDE lies in improving the experience of visitors at European museums and through the internet by increasing the digital resources at their disposal, leading to a more attractive interaction. Experts from academia, technological research centres, SMEs and end-users with large experience collaborating in international research projects constitute a well-balanced consortium, in which the participation of museums definitely plays an irreplaceable role and makes the difference between theoretical and applied results (<http://insidde-fp7.eu>).

Very interesting and successful international workshop which has taken place 2013 in Delphi, Greece, has been organized on the theme “Virtual Archaeology, Museums and Cultural Tourism“. This international workshop was aimed at investigating all new trends in the field of digital (e.g., online, virtual) museums, virtual communities, archaeometric studies, digital cultural tourism and related topics. The workshop was attended by students, museum and cultural heritage professionals, scholars, archaeologists, historians, ethnologists, IT specialists and engineers and others working on digital applications in cultural heritage, public and private museums, etc. Topics of the debate included Visualizing archaeology and heritage in 3D, Virtual museums, Virtual, Augmented & Mixed Reality applications, Serious Games, Museums, Narrative and Virtual Storytelling, Web 2.0 and Social Networking in cultural heritage, Interactive installations in museums and heritage sites, Data mining and digital archives, Digital Cultural Tourism, Digital preservation of historical & traditional practices, Virtual Educational approaches and much more (<http://vamct13.syros.aegean.gr/>)



The museum visitor experience is often difficult to visualize for every visitor from beginning to end. That is where visitor journey mapping comes in. A user journey map is the creation of a visualization of the steps a visitor might go through in engaging with the museum during the visit. It is based off of personas that represent specific “types” of visitors and shows what happens at each stage. By visualizing a type of experience, the visitors needs, actions, emotions and pain points can be better addressed. This user-experience method was explored in a workshop at the Pratt Institute School of Information and was attended by students in the Museums & Digital Culture and Information Experience Design (IXD) programs. The focus has been on helping organizations create and implement user-centered digital programs and improve visitor experiences. Journey maps are “documents that visually illustrate customers’ processes, needs, and perceptions throughout their relationships with an organization.”. A specifically-focused journey map might touch on the experiences, challenges, and questions entailed for a single persona in a single situation, providing an acute description of the customer’s perspective. These customer journeys allow an institution to assess how their product is experienced through the lens of an individual with defined characteristics and desires. The most useful aspect of Journey mapping is that it takes form from the perspective of various visitor personas. Museum employees often times view their work and their museum differently than the average visitor because of how close they are to the institution. This can lead to decisions that do not always lend to a cohesive visitor experience. Journey mapping helps bring the visitor back into focus. It draws attention to the problem areas and highlights areas of success from the front-facing visitor side in museums all the way to the behind the scenes processes, all of which contribute to the visitors complete experience. Touchpoints do not only exist in the physical environment and it is just as important to consider how users are interacting with the institution in the digital realm. Journey mapping is especially useful in this instance because it pieces together the virtual with the physical interactions. For a museum, this is especially important. Digital expectations of the visitor do not leave when they walk through museum doors. Journey mapping to address areas of weakness across all these various touch points, especially digital, will create overall better visitor experiences. (<http://museumsdigitalculture.prattsi.org>)

Cultural and Creative sectors occupy a significant place in today’s European economy, by contributing to innovation, investment, digital modernisation and cultural tourism. The Cultural and Creative Industries (CCIs) generate indeed around €509 billion per year, representing 5.3% of the EU’s total GDP and employ 12 million full-time jobs, which constitutes 7.5% of the EU’s employment and the third largest employer sector in the EU (<https://www.digitalmeetsculture.net/article/modernising-cultural-and-creative-industries-within-the-eu/>). More than the economic value added to the EU’s GDP, cultural and creative sectors promote the European culture within and beyond the EU’s borders. In a political context characterised by the questioning of the European project, cultural and creative sectors have the potential to strengthen the European identities, cultural diversity and values; favour the critical thinking and build bridge between art, culture, business and technology in order to bring the European citizens closer.

In the last years, the EU has developed various projects in the framework of the 2015-18 Work Plan for Culture and the 2020 Horizon programmes to finance and support Cultural and Creative Industries. However, market fragmentation, insufficient access to finance and uncertainties in salaries conditions continue to undermine the cultural participation and development. In response to the Council’s invitation to do more in the cultural sector, in May 2018 the European Commission adopted a proposal for a New European Agenda for Culture. The New Agenda aims to harness the power of culture and cultural diversity for social

cohesion; bolster the common European identity; support jobs and growth in cultural and creative sectors and to strengthen international cultural relations. With the evolution of globalisation and digitalisation in modern life, the New European Agenda for Culture embraces the innovation in cultural and creative sectors. This goes with the adaptation of education and training to address the technological and business skills deficit and bring about evolution in the cultural sector. Moreover, it is currently assessed that there is a need for continuous assessment to ensure that the regulatory framework complies with intellectual property rights, consumer protection, online distribution and the establishment and operation of business rules in a digital era (<http://vamct13.syros.aegean.gr/>)

The goal of the paper is to explore existence of web sites and application of virtual technology/tour in museums/art galleries business practice in Dubrovnik.

### **3. Results of research carried out in Dubrovnik**

For the purpose of this paper we have done secondary and primary research. The data about museums has been collected from secondary resources and the data about art galleries from the primary research. The empirical research has been carried out by interviewing 10 managers/employees of art galleries in 2015. in the city of Dubrovnik. The aim of the research was to explore the their perception towards virtuality in art galleries' collections presentation in Dubrovnik.

The Patriotic Museum, forerunner of Dubrovnik Museums, was founded in 1872 at the instigation of the Chamber of Trade and the Commune Council. The museum was opened to the public in 1873. Its nucleus consists of a fine natural history collection, along with which cultural, historical and archaeological collections were founded and a collection of folk handicrafts. Today Dubrovnik Museums are a complex regional establishment comprising five specialised museums: the Cultural History Museum, Maritime Museum, Archaeological Museum, Ethnographic Museum and Museum of Contemporary History. In 2011 in the Museum's Night the virtual technology has been used in the business practice of Dubrovnik Museums. Using the tach screens and original interfaces the content of collections has been available to international public. Rupe Ethnographic Museum on the Website offers data about working hour, price for adults and for the kids, individual price and the price for group of visitors, address and content of the collection. The Maritime Museum Website also provides information about address, prices, working hours and contain of the collection. The Museum of Contemporary History Website contains information refering to the working hours, address, prices and contain of the collections and exhibitons. The Archaeological Museum Website contains the information about working hour, prices, address and collections and exhibitons. Cultural-History Museum Website offer data about museum, working hours, prices, exhibitons, collections, events. So, visitors is allowed to see some basic information about working hour, price, address and to see selected artefacts. The visitors aslo can use short virtual tour and „walk through“ the Maritime Museum, cultural History Museum, Ethnographic Museum. On the Website of Dubrovnik museums we can also find some basic information about educational program and program for kids. Museum of Modern Art Dubrovnik Website provides information about Museum Gallery, address, working hours, collections, archive and exhibitons (<http://www.dumus.hr>)

In the empirical research which has been carried out in art galleries 10 managers (owners) and employees have taken part. Men in the study were represented with a share of 60%, while women accounted for 40%. The largest number of managers/employees (50%) were older than 58. The same part of them, 30% belongs to managers/employees between 36 and 57, such

as until 36. The managers/employees are mostly college-educated or have finished high school (60%). One part of them have master degree and 30 % of them have finished secondary school.

The results of research shows that 50% of art galleries have Websites, 40% have no Website and 10% of them is in the process of creating. The Art Galleries which use virtual technology on their Websites put basic data about galleries and items from the collection.

The paintings which can be seen are mostly in the range of 5% until 30%. The gallery which is in the process of Website creating, plan to put 90% of items on the web site. Beside the paintings on the Website can be seen items made from porcelain (10%), ceramic (10%), jewelry (20%), silk (10%), souvenirs (10%). Just a small part of art galleries (20%) put the data about events on their web sites. The 40% of interviewers do not report some problems connected with virtual technology usement, 10% report the problem with accurating the content and the costs, quality of photography and the volume of the items which they have to put on the Website.

All the art galleries are oriented towards all clients, there is no differentiation according to the market segments. Very high level of satisfaction with art galleries collection reports 70% of managers/employees and partial level of satisfaction reports 30 % of them. The managers/employees state that there is no special content for children on the Website (100%) and there is no payment/fee for visiting Web sites (100%). The usement of virtual technology does not influence on reduction of physical visits to the galleries (100%). In opinion of managers/employees it mostly influences on more physical visits to the galleries and it arises the informational level of their clients who are coming to see some chosen item. So, we can conclude that visit of virtual art galleries help the promotion of real art galleries, although art galleries have no special promotional messages on their Websites. For example, Apolon-online art gallery in Croatia, offer virtual tour and has promotional activities for clients (<http://galerija-apolon>)

Mostly there are no some special promotional messages on art galleries Website in Dubrovnik, but the managers/employees mostly find music is important in creating virtual tour. We also would like to mention that only 10% of all the interviewers (it includes and the managers in the Art Galleries without Website) consider that the music is not important in providing Art Galleries service. For the most of them it is very important element (70%) or partially important (20%).

#### **4. In conclusion**

It is undeniable that technology has a growing presence within the museum sphere. At first, audio-visual technology was harnessed by the museum to augment the museum's exhibits and provide an enhanced user experience. However, with the universality of everyone owning a smartphone, the museum has seen an increasing rate of technology encroachment, and not of their own making. Despite museums having the reputation of being technophobic or exceptionally slow at evolving, they have an opportunity now to be proactive in the AR and VR realms. Augmented reality is the integration of digital information with the user's environment in real time. Unlike virtual reality, which creates a totally artificial environment which is experienced through sensory stimuli (such as sights and sounds), augmented reality uses the existing environment and overlays new information on top of it. The business practice in the world's famous museums/galleries shows the positive influence of VR technology implementation. Analysis of three VR projects 'Modigliani VR: The Ochre Atelier' at the Tate Modern, 'Jupiter Hall' at the Hermitage Museum, and 'DigiMuse



programme' at the National Museum of Singapore in the context of museological trends and global market indicates that this demands partnership and new form of cooperation which has an economic component ensuring value creation. The VR technology can become a new channel to achieve museum's objectives while remaining relevant and sustainable. Interest is nowadays focuses on the relationships between museums, artifacts, digital technologies and the Web, and their role in the redefinition of the museum itself as "communication engine". The interaction between real ontologies, the empirical perception of material culture – objects – and their virtual ontologies – the digital representations – creates new perspectives in the domain of data analysis, data sharing, data contextualization and cultural transmission. In this way, every museum is a meta-museum since artifacts, sites and objects exist in relation and interaction with cultural processes. In other words, in the digital domain, a museum artifact is the outcome of a very sophisticated informational and communicational process, contextualized in a virtual network of relations. The museum and its collections are themselves a site or a "sitefact", because they create new contexts and territories of knowledge.

According to the results of the research in 2015. it is visible that museums in Dubrovnik apply virtual technology in their business practice, but it is oriented on the some basic data about museums and making available part of items to the visitors. The significant part of art galleries did not have Website, although some of them has been creating their own Websites. Very often just a part of collection can be seen during the virtual visit ( mostly about 30% of paintings and other items). All possibilities which provide virtual technology in museums/art galleries business practice are not used enough, especially in the form of learning museum/art galleries. New technologies provide a lot of possibilities for museums/art galleries product/service market placement, although the quality of visit can be reduced. So, it is important to make a right decision about technique which will be used in presentation. Some high-quality and sophisticated virtual museums in the world involve collaboration between museologist and computer experts, so it can be in Dubrovnik museum business practice the case, too.

There are some activities which have been done, but it is necessary to support and initiate application of virtual technology in Dubrovnik museums/ art galleries business practice in the future ( 3D technology and other techniques) and arising more the existing Websites on the level of learning museums/ art galleries. Unfortunately very often the public (includes tourist) is not well informed about world worth collections which can be seen in Dubrovnik museums/art galleries. The information technologies provide solutions to issues of space limitations, of the considerable exhibitions cost and of curator's concerns concerning the fragility of some artefacts (Styliani *et al.*, 2009).

The main directive of a museum is to provide an environment where art, science, history, and cultural objects can be displayed. Museum staff create content and curate objects to tell a story. The experience a museum-goer has when witnessing an exhibit is meant to involve the visual (and sometimes aural sense) and leave the person changed as a result of their exposure to the exhibit. The exhibit is designed to immerse the visitor, evoke emotion inspire new thoughts, and encourage the person to feel present. AR and VR both provide a greater ability to place things, events, and people within context—leading to a greater understanding. VR offers a more holistic form of storytelling. VR, and to a lesser extent AR, can open up museum exhibits to people unable to attend or fully engage in the physical exhibit experience. Whether it's the lure of technology or the promise of a more immersive museums experience,

museums who've tested AR and VR technology in their exhibits experienced higher attendance.

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