

Employing immersion to communicate archaeology

A visitor-centered approach



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Abstract

The present thesis examines how the museum visitor's experience is being transformed by various developments and particularly by the advent of virtual reality technology. The research focused on identifying the problems of communicating the archaeological information to the museum audiences while highlighting best practices and proposing solutions. The immersive function of virtual reality was examined for its potentials to enhance the visitor's perception, learning process and overall museum experience, while an attempt to restore how immersion is being perceived in the cultural field has been made. At the same time, common misuses and traps were highlighted and followed by instructions for the best employment of virtual reality by the museums. The User Experience (UX) Design approach is proposed by this thesis as a potential standard methodology to be adopted by the museums for interpreting the results of the visitor studies into concrete design solutions. Finally, all the insights gained during this research were accumulated into a framework of principles, aims and guidelines for the optimal museum experience with the incorporation of virtual reality.

Key words: museum experience, museum visitors, visitor-centered approach, UX design, virtual reality, immersion, framework, virtual reality ethics, exhibition design

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1. Introduction

Humans have always invented ways to immerse themselves into otherworldly realms, for example, by reading a good book, watching a well-played performance in the theater, listening to the intense narration of a storyteller or participating in the tribe's ritual dance.

Why did contemporary people create a technology¹ to achieve that? Most importantly, why do museums need that technology? Have Rothko's paintings stopped making the visitors cry? Or is Stendhal Syndrome now labelled as "fake news"?

Some scholars argue about the fading power of the object to tell its story, to inspire and cause emotions by itself, while museums remove excess objects and bring in new technology (Ames 1992; MacArthur 2011; Conn 2010). But, is it the power of the object to speak or the ability of modern humans to listen, what is fading?

Putting aside these questions for a later reflection, this thesis is about understanding why the museums need to employ immersion and how it can contribute to a meaningful museum experience.

One fundamental function of the museum is to communicate the scientific information related to the exhibits. This function defines the institution's mission as a societal one since it aims at the development of societies through the knowledge derived by the study of the past. However, in the course of the institution's evolution, it was not until 1974 when the term "communication" was chosen to describe this function in the official museum definition (ICOM, 1974). By replacing the previous terms of "education" and "instruction", it represents a turning point when the museums started changing their long-established perspectives regarding their relationship with the visitors and society at large. They became less authoritative and willing to adjust their work and attitude towards their audience's needs. Already, in the course of several decades, a number of innovative museum influencers had addressed the institution's weaknesses and suggested urgent changes towards that direction. Mainly, the need to abandon elitism and become relevant to the everyday people by embracing their values, concerns and interests, to take a stand on social issues, to meet the so far unmet visitor's needs by updating the learning methods, the exhibition practices and the means for the presentation of information, to employ psychologists, educators and communicators and to reach wider audiences through the mass media and new technologies (Dana 1917; Low 1942; Wittlin 1970; Cameron 1971). In the following decades, additional requirements were identified so as to render the term "communication" more specific and the museum's function more meaningful. Several pioneer professionals started exploring the visitor's identity advocating the need for their increased role in the meaning-making process, while at the same time they defined the museum's offer as an experience. These realizations opened up new potentials and perspectives regarding what a museum could offer: two-way communication, affect-based, engaging and authentic experiences, the democratization of what is considered to be the truth by incorporating the alternative narratives of minorities. All these new insights describe the ongoing *experiential* and *visitor-centered shift* (Weil 1990; Ames 1992; Roberts 1997; Skramstad 1999; Falk 2016; Harris 2016).

In recent years, due to the widespread use of digital technologies (GIS, Total station, 3D modelling) in field archaeology to acquire, document and analyze the data, there is an

¹ Immersive technology in this dissertation refers to the technology of Virtual/Augmented/Mixed Reality (VR/AR/MR).

unprecedented production of archaeological information which, due to the mass and complexity, is often impossible to communicate in a museum with the traditional means. Modern digital technologies have been acknowledged for their abilities to tackle this kind of problems and provide effective and interactive visualizations of data (mobile devices, Virtual/Augmented/Mixed reality, interactive interfaces), thus some museums are making efforts to incorporate them in the exhibition context. More than that, since the museum's goal now is to communicate the intangible aspects of the past (ICOM, 2007), to provide affect-based, engaging and participatory experiences, the new technologies have become even more a necessity. However, old practices and perspectives are still hard to overcome and the technological adaptation of museums is happening at a slow pace and not without hesitation and criticism. The reason behind such an attitude is the fear of losing authority, quality due to popularization and status due to the embrace of subjectivity (Harris 2016; Simon 2011; MacArthur 2011; Conn 2010; Davis 2016). An additional issue is the continuous development of these technologies which quickly become obsolete prior to the establishment of standardization or the test of time in the museum context. Experimentation with new technologies becomes difficult also due to the redirection of state funds away from culture and towards other pressing sectors of our era, such as pensions and healthcare (MacArthur 2011; Champion 2014; Meijer et al. 2010; Chenhall & Vance 2010).

Yet, during the last years, there has been a considerable boost in projects and theoretical discourse exploring the use of virtual technology for communicating cultural heritage. What makes this event so important for archaeology and the museum, is that these projects have brought together professionals and institutions of such diverse scientific spheres, working ethics and mentalities that are constructing an unparalleled universe of collaborations with very promising results for the future. New ideas, a diversity of lenses, the daring to experiment and the realization of common goals are just a few, just the basic ones. What these developments are going to bring is a re-connection of modern humans with cultural heritage, on different terms and a whole new way, which starts from the bottom- up, from the mundane, the common people and their lives.

Most of these projects though are being tested in a lab without ever reaching the real context of a museum and the intended end-users, the visitors. But also the projects which make it to the museum environment are rarely properly evaluated for their effectiveness and meaningfulness, as we will see during the examination of case studies (Pescarin et al. 2012; Bianca Gockel et al. 2013; Champion 2014). One of the findings of this research was that virtual reality in the cultural heritage sector has acquired a different meaning which does not make justice of its actual capabilities and proper treatment. The crucial affordances of this technology are Presence and Immersion (Champion 2014; Boellstorff 2014; Riva & Waterworth 2014) which in this particular sector have not been thoroughly understood and their benefits for the communication of archaeology in museums are not being properly exploited. What is more, the findings from visitor studies and the museum experience are not translated into practical guidelines for the development of these technological projects, which is due to the lack of common language between the different professions involved and their insufficient ways of collaboration (Roppola 2012; Chenhall & Vance 2010). Moreover, the frameworks developed and being used so far (London Charter, Seville principles) have limited effectiveness due to the reasons stated above, but also because they have as a starting point the needs of the cultural heritage professionals, while the needs of museum visitors are hardly present, if not completely absent, in their approach. In addition, these frameworks were created for computer-based projects in general, lacking thus, the ability to address VR-

specific guidelines and thus, adjust these VR projects according to the needs of a museum context, the visitors and the affordances of VR technology. All these statements will be proved and developed further in the next chapters of this research.

Although this research started with the aim to explore how immersive experiences are being implemented by the museums and with what results, the author soon realized that virtual reality in museums pertains to a complex universe of stakeholders, needs and perspectives and more than that, it is dependent and interrelated with the wider museum experience. Thus, it would be impossible to reach any valid results, without first exploring the wider context and the relationships formed in it.

1.1 Aims and Research Questions

What constitutes a good virtual experience in a museum context? This question could summarize the aim of this thesis, if only it were not so vague. Good for *whom*? And, what does *good* means in this context? Therefore, let us rephrase the research problem:

How can a virtual experience be meaningful for the visitor, the museum and the virtual technology itself?

In order to reach valid conclusions, additional objectives need to be set: The first is to reach an updated definition of what a museum ought to be in the contemporary, or near-future world, by taking into account the impactful transformations which are now shaping our societies. The second one is the creation of a framework for optimal implementation of virtual experiences in the museum context, which will incorporate the needs and interests of both the museum and visitors in connection to the affordances of VR technology. A third goal is to examine whether the established ethical theories can deal with ethical issues that may arise by using virtual reality in museums and identify situations where the users may be harmed.

Through the study of previous research and case studies, this thesis will aim to address the problem and answer the following three research questions:

1. How can we evaluate the visitor's experience in terms of their participation in the creation of meaning?
2. What principles constitute an optimal framework for the creation of virtual experiences, compatible with the museum context?
3. How does the immersive process of meaning-making benefits archaeology and the museums?

2. Changes Already Here and Changes to Come

Museums in the 21st century demonstrate an unprecedented receptiveness in ideas and developments that are already shaping many other domains of our contemporary world. The pace of adoption is certainly slower compared to other institutions, the entertainment industry or the markets, but the era of decisive exploration of what is happening outside the museum walls has arrived. Museum leaders show an eagerness to map out factors able to impact the museum work. Be it new technologies, sociocultural phenomena or economic developments, the bottom-line is people. All these affect and reflect how people think, work, enjoy life or just cope with their daily tasks. And it is exactly this interest in people and their evolving preferences, habits and mentality that causes museums to change.

FACTORS PREDICTED TO AFFECT THE MUSEUMS

The “Agenda 2026” report produced by The Netherlands Museum Association maps out the trends that are going to impact the museum sector worldwide. The report classifies as highly predictable and relevant the **increasing aged population** in Europe, who are predicted to become museum visitors, **the growth of international cultural tourism** and the **redirection of funds** from culture to other pressing sectors such as pensions and care. Less predictable but with high relevancy is **the growth of mega-cities, the digitization of society** and the **strengthening of European influence**. The centralization of funds towards the metropolitan areas in the European capitals is predicted to favour the bigger museums at the expense of the small ones. Further digitization will prompt museums to seek external collaborations, experts and private sponsors, standardization of systems etc., which means museums with more resources would cope better with these changes. Possible enforcement of European integration may create *supranational* museums which would bolster a European perspective on national themes and probably create debates on identity issues (Meijer et al. 2010, 2 ff).

A different study titled “NMC Horizon Report: 2016 Museum Edition”, focuses on how emerging technologies are going to affect museums in the near future. It consists of three focus-areas (trends, challenges and technological developments) that are expected to affect museum policy, leadership and practice:

- **Mobile Content and Delivery:** museums have recognized the attachment of visitors to their mobile devices (e.g. smartphones and tablets) and the exciting possibilities of improving navigation, interpretation, information and sharing of content. However, they are increasingly updating their policies and creating their own apps to tackle problems such as distraction, evasion of personal space and even safety.
- **Participatory Experiences:** this trend is a phenomenon of the western culture where the people are accustomed to the use of social media and the participatory nature of the Internet (user collaboration, interactivity, sharing of content). Museums have seen it as an opportunity to widen their audiences, communicate their goals more effectively and even fund their activities. However, this comes with a pressing need for decisive re-examination of policies and existential issues surrounding the museum as an institution (Freeman et al. 2016, 16 ff).
- **Data Analytics:** the data produced when people use the Internet can inform about user behaviour, preferences, quality of experience, even predict sales or reveal

marketing weaknesses. Museums are already monitoring website visits while they will increasingly employ devices like eye-trackers or AI cameras, in order to collect more data. However, issues of information security and ethical considerations are going to preoccupy the museums, along with the need to expand their collaborations.

- **Personalization:** the younger generations are interested in custom-made products, approaches and experiences. Research has shown that both entertainment and learning are improved when they are based on the individual's characteristics. Museums are increasingly employing emerging technologies in order to collect data and achieve personalized experiences. However, wider collaborations have to be established and universal frameworks and policies have to be explored (Freeman et al. 2016, 12 ff).
- **Cross-Institution Collaboration:** museums need to form partnerships in order to develop improved management systems, digital platforms for content sharing and communication and frameworks of good practices to meet today's needs. Museum directors will have to test new leadership strategies with the aim to become more agile, improve museum adaptability and make the visitor part of the efforts.
- **New Roles for Museum Professionals:** museum staff needs to be trained in concepts, tools and working ethics related to the incorporation of new technologies and knowledge from other fields (Freeman et al. 2016, 8 ff).

The above trends create a number of challenges which the NMC report classifies as “solvable” (the know-how exists), “difficult” (the problem is comprehensible but the solution is vague) and “wicked” (the problem is hard to grasp and so the solutions are). **Developing Effective Digital Strategies** and **Improving Digital Literacy of Museum Professionals** are the solvable challenges, **Improving Accessibility for Disabled Populations** and **Measuring the Impact of New Technologies** are the difficult ones while **Managing Knowledge Obsolescence** and **Privacy Concerns** are identified as both hard to grasp and tackle (Freeman et al. 2016, 22 ff).

The following technological advances are expected to affect the interpretation and learning in the museums:

- **Digital Humanities Technologies & Makerspaces** are already in widespread use in the museum context, but their standardization is not yet complete. The first relates to the use of computer programs in research, visualization, preservation, management and sharing of data, while Makerspaces relate to the Do-It-Yourself movement which is characteristic of the millennial generation and it is about using materials and technology in a personal, creative or critical way of thinking (Freeman et al. 2016, 36 ff).
- **Location Intelligence & Virtual Reality:** Museums are experimenting with technologies that use geospatial data to enhance navigation and customization of service, so as to improve the visitor's experience, learning and interpretation. VR technology is predicted to become mainstream as it expands the ability to engage with the museum objects and narratives. Inaccessible places and objects can be experienced in a realistic and personal way (Freeman et al. 2016, 40 ff).
- **Information Visualization & Networked Objects:** The first one refers to the use of advanced graphics to illustrate complicated information, while the latter is related to the Internet of Everything (IoE - the interconnection of everyday objects, people and devices through the Internet). The need for more effective ways to present information is becoming pressing and the IoE is predicted to make museum content

even more accessible, interactive and mobile (Freeman et al. 2016, 44 ff).

OTHER FACTORS THAT CAUSE MUSEUMS TO CHANGE

As Ambrose & Crispin note (2012, 25), the museum's work nowadays is more visible due to the exposure in the media and the internet, which resulted in people questioning museum competencies and role. People being aware of the institution's elitist past now expect more inclusiveness and participation. According to Davis (2016, 91 ff), museums in the post-colonial era seek to forgo the old authoritarian, single-sighted perspectives, shifting their interest from collections to the community and recognizing the pluralism of narratives and truths. In seeking to fulfil more visitors' needs they offer a variety of interpretive techniques and learning methods. However, there is still resistance towards these changes because of the fear of losing the power and status derived from the expert knowledge that has been traditionally connected to the museum profession. As a result, non-effective methods of communication such as the division by subject classifications are still the norm (Davis 2016, 97). At the same time, the increasing dependency on the markets has put in the foreground preoccupations previously alien to the museum such as profits, marketing, corporate values and strategies etc. This shift towards business resemblance had nonetheless one positive outcome: the shift towards the audience's value and its empowerment through the efforts to broaden it (Smeds 2016, 105 & 123 f).

A series of important research on visitor studies have shed light into aspects museums were ignorant about or considered to be irrelevant. According to Falk, museums keep on conducting demographic surveys (age, gender, nationality etc.) in order to define the visitor's profile. These surveys conclude that the average visitor is a white, middle-aged, well-educated woman. However, this statistical construction is not helpful, as it does not provide any insights into what visitors prefer, think, understand or miss from their experience (Falk 2016, 72). Research has shown that the museum visitor identity is much more complicated and fluid. Weiser suggests that museum visitors are an *imagined community* perceived through the illusion of sameness. Others view them as *engaged*, seeking to build a *common identity* through a common narrative (Weiser 2016, 40). As Anthony Giddens has noted (cited in Weiser 2016, 41), modern people's identities are detached from collectivist structures and have become more individualized. On the same course of thought, Hammershøj and Schmidt's theory of *self-formation* and *self-performance* (cited in Smeds 2016, 106) shows that, unlike the past where a person was incorporating universal values and was becoming part of the larger, nowadays a person seeks to perform her/his individuality on the social stage. Weiser, following Kenneth Burke's reflections on identity, writes: "...the individual characteristics that make up one's personal identity narrative are translated into an abstract reflection, then translated back into a narrative now larger than oneself—in other words, into a persuasive narrative of self in society" (Weiser 2016, 40). According to Fivush and Haden (cited in Weiser 2016, 41), identity is formed by a process where random pieces of memory are put together to reflect linearity and causality, a *lifetory*. Similarly, MacAdams (cited in Weiser 2016, 42), views identity as a *timeline*, where our different roles and life choices are synchronically and diachronically unified into a self and a narrative. Weiser draws a resemblance between the above concept of unification that forms a person's identity and how museum narratives come into being. Falk's research based on systematic interviews with museum visitors has offered a more concrete image about museum visitors. According to Falk, in the context of a museum, visitors each time perform an identity role depending on their motivation behind the

visitation. To *enact* such a role means to come into a personal fulfilment, to meet identity-related needs. But here, as he points out, identity is temporal and *personally-relevant*, it is about aspects of one's self, a curious person, a good parent, someone who seeks to relate with something unique etc., that need to be cultivated or confirmed. Falk's research resulted in seven visitor categories with distinct needs (Explorer, Facilitator, Professional/Hobbyist, Experience Seeker, Recharger, Respectful Pilgrim and Affinity Seeker), which offer museums a more thorough basis for a visitor-centered exhibition design (Falk 2016, 78 ff). However, what complicates the museum experience as Falk notes, is that a visitor can perform multiple identity roles at the same visit, as she/he may have more than one motive. Moreover, he stresses the fact that a museum visit does not start nor end inside the museum and the events prior and after the visit contribute to how one feels about, or interpret her/his experience. But, as these are factors museums cannot control, what they can control is meeting the visitors' *entering expectations* (Falk 2009, 35 & 120).

Museums have been influenced by new scientific understandings on the nature of learning and they have started adding constructivist approaches in their traditional methods, by engaging the visitor into the active construction of knowledge (Ambrose & Crispin 2012, 60). *Expressing the inexpressible and representing the unrepresentable*, as Harris notes (2016, 16), is what museums have to achieve in our times where objects' power is weakened and thus, to meet the visitors at their inner world of emotions is a new goal for some museums. The *turn to affect*, as she describes it, has led museums to experiment with new types of exhibitions creating interactive and immersive experiences. By targeting bodily responses, which represent the pure - unprocessed by mental activity - experience, museums put the visitor into the center of the meaning, an unprecedented act of visitor empowerment. As an example of an affect-based exhibition, the author describes the "Earthquake House", an immersive experience at Te Papa Museum of New Zealand, where the visitors can feel the simulated manifestations of an earthquake inside a controlled environment that resembles an ordinary house. However, the author points out the resemblance of such experiences with the ones provided by the entertainment industry and the fairgrounds, which do not demand more than affective responses and curators should be concerned about (Harris 2016, 16 ff).

Nina Simon (2016) has offered important insights into the much-cited inquiry of museum relevancy. She argues that relevancy should not be associated with familiarity, because it is not about adding new knowledge to already existing one, but about adding new value by arriving into conclusions that matter to someone personally:

"To answer a question on your mind. To confirm a suspicion. To fulfil a dream. To set your path forward" (2016, 36).

As she explains, familiarity is connected with seeking to be comfortable but relevancy incorporates effort and risk. However, the lower the effort the higher the relevancy, because there is a fine line between leaving the comfort of something we are used to and trying something that claims to offer something new (Simon 2016, 36 ff). A museum's offer cannot be relevant to everyone since each person has her/his own notion about it, based on their personal experiences, beliefs etc. However, she adds that relevancy is not a fixed characteristic, hence it is possible to make someone transcend from their established preferences and try the offer. Relevancy is crucial because, as she simply puts it, people respond to *what matters to them* and the museum visitation is based on a hope to find something that interests *them* (Simon 2016, 40 ff). According to Simon, a museum exhibition cannot be relevant to diverse audiences at the same time, which is why it should

target to specific “communities” each time, by talking with members or representatives of each group, creating networks and getting first-hand feedback. This would allow the whole experience to have consistency and appeal to the common characteristics of the target audience (Simon 2016, 68 ff). She also underlines the participatory nature of digital technology, a two-way process, where the user’s input causes a responsive adaptation of the system (2011, 22 ff). An example is given when the user is able to rate the provided content, as in Youtube and Netflix, then all other users are benefited. Another point she makes is that the more people contribute and participate, like in Wikipedia, the more value is being added. She points out the lack of responsiveness in museum participatory experiences, arguing that visitors need to know how their input will be used and affect the exhibition in order to feel motivated. An important point she makes is that exhibits made for single-person interaction are unsuitable for crowded museums and visitors do not enjoy the experience, while participatory exhibitions are able to manage the crowds in ways that will contribute in a positive experience (Simon 2011, 24 ff).

CONCLUSION

In this chapter an attempt to capture the broader context of museum preoccupations and ongoing changes has been made, in order to better understand in the following chapters, how the new and immersive technologies contribute to the museum transformation, why their employment renders those who use them relevant to the today’s world and why that becomes an asset for the museum’s future. Socio-economic and technological trends and factors are changing the world, making those who do not adapt, quickly obsolete and easy to be extinct from the stage of evolution, action and social impact. Museums, sometimes negotiating and sometimes absorbing some essential recent advancements in other fields and sciences, try to set a robust course towards the insurance of their own future.

2.1 Let us break the museum into pieces!

In this chapter, an attempt to pinpoint evolution phases of the museum institution is being made, in order to better understand and evaluate its present state. For this goal, information extracted by articles written in different decades by leading figures of the institution will be used. The chapter also seeks to discuss what constitutes a museum in the present day and how the current official definitions of the museum could be updated by the thesis research aims.

LESSONS FROM 1917

John Dana, the founder of the Newark Museum of New Jersey and innovative theoretician of the museums, wrote an influential article titled “The Gloom of the Museum” (1917) about the changes museums should undergo that sound currently very relevant. He highlights the need to abandon elitism and enrich the collections with objects of the everyday and local life, which have a “*direct bearing on the daily life of those who support it, visit...and make use of its collections*”, an idea which echoes today’s efforts of museum professionals. He then goes on to suggest that a museum’s purpose should be to make life “interesting”, “joyful”, and “wholesome”, but “*...a museum cannot very well exercise that function unless it relates itself quite closely to the life it should be influencing*” (Dana 1917, 24). Here, the word “relate” rings a bell for “relevancy”, a term so many scholars advocate today for the sake of the museum’s future. Interestingly, Dana notes (1917, 21) the obsolescence of museum buildings,

in terms of architecture, which should be easily accessible and welcoming to the ordinary people, while they should enforce the objects by making them look attractive. These are discussions that still bother the museum professionals, particularly those dealing with the bigger museums, which acquired their collections in the course of centuries and thus, radical architectural and design solutions need more courage and planning in order to be applied (see Lindsay 2016).

Dana's recipe for a museum to stay alive (aka relevant) is "*It must teach and it must advertise*" (1917, 25). He connects the term *teach* with the need to abandon the dogmatic style of museum interpretation and replace it with a comparative one that will let visitors form an opinion by themselves. This suggestion reflects today's constructivist practices which many museums have embraced. By "advertise" Dana envisioned museum objects travelling the world through the mass media of the time, becoming thus accessible to everyone (1917, 25 f). Museums today seem to have found the goose that lays the golden tickets for this travelling, the social media and the content-sharing applications.

LESSONS FROM 1942

Theodore Low, an educator at the Metropolitan Museum of Art (New York), in his article "What is a museum?" (1942), among other changes, he firmly suggested the empowerment of the educators working in the museum sector. His ideas were formed around what he believed is the museum's ultimate purpose: the enlightenment of the everyday people. He believed that the museum's existence is meaningless if it only serves the needs of scholars and curators. So, once more, the subject of relevancy towards society is raised. He also blamed the authoritarian and conservative attitude of museum professionals, especially curators, who do not allow the museum to embrace the social changes and the evolution of ideas (Low 1942, 36 ff). Due to the dreadful times of his generation, he advocates that the power of the museum is its potency for good, against the evil forces that threaten the world and also its rightful stand to serve the truth against the propaganda (Low 1942, 30 ff). Throughout his article the advocacy for an urgent and active social stand by the museums is emphasized.

Regarding the museum functions, acquisition-preservation, scholarly study and public education, he stresses the need to unify the work of the different professions and departments involved, under the same goal and a mindset of cooperation (Low 1942, 35 f), which is reflected in today's efforts for the establishment of more efficient models of interdisciplinary teamwork (Roppola 2012; Freeman et al. 2016, 8 ff; Anderson 2012, 4 ff).

LESSONS FROM THE 1970s

Alma Wittlin, an insightful museum scholar, proposed a series of core museum changes in order to deal with the "*unmet needs of people*". Influenced by the audiovisual technological trend of the time, she defended the withdrawal of excess objects into depots and the use of technology to improve the enjoyment and quality of the experience. She highlighted the three-dimensionality and contextual, object-based information as fundamental values of the museum experience, opposing the use of screens for the display of texts. She addressed the *fatigue* of modern people due to their exposure to a plethora of information in their everyday lives, stating that the museums should keep the information "*relevant*" to visitors. By that, she refers to both the subject matter and the presentation. She proposed that museum exhibitions should address issues of the time that are of general interest or a contemporary problem, and draw correlations with the past. Further, she highlighted the urgency of having specialists working together in a structured and interdependent way as in a business context.

She particularly stressed the need to test the exhibits by employing visual perception psychologists and communicators (Wittlin 1970, 45 ff).

Duncan Cameron's article published a year later (1971) discusses the museum identity crisis that got intensified by two phenomena of that time: the exhibition and collection activities of several science centers and other institutions and the anti-museum protest movement that demanded a reform towards inclusivity and abandonment of elitist values, mindset and practices. He highlights the basic ongoing problem that stemmed from the very origins of the museum as a public institution. It is rooted in the structure of collections itself, created by the elite of academics and curators, who acquired, studied and organized the exhibits according to their special interests and preferences, constructing hence, a reality that depicts their values, concerns and priorities. As he mentions, the way these collections are built and presented "*could only be meaningful*" to them. However, he does not oppose the traditional view of the museum as a temple, that is, a sacred place that holds the objective truth. He considers the pursuit of *proved excellence* and the *highest degree of objectivity* to be the museum's social role. But, at the same time, he advocates a reform towards being a forum for public dialogue and critique. A place where new ideas and experimentation will be discussed and processed. As he puts it,

"...the forum is where the battles are fought, the temple is where the victors rest. The former is process, the latter is product" (Cameron 1971, 70)

Interestingly, he suggests that exhibitions should be designed in a way that would be suitable for the mass media to peer into and promote them. Outreach programs with the aid of electronic and other mass media would actualize the function of the museum as a forum (Cameron 1971, 61 ff).

LESSONS FROM THE 1990s

Several scholars and professionals during the '90s identified problems and proposed changes that have led today's museums to great progress.

Stephen Weil proposed a three-function model (preservation, study and communication), instead of the traditional one that identifies five distinct aims: collect, conserve, study, interpret and exhibit. Of particular interest is the proposed unity of the interpretation and exhibition under the term communication. The exhibition's structure is considered to be the cornerstone of the interpretation process, as opposed to the accompanying aids, such as labels, activities etc. An increased role for the visitor is also being discussed along with the importance of their motives behind the visitation (Weil 1990, 74 ff). Weil also stresses the need for the museum experience to be a "*deeply affective experience*" (Weil 1990, 79).

Michael Ames highlights the failure of the museums to convey the stories of native people due to the prevailing imperialist narratives and the absence of the authentic native perspective, along with the stories of other minority groups, from the exhibition design. He also discusses the question of authenticity supporting that the objective should be the authentic experiences rather than authentic objects (Ames 1992, 80 ff).

Lisa Roberts, in discussing how museum interpretation has changed over the decades, she notes the visitor-centered shift inspired by the persistent efforts of educators towards alternative ways and a more effective, two-way communication. Museums have started to explore how the visitor's worlds and experiences relate to the interpretation of exhibitions (Roberts 1997, 221 f).

Harold Skramstad maps out the challenges of the 21st century, predicting that museums will greatly demand experience designers, as exhibitions will seek to be deep, powerful and engaging experiences. He notes that exhibition producers will pursue close interaction with the audiences and the latter will expect active participation. The artefacts will serve as means rather than ends. Interestingly, he talks about a re-statement of every museum's purpose that will include a value proposition to their audiences, that is, not only what are the museum's aims but how the outcomes will serve the public (Skramstad 1999, 127 ff).

As a capstone to all the above, a year later, Judy Rand, a renowned curator, published the Visitor's Bill of Rights, mapping out eleven needs/demands that every visitor should fulfil when visiting a museum:

- Comfort, Orientation and Welcome: Visitors should spend the minimum effort to attend to their physical needs, navigate, examine the exhibits, while the museum staff, apart from being welcoming, should be representative of the diverse audience.
- Enjoyment, Socializing and Respect: The experience should be interesting, engaging and relevant to them while facilitating socialization and embrace the various levels of knowledge, cognitive abilities and interests.
- Communication and Learning: Visitors expect to have two-way, clear and accurate communication with the museum narratives, while the learning process should be undisturbed and address different learning styles.
- Choice and Control, Challenge and Confidence, Revitalization: The museum should attend the visitor's need for autonomy, bodily action, sense of achievement, the flow of experience and refreshment (Rand 2000, 158 f).

CONCLUSION

From the above it can be concluded that issues that were bothering the museums in those early years continue to matter today. Although there has been big progress in some sectors since those early years, the main problem for the museums continues to be their relevancy towards their audiences and the institution's weakness to impact the wider society through its work.

2.2 Negotiating Museum Identity in the 21st Century

As we saw in the previous chapter, unresolved identity issues have been affecting the museum performance and contemporary museum experts, such as Robert Janes (2009) and Gail Anderson (2012) among others, stress the need for a fundamental re-examination of museum identity. Having a concrete identity awareness, as we will show in this chapter, apart from making the institution more effective, creates an authentic "brand" and this, in turn, creates loyal audiences. So, this chapter is about, discussing the official definitions of a museum which have been developed in the course of the mid- 20th century until now, identifying developments that are likely to cause institutional transformation and suggesting changes to the today's official definition by ICOM, informed by these developments.

THE COURSE OF A DEFINITION

"A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and

exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment” (ICOM 2007).

The above sentence is the official definition of a museum, according to the International Council of Museums (ICOM), updated in 2007 to, interestingly, include the “*intangible heritage*” in the previous definition where only the “*material evidence*” was mentioned (ICOM 2001). This addition depicts a shift described in chapter 2 towards “*expressing the inexpressible*” and the turn to affect, as stated by Jennifer Harris (2016).

As late as 1989 a correction of 1974’s definition changed the expression from “*...material evidence of man and his environment*” (ICOM 1989) to “*material evidence of people and their environment*” (ICOM 1974), a tiny piece of evidence that shows how slow the institution has adapted to societal changes so far.

However, the 1974’s definition corrected the previous one which refers to “*...collections of objects of cultural or scientific significance*” (ICOM 1961). This change probably reflects the shift away from the obsession around the collections, which were formed as a result of the taste and values of the aristocracy and the curators, and towards embracing the everyday objects, which Dana advocated in 1917 (chapter 2.1).

The 1951’s definition contained an unusual phrase, a bit vague, that has never been repeated in the previous or the following definitions, but probably in the ears of a person who lives in 2019 sounds very meaningful and up-to-date:

“...for the purpose of preserving, studying, enhancing by various means and, in particular, of exhibiting to the public for its delectation and instruction groups of objects and specimens of cultural value” (ICOM 1951).

The phrase, of course, is “*enhancing by various means*” the museum objects. Whichever the actual meaning was back in the ’50s, it is something much discussed nowadays in the dialogue about the objects’ power and the use of new technologies to augment them (Ames 1992, MacArthur 2011, Conn 2010) (also see chapter 2). Another interesting point when comparing the 50’s definition with the contemporary one, is how the stated purpose has shifted from *preservation, study, enhancement and exhibition*, to “*education, study and enjoyment*”. The museum functions once viewed as the end- purpose now they are considered to be activities aiming at a different purpose, which is directly related to the museum’s audience. What used to be the answer to the Why question now is the answer to the “What a museum does?” question. Robert Janes (2009, 166) attributes the museum functions to the question of How, which he considers as less important. My argument is that the museum functions do not communicate how a museum fulfils the stated purposes of education, study and enjoyment, and by assuming that by these alone the purpose is fulfilled, then we are certainly misled. At the end of this chapter, I will extend this argument and explain why it would be meaningful to add the How question in the museum definition. To arrive at a valid conclusion, additional aspects concerning the contemporary museum identity have to be discussed in the following paragraphs.

MUSEUM AS A BUSINESS AND A PRODUCT

What is a museum right now? Ambrose and Crispin (2012, 43 ff) talk about the museum product. Trying to define it they say:

“It is an amalgam of services, people, buildings, facilities, atmosphere, customer care, accessibility, corporate presentation, collections, events and activities and many other

quantifiable and non-quantifiable factors” (2012, 43).

They mention the term *brand* and *market competitors* and they advise museums to identify their *market segments* and provide *products and services* to meet their needs. They also suggest building a strong brand, if they want to have a distinctive identity in people’s minds. The authors state that these propositions will help the museums make their collections more accessible and thus achieve their higher societal goal (Ambrose and Crispin 2012, 13 ff).

On the other hand, Davis (2016, 92) notes the corrosive power of the markets, which satisfy the needs of those who can pay the price, while society exists to fulfil people’s needs regardless of their paying capacity. She states that museums belong to society and not to the markets because they exist for social good, while the markets’ purpose is profit.

Similarly, Robert Janes argues that adopting corporate models and free-market values without refinement actually harms the museums. That is because museums have an agenda dependent on the market forces (restaurants, gift shops etc) and one that should be irrelevant of them (research, collections, audiences), but under the corporate ideology, they are mixed together under the same bottom line, the profit (Janes 2009, 94 ff).

Indeed, in all the definitions we have previously seen, a museum is a non-profit institution with the purpose of social development. And then we have the businesses, whose purpose is profit. But, the truth in both cases seems to be a bit more complicated. Let us take the average museum for example. There is the basic ticket fee and then the prices rise for audio guides and other services, or for special exhibitions. So people having less purchasing ability they are offered poorer service. Moreover, museums purpose and efforts to benefit society are undeniable. But, as we have seen in chapter 2.1, they lacked so far the ability to become decisive factors of social change and development.

On the other hand, let us quote the contemporary “star” businessman Elon Musk, creator of Tesla, SpaceX and Neuralink:

“When something is important enough, you do it even if the odds are not in your favour” (Pelley 2012)

He represents a specimen of innovative business leaders who communicate real values in people’s lives through their products. Risking business profits to give form to humanity’s long-standing dreams: autonomous transportation, a colony to Mars, AI augmentation of human biology. Someone could, of course, argue that this is an example of a megalomaniac who chases his dreams that happen to be other people’s dreams too. But, the key words here are “communication of real value”. According to Simon Sinek (2009, 42 ff), author and motivational speaker, this is what distinguishes great organizations and businesses. Money is a result as he says, but there is always a core value people can relate to. Summing up this idea with his captivating phrase:

“People don’t buy WHAT you do, they buy WHY you do it” (Sinek 2009, 44)

However, Gail Anderson (2004, 1 ff) discussing the paradigm shift and the reinvented museum, argues that the self-exploration of museums and the debates are now showing results, through the efforts of inspired leaders and professionals who seek to make the museums relevant and responsive to the wider society. She specifically writes:

“Some management practices, once viewed as the purview of the corporate world, are now understood to be ingredients for enabling the museum to survive and achieve its mission” (Anderson 2004, 5).

MUSEUM AS AN INSTITUTION FOR SOCIAL DEVELOPMENT

The question of Why as being the most important one has been stressed by museum scholars too (see Falk 2009). Discussing the *dialogic museum* Ševčenko & Tchen (2011, 84 ff) suggest that presenting a truth or evidence about a neglected fact is not enough, rather, museums should communicate why this knowledge is important for people and how it can affect their lives. The dialogic museum in its role as a forum for dialogue has three functions: to bring into sight previously neglected truths, to present truths that have derived from the shared experiences and curation of a community and to reveal how contemporary people reconstruct the past through their perspectives. However, as the authors state, by inviting the public to an open dialogue raises some moral issues: should there be limits in what a museum should invite people to discuss? Should it protect people from harmful comments, content, or misleading claims? Should a museum take a stand on contemporary issues or just pose questions? (Ševčenko & Tchen 2011, 82 ff)

Robert Janes (2009, 166) discussing the *mindful museum* he clearly suggests museums should abandon the reference to the traditional processes of how museums work (collecting, preserving etc.) in their mission statement, as they are just means and not ends, and replace them with statements of why. For the mindful museum of the future, the why-statement should pertain to the correlation and synthesis of different people, perspectives, problems, solutions and challenges of our world.

Shifting our attention to other aspects of museum identity, an interesting viewpoint regarding what actually museums are about is expressed by Bruno Soares (2016, 129 ff). Having as a starting point the concept of performative reflexivity, he suggests that museums reconstruct artificial versions of reality, based on out-of-context real objects. Visitors being confronted with the museum reality, a *reframed reality*, are subject to reflect upon this reality, the real world outside and themselves. As he points out, the museum's power is the accommodation of the past into the present (and vice versa) and the creation of emotional bonds around it. It is not a mere reconstruction but the creation of a *living relationship*:

“Museums perform the past, and also our relationships—as actors in the present - with it” (Soares 2016, 135).

Aida Rechena examines the museum's offer under the lens of social representation theory:

“Social representations are a complex system that developed in the cognitive, affective and social dimensions of human life: cognitive because it concerns the construction of social knowledge; affective for bringing the implicit symbolic and imaginative character of this social knowledge; and social because both cognition and affections are based on social reality and all forms of interaction and communication between people” (Rechena 2016, 142).

She concludes that the visitors use social representations (pre-existent, socially produced/shared and individually negotiated) when confronted with museum objects and based on these they shape their own interpretations. Thus, she suggests museums should be places where this process is being endorsed and facilitated. Curators should stop perceiving visitors as a homogenous group and make them part of the exhibition's meaning-making (Rechena 2016, 143 ff). She embraces Nina Simon's participatory museum definition and she quotes:

“...a place where visitors can create, share and connect with each other around content. Create means that visitors contribute their own ideas, objects, and creative expression to the institution and to each other. Share means that people discuss, take home, remix, and

redistribute both what they see and what they make during their visit. Connect means that visitors socialize with other people-staff and visitors-who share their particular interests. Around content means that visitors' conversations and creations focus on the evidence, objects, and ideas most important to the institution in question” (Rechena 2016, 148).

While some scholars propose that museums need to lose or share authority in order to meet the visitor's needs, Dufresne-Tassé based on her research concludes that a loss in museum's authority does not necessarily lead to visitor empowerment or the opposite. She distinguishes three situations of visitor empowerment: when she/he *processes, understands* and *appropriates* the museum offer, when she/he reflects or acts upon this offer and when she/he influences the museum's work. Her results have shown that visitors read about 50% of the texts offered, they process 50-80% of the displayed objects, they treat the objects as unrelated and only 2-5% of the ideas they express show a synthesis or reflection of their experience. Unlike other researchers (see Nina Simon), she argues that what will improve visitor's powers is not adjusting the exhibitions to a particular group but making them more effective in communicating the ideas. She concludes that the fear of losing authority for the sake of visitor's empowerment is unjustifiable by the above facts (Dufresne-Tassé 2016, 229 ff).

Similarly, Satwicz & Morrissey (2011, 196 ff) argue that a participatory exhibition is not necessarily more *inclusive, beneficial* or *engaging*. Their research on Minnesota's Science Museum social website “Science Buzz”, showed that the online discussions were meaningful and contributed to learning and inquiry mainly when the museum staff were involved. Thus, they stress the need to explore effective frameworks for the design of participatory exhibitions where the museum will act as a facilitator.

MacArthur (2011, 56 ff) discusses how modern technology has impacted today's museum identity by redefining and complementing the three original functions of museum objects as reference materials, means of learning and tokens of collective memory. Steven Conn (2010) as cited by MacArthur (2011, 58), noted that, as the number of archaeological material grows in a pace that is difficult to store, study, display and preserve, there is a “parallel museum universe” of objects lying in depots, difficult to be accessed even by scholars. According to MacArthur, as the digital space is vast and easy to access and the digital format is easy to manipulate, these objects are coming out of the dark, enriching our perception of the past. However, as he notes, there is serious scepticism about the extent to which digital format should substitute the physical objects, as there are both practical and ethical issues to be considered. Furthermore, the author highlights the fact that the visitor's meaning-making has moved from the labels to sophisticated technologies which offer personalized and customized learning, through interaction and discovery. The internet has changed how knowledge is constructed and shared: visitors now can take on the curator's role, make their own selection of exhibits and share their perspective. However, Conn (cited in MacArthur 2011, 61) argues that these developments resulted in people losing their faith in the object's ability to tell its story alone. Regarding the objects as tokens of collective memory, MacArthur (2011, 62) notes that museums used to choose what to collect and preserve, at first rare and famous objects, later with the development of ethnography, objects of everyday life. But only now, in the Internet era, museums are willing to listen to visitor's feedback, ask them about their preferences and even co-decide what to collect and display.

AUTHENTICITY AS A CORE ATTRIBUTE OF THE MUSEUM'S IDENTITY

Authenticity is an important term concerning the museum's core identity and has caused serious debates over its definition and the means for achieving it, particularly with the advent of new technologies and exhibit types. Chang's research (2016) on the authentic was conducted at the Dinosaur Exhibition at Taiwan's National Museum of Natural sciences, using Gilmore and Pine's guidelines to define and examine museum authenticity. Quoting their provocative phrase:

"All museums...-as with all businesses- are fake, fake, fake" (Chang 2016, 215)

They distinguish the *authenticity of experience* from *the authenticity* of an object/service, arguing that authenticity is not inherent into the objects but it is decided by the individual's experience of an object/service (see the Earthquake House example, chapter 2). Gilmore and Pine suggest that consumers naturally perceive something as authentic when it is *true to its claim* and *true to itself* and they advise museums to focus on *rendering* the authentic, which means creating the perception of it. They went further on to categorize the authentic in four types: real-real, real-fake, fake-real and fake-fake, where the first term in each category refers to something being true or fake to its claim and the second to something being true or fake to itself (Chang 2016, 215 ff). Chang, after interviewing the visitors of the Dinosaur Exhibition, in order to establish the authenticity of their experience, she categorized the exhibition's authenticity as Fake-Real. People were noticing the fakeness of the exhibits but they were choosing to believe the messages they were conveying. However, she notes that a museum's goal is not achieved by merely creating an authentic experience, because the educational point can be missed. Thus, she stresses the need to *"distinguish between experience as an end and experience as a means"* (Chang 2016, 225 f).

On the other hand, Vannini (2016, 206 ff) suggests that authenticity is relevant to the cultural uniqueness and the consistency between the actual experience and the visitors' expectations. Having as a starting point the four points of Griswold's cultural diamond, she concludes that, if the museum brand, the cultural object, the social world, the receivers and the communication which binds all these elements are well-balanced, then the experience is consistent with the visitors' expectations. She uses the example of the Museo Civico di Sansepolcro to suggest that authenticity, in that case, is iconic and indexical because of the masterpieces, which do not need any interference of labels and texts, or modern technology whatsoever. Vannini concludes that the visitors of that particular museum have a consistent experience because the reason behind their visit is to have an unmediated reflection upon Piero Della Francesca's masterpiece. She specifically refers to the museum's comment book, where, as she notes, the visitors do not complain about the minimalism or the lack of modern technology. As a well-intentioned critique of Vannini's claim, let us use Sinek's (2009, 59) quote of Henry Ford, founder of the Ford Motor Company:

"If I had asked people what they wanted, they would have said a faster horse."

Sinek perceives as great organizations and innovators those who can foresee and actualize a development before it becomes a concrete need or idea in people's minds. Now, turning back to the discussion of authenticity, Sinek argues that people are able to perceive authenticity when everything someone says and does is consistent because only then they can grasp what she/he actually believes (Sinek 2009, 66). It noticeably echoes Wan-Chen's definition and sounds parallel with Vannini's assumption that people visit that particular museum because it conveys a balance between what it claims to be, what it believes it is and what it actually is (that is, a place of authentic masterpieces).

Overall, there are two sides of the same coin regarding authenticity: the authenticity of an object and the authenticity of experiencing it. However, a visitor standing in front of an authentic object will not gain much, unless its story is presented in a way she/he will understand and feel the important dimensions of its life-story. But does it mean everyone will experience, or relate with it, the same way? As we have seen in chapter 2, the experience is subjective, personal and correlated to the individual's background. Possibly even, if the authentic object in its physical form is entirely missing from the experience, that experience would not be as powerful. Deprived of the unique feeling we get when we stand nearby an actual piece that survived the past, the experience will rather resemble the feeling we get by a documentary, a game, a multimedia narration. Museum's unique offering is exactly the fact that it provides people with the tangible specimens which document the past, otherwise, it would be no different than the experiences provided by other industries (see Wittlin 1970, MacArthur 2011, Conn 2010). To summarize, the ideal situation is when we have both authentic objects and authentic experiences.

Having so far mapped out the unresolved issues museums have been facing and the developments which are transforming fundamental aspects of its identity today, we could distinguish four troubling areas: **Authenticity, Engagement, Relevancy and Change**. These elements have been stable museum pursuits over the centuries and thus, can be viewed as core principles of a museum's identity. They are also determinants of the meaning-making process and affect the quality of experience thus they should be regarded as the constituents of a meaningful (virtual) museum experience. This argument is further developed in the following paragraphs.

TOWARDS A NEW DEFINITION

The official definition (ICOM 2007) describes the character ("*non-profit, permanent institution in the service of society and its development, open to the public*"), functions ("*acquires, conserves, researches, communicates and exhibits*") and purposes of a museum ("*education, study and enjoyment*").

As we have previously argued, the functions answer to the "What a museum does" question, the purposes answer to the Why, while the How is missing. Beginning with the functions, a museum nowadays can skip the "acquisition" function, as it can fulfil its role by using copies and digital formats and by hosting non-permanent exhibitions. Of course, *having* physical objects is what makes museums unique, as we saw before, but there should be another term to describe the quality of this *having*. Acquisition connotes an act aimed at ownership and, at the same time, conserves the toxic mentality from the colonialist past. In a society being transformed by the shift towards a Sharing Economy (Internet services, Uber, Airbnb, Spotify etc.), to be entitled as the owner of humanity's heritage is problematic. If museums wish to be on the same page with modern society, they must embrace the sharing mentality. Thus, in a restated definition the verb "acquires" should change to "shares", as in, *I have something together with others*.

Moreover, the verb "conserves" should be replaced by the verb "protects" as the latter connotes a wider context of meaning. The word "conserves" relates closer to the meaning of keeping something from changing or being damaged due to, mostly, natural processes, while the verb "protects" implies also an active, even legal or political, stance against external harm. At the same time, it is closer connoted with the emotion of care.

As the world recently experienced the massive destruction of ancient heritage in Syria and the rise of illicit trade due to wars and the global economic crisis, being defined by such a

powerful and political word may cause museums to be more responsive towards this phenomena.

As for the verb “exhibits”, it is time to reconsider its place in the museum definition altogether. It means to display publicly, a function strongly connected to vision and passivity. Museum objects used to be treated as, isolated, enclosed, not needing explanation or self-explanatory, only-to-be-viewed and admired relics. Such objects were perfectly fitted in the term *exhibit*. What about now, though? As we have seen previously, it is not about the objects themselves anymore, and it is certainly not about watching the objects. It is about experiencing the past through feelings and storytelling, understanding the relationships, the processes, the implications and interrelations of events etc., which formed a world which is palpable through the excavated specimens. To call a museum object an exhibit it deprives them of the dignity they had as active and in a “living state” products of humanity but also limits their modern-day transformation. Museum objects have become multimodal, interactive, augmented, parts of a narrative, an environment, an experience. They exist in the museum context in order to communicate something that goes beyond the mere materiality of the object. Therefore, the word “communicates” which is already in the official definition, can stand alone, as it includes the “exhibition” part.

Now let us turn to the Why question, which according to the official definition is being answered by the purposes of “*education, study and enjoyment*”. Education is a process of passing knowledge, values etc. and it is passive and external, while study connotes personal effort and the use of skills, and thus, it is active and inward. These two typical terms do not clearly convey an end-purpose or the nature of a purpose. They can be misinterpreted or acquire different meaning in different eras and by different people or political systems. For example, in the past, museums were educating people with the ideas and tastes of those in power, with the end-purpose of retaining the status-quo. Thus, education and study are just processes to an end-purpose. The question is what should be the purpose and nature of the museum learning experience? The short answer is to make people reflect, engage in dialogue and change.

Education in its purest form, stripped from any agendas and manipulations, aims to the above results. To make people interact with something, produce thoughts, share and challenge these thoughts with others and, finally, change, even if the change is not obvious. Is not that what the museums are struggling for in today’s world? By designing exhibitions in a way visitors will grasp the relationships between the exhibits, by trying to incorporate them in the interpretation process, by trying to instigate the sharing of thoughts and inquiries? And is not that a kind of change museums are trying to inspire? The worst day for a museum is to have people leaving the exhibition in the same state as when they got in. More importantly, people are inspired to reflect, engage in dialogue and change. It is an intrinsically positive and creative situation, while education and study can be enforced or be conducted in a non-productive way. Therefore, the proposed re-statement of purpose leaves no ambiguities regarding the nature, quality and end-results of the museum’s effort. As for the term enjoyment, it cannot be a stand-alone purpose in a museum context. People will anyways enjoy a well-designed exhibition, an interesting dialogue around the exhibits, a revealing reflection, a new value that will cause some kind of change in them. Or they will just enjoy socializing in the museum. Still, some visitors may not enjoy anything from the above. In other words, enjoyment does not belong to the purpose but it is an intrinsic value that resides in the How question that is missing from the official definition.

How a museum will fulfil the purpose of reflection, dialogue and change, then? By offering

engaging, relevant and authentic experiences. The terms are already discussed in the previous paragraphs and we have concluded that they are the answers to the ongoing museum problems regarding their societal role. Finally, the official definition states the museum is a permanent institution. But, being only four centuries old as an institution, such a claim sounds overstated. What processes has it been through to survive “natural selection” and earn a place among the other permanent institutions, such as family, law, education etc.? Museums should abandon the idea of a secure and fixed position in society if they want to make a breakthrough and catch up with future transformations. Now, providing that permanency refers to its form, it does not depict today’s reality since a museum can function without having a permanent location, building or collection. For the above reasons, this term should be omitted.

Concluding from the above, ICOM’s definition of 2007 should be re-framed as:

*“A museum is a non-profit, public institution which **protects, shares, researches and communicates the tangible and intangible heritage of humanity and its environment by offering engaging, relevant and authentic experiences, for the purpose of inspiring individual and community reflection, dialogue and change**”.*

CONCLUSION

In our attempt to identify which stable principles constitute the core of a museum’s identity throughout the ages, we arrived at **Authenticity, Engagement, Relevancy and Change**. It seems that the How question is crucial in our quest to define what museums are in today’s world because it helps to articulate the nature and quality of its functions and thus, strengthens the perceived identity and aims. Moreover, the updated definition clarifies the identity even more, by acknowledging the new, visitor-centered, direction museums are now moving at. Yet, someone could argue that it is not a good idea to incorporate trends and other era-dependent references in a definition which aspires to withstand time. However, ICOM updates the museum definition almost every five to fifteen years, thus there seems to be a constant need to redefine the museum as it keeps evolving. Now, regarding the re-framed definition, by reflecting the visitor-centered shift it actually articulates a persistent need over the centuries, as we have seen in chapter 2.1. Having the actual people as the starting point of all its functions and aims is what has been so far missing to justify the designation “public institution” and to fulfil its social purpose. Overall, the proposed definition is formed with unambiguous terms which offer a clearer understanding of the museum’s core values, the nature of its aims and its end-purpose.

3. Immersion and Cultural heritage: Towards their meeting point

This chapter is about identifying what constitutes immersion and virtuality, what terms and definitions are being used and how they are being differentiated in the cultural heritage context. The subject will be analyzed from the perspectives of computer science, philosophy, neuroscience and heritage studies. I will also highlight the nuances between the terms “immersive experience” and “virtual experience”, although they are often used indistinctly, and will argue for the need to embrace the immersive feature of VR technology, that is the

sense of bodily involvement. However, we make use of the specific terms each author uses, when there is a reference to their views.

DEFINING VIRTUAL REALITY AND VIRTUAL HERITAGE

Philosophers during the 20th century re-framed the term virtual to express the *potentiality*, instead of the physical strength that originally meant during the Roman period, and thus, under this new meaning, the virtual is a dimension of reality (Massumi 2013, 56).

Philosopher Jeff Malpas (cited in Bittarello 2013, 88) described the virtual as a non-autonomous part of the real because both in content and equipment is dependent on the everyday world, but it is also effective on it, as it can inspire actions and behaviours. Doel and Clarke (cited in Bittarello 2013, 88 f) describe reality as the simultaneous expression of the actual and the virtual. Virtual worlds in the form of tales, myths, rituals etc., shape reality by sustaining the status quo or by inspiring people to seek alternatives to it. But also, at an individual scale, people through the virtual negotiate their identities and social roles (Bittarello 2013, 93 ff).

Steve Bryson, Computer Science and Virtual Reality expert, formed a definition of virtual reality in 1998, which withstood time in part because it is not technology-specific, as he says:

“Virtual Reality is the use of computer technology to create the effect of an interactive three-dimensional world in which the objects have a sense of spatial presence” (Bryson 2013, 4)

The term Virtual Reality originated from Jaron Lanier in 1985/1986, a founding father and VR equipment pioneer, in a time where similar projects were using the term virtual environments. At the same time, many definitions were unsuccessful and created debate because being technology-specific made no sense to people who had never used that technology and also, there was disagreement to whether a specific technology was required to define that term or not.

Discussing his definition, Bryson defends the term “effect” to be understood as a cognitive phenomenon and not as an illusion that tricks the user. Also, by “spatial presence” he meant the feeling that the objects have a spatial location of their own, regardless where the user turns her/his gaze. For achieving the effect of spatial presence, Bryson views a head tracking technology to be essential because as he simply puts it,

“If you move your head and nothing happens it ain’t VR” (Bryson 2013, 5).

What is interesting is that Bryson initially included the word immersion in his definition, but he later rejected it as a requirement, on the grounds that immersion presupposes being surrounded by an environment, while several VR projects do not provide that aspect, yet they are still VR (Bryson 2013, 4).

On the other hand, Erik Champion, Cultural Heritage and Visualization expert, offers a cultural heritage-specific definition of virtual reality:

“Virtual heritage is the attempt to convey not just the appearance but also the meaning and significance of cultural artefacts and the associated social agency that designed and used them, through the use of interactive and immersive digital media” (Champion 2013, 273).

He does not find Bryson’s definition to be suitable for the virtual heritage field, because virtual heritage projects are usually wall-mounted or desktop-based installations and rarely

include the head tracking element, which Bryson identifies as essential to characterize something as VR. They also lack other features VR technology offers, such as multi-user function and interactivity, or may not even be computer-based. Thus, the term virtual in the cultural heritage field is not actually dependent to virtual reality and its technology, but it incorporates it along with the rest of the digital means, like 3D or even 2D visualizations (Champion 2013, 272 f). However, it can be argued that the distinction between VR projects and other digital projects is of major importance, especially when it comes to the creation of guidelines and frameworks of good use. So far, the official frameworks created for virtual heritage projects, do not distinguish between three-dimensional visualizations and virtual reality projects. It is as if someone created a framework for scenography without taking into account the different parameters of setting a stage for a theatrical performance and a movie production. However, this argument will be developed in later chapters.

Champion also pinpoints that the head/eye-tracking requirement constitutes a vision bias, excluding vision-impaired people from the equation, along with the other senses that give us the perception of being in a place (2013, 272 f). Here it can be argued that virtual reality has developed in ways that transcend vision, thus, head/eye-tracking is nowadays just one of the several user-tracking technology capabilities. There are motion-tracking treadmills, 3D sound, haptic gloves/suits and olfactory masks, which make virtual reality inclusive and offer a holistic way to perceive and interact with the digital worlds.

The third point in Champion's argument is that virtual heritage's primary concern is the understanding of both the material and intangible aspects of a past culture and spatial presence is not an essential aspect of this process (2013, 273). However, in a later study Champion (2015, 44 ff) concluded that the sense of presence and embodiment are essential for acquiring not only higher levels of cultural understanding but also the basic perception of a cultural landscape.

Concluding from the above, the present thesis adopts Bryson's definition according to which a user-tracking technology is essential to characterize something VR. This technology simulates the real-life process of how visual input shapes and affects perception, since the virtual objects have a fixed spatial location which is responsive to the user's eye's/head's position, as with the physical objects in the physical world. Thus the user-tracking technology enables the user to experience the highest level of immersion, the feeling of being physically/bodily present in the virtual world. But equally important is that the eye-tracking is an essential tool for performing the real-time navigation and interactions in the virtual world: through gazing the user can walk around or act in the virtual environment without the need for physical movement. Thus gazing in a 3D environment is what a cursor and arrows are in a 2D computer environment.

Champion along with the archaeologist Laia Pujol (2012, 87 ff) note that the goal for virtual heritage projects is cultural presence. But "presence" translated as "being there" is not sufficient in the heritage sector. Thus they highlight that the term connotes the feeling that a virtual environment represents an actual place which had been transformed into a culturally meaningful environment by the people who lived there. However, they suggest a more active form of cultural presence where the users participate, and which "*would also encourage empathy, interaction and collaboration to enhance awareness and understanding of past or foreign cultures*" (2012, 89).

Moreover, they created a framework of objectives for the virtual heritage projects, according to which the aims are:

- To *capture* objects and processes of scientific, social, or spiritual value
- To *present* this information as accurately, authentically, and engagingly as possible
- To *distribute* the project in a sensitive, safe, and durable manner to as wide and long-term an audience as possible
- To provide an effective and inspirational *learning* environment appropriate to the content and to the audience
- To allow the possibility to *participate* in its construction
- to carefully *evaluate* the project's effectiveness with regards to the above aims in order to improve both the project in particular and virtual heritage in general

(2012, 86).

Champion (2013, 274 ff) explains why these aims correspond to specific problems related to virtual heritage projects. The first issue is that the designers trying to achieve the highest level of realism may falsely transmit the notion of axiomatic truth while the virtual models are based on archaeological interpretations and assumptions. Moreover, the efforts for highly realistic details most of the time pass unnoticed by the users, who seek to feel related to the whole experience and this is not dependent on the level of realism. Another issue is that most virtual heritage projects are a one-time occasion, which leaves no fertile soil for improvement through criticism. Thus, being accompanied with a fully detailed archive of all the activities concerning the project will greatly benefit the field. Now, concerning the types of virtual reconstructions, as he notes, most of the projects are static (visualization-based), providing no chance for meaningful interaction through which the reconstruction would better communicate the cultural transformations that take place over time. On the other hand, he pinpoints that activity-based virtual heritage projects being, do not necessarily result in reflection or extension of knowledge, as the user can be easily absorbed by the "game mode" approach of completing tasks for the pleasure of it.

Champion (2013, 279) emphasizes the lack of projects which focus on the end user from the start of the design process until the evaluation. According to him, the evaluation should seek to identify if the user's perspective is at any point transformed, as a result of being immersed in a different cultural context, if they experienced cultural presence in short. As ethnographic techniques cannot answer that question, he proposes to test the users on their ability to:

- form conclusions upon the provided information and relate them to other cultural sites or objects
- Identify alien characters to the particular cultural context

He also proposes to test their engagement using questionnaires, memory tests, recording physiological data or testing their ability to complete tasks.

THE ONTOLOGY OF VIRTUAL OBJECTS

Philip Brey (2013), theoretician of philosophy of technology, examines the ontological status of the objects being present in Virtual Reality, in order to resolve general misconceptions on the subject and thus, help the design and use of virtual projects.

First of all, he establishes that virtual objects do exist because they are situated in virtual places where people are able to perceive them with their senses and interact with them. But, the difficult question is whether they are real or not. The claim he opposes is that by not having a mass and physical composition virtual objects are disqualified from being real. Using John Searle's theory of essentially physical and contingently physical objects he concludes that:

“certain types of virtual objects, actions, and events qualify as real, in the sense that they do not just simulate but ontologically reproduce the entity that they are an imitation of” (Brey 2013, 47).

His argument is based on the fact that virtual objects lacking the actual physical properties of the physical objects (weight, mass, chemical composition etc.) are mere simulations of them but concerning the institutional objects such as money, property etc, virtual objects can be ontological reproductions of them because institutional objects can exist in virtual reality. For example, virtual coins can be transferred as real money in a real bank account and the opposite (Brey 2013, 48 f). Brey also examines the ontology of virtual objects from the aspect of human-object interaction. He argues that virtual actions are certainly real because they have both physical and institutional consequences. Gaining virtual coins, making a promise to another user or stealing a user’s virtual objects can be translated as real money, real promise and real stealing, occurring in the physical world at the same time as in the virtual. The fact that virtual actions cause emotional and bodily responses to the users constitutes their physical effects (Brey 2013, 50 ff).

However, we could consider further the claim that virtual objects having no mass and weight are not real, from the perspective of computer engineering. Virtual objects being digital objects they are constituted from bits, which in turn correspond to electrons. Engineers Kish and Granqvist in their paper examine the question of mass and weight of digital information (bits), on the basis of quantum physics and special relativity. Their results show that bits and in extension digital/virtual objects, actually do have a mass (Kish & Granqvist 2013, 1895 ff).

VIRTUAL PRESENCE / IMMERSION

There is no general consensus among scholars about how the terms “presence” and “immersion” differ and what the distinctive qualities of each one are. However, Slater and Wilbur (cited in Calleja 2013, 225), Computer Science professors, and recent research, relate the term immersion to the objective property of the technology, while the term presence to the user’s response to that, which is the “sense of being” in the virtual environment. Frank Spillers, an expert in the design of VR/AR experiences, clarifies how contemporary VR developers perceive the two terms. Presence is the illusion of place and plausibility, that is, the sense of being at a place “in spite of the sure knowledge that you are not there” and the sense that “what is apparently happening is really happening (even though you know for sure that it is not)” (Slater 2009, 3551 ff). Immersion is how deep the user is across the AR, MR and VR spectrum, where the AR is the least immersive while the VR the most immersive. The distinctive qualities are that in AR, a user can imagine what is not there and extend or enhance what is there, in MR can imagine and manipulate what is (or is not) there and enhance it within the physics of what is there, while in VR a user can co-author the interaction and narrative of what is not there as well as enhance it without the limitations of real-world physics (IDF, 1.3. “AR/VR/MR distinctions”). Thus, immersion is linked to the type of technology used and how deeply it allows the user to experience that spectrum. Calleja (2013, 226) argues that presence is critically dependent on the interpretation and agency because our interaction with any given environment depends on our preconceptions and similar experiences. If something in the environment does not fit our known interpretations then we become detached as we automatically engage in the interpretation process, which is the opposite of feeling present. He also stresses the need to distinguish between the different experiential modes of immersion such as immersion as absorption versus transportation and immersion through different media. He further suggests avoiding

judging the quality of experience by the qualities of the technology and approach immersion as a product of numerous experiential phenomena, rather than a single experience. Finally, he proposes the term *incorporation* as a solution to the problems the other two terms create (Calleja 2013, 231 ff).

Witmer and Singer (1998, 227 f) clarify that presence is a matter of how sharply a user focuses her/his attention on the virtual environment and that there are different degrees on that, but it is not a prerequisite to completely lose attention from the physical environment. Of course, the more focused someone is on the virtual world the more presence she/he will report. In connection to Calleja's view about the factors that impact presence, Witmer and Singer identified four more factors: Control, Sensory, Distraction and Realism (They are further discussed in chapter 5).

A fundamental aspect of the virtual world's ontology is the social or co-presence, which is not limited only to human interaction, as they can coexist with computer characters in such an environment. In defining the virtual reality, terms such as "unreal" are not legitimate because the activities and social presence that take place there form a reality (Boellstorff 2013, 740 ff). However, Pujol and Champion (2012, 87 f) highlight the importance of distinguishing the terms "social presence" from "co-presence", when talking about virtual heritage. They argue that co-presence is merely about understanding that we share the same virtual environment with other users or computer characters. But the term social presence was proposed by scholars upon their realization of how a person's background, needs, views etc and cultural/social origin, differentiate their virtual experience from the others'. They also distinguish cultural presence from social presence in that the latter does not necessarily result in cultural understanding.

According to Riva & Waterworth (2013, 206 f), the term presence is viewed mainly in two different ways by scholars. Some describe it as "media presence" and others as "inner presence". The first describes it as "*a function of our experience of a given medium*", while the latter as a "*psychological phenomenon, not necessarily linked to the experience of a medium, the effect of which is the control of the individual and social activity*". The authors borrowing from the recent findings in cognitive science define it as "*a neuropsychological phenomenon the effect of which is to produce a sense of agency and control: subjects are "present" if they feel themselves able to enact their intentions in an external world*" (2013, 207). Borrowing from neuroscientist Damasio's *three levels of self*, they identify three layers/subprocesses of presence: proto-presence (*the intuitive perception of successfully differentiating the self from the external world through action*), core presence (*the intuitive perception of successfully acting in the external world toward a present object*) and extended presence (*the intuitive perception of successfully acting in the external world toward a possible object*). Correspondingly, the proto and core-consciousness are bound to the here and now, while extended consciousness is the processing of information that transcends the here and now and explores the possible, the imaginative. It is what allows us to reflect, plan and project. When all three sub-processes achieve a high level of presence then the experience has "*flow*" (Riva & Waterworth 2013, 208 ff).

When all three types of consciousness are processing the same stimulus, then a high level of presence is achieved, while being stimulated by conflicting content it results in poor presence. In the physical world proto and core presence are hardly in conflict, while in the virtual world this common conflict sometimes results in cybersickness, a form of motion

sickness (Riva & Waterworth 2013, 212). To better understand, the authors give the example of reading a captivating book, where only the extended consciousness is preoccupied, while in a situation of a very realistic virtual environment, the extended consciousness is disturbed by irrelevant matters because of the poorly mediated content (Riva & Waterworth 2013, 217). To sum up, the authors suggest that presence is both an *unconscious* (intuitive process) and *conscious* (we can feel it) *metacognitive* (we regulate our action) *judgement* (Riva & Waterworth 2013, 215).

When presence is mediated by technology, the authors note the importance of action, as opposed to perception, in the quest for achieving maximum presence: “*I’m more present in a poor virtual environment (e.g., a textual MUD) where I can act in many different ways than in a lifelike virtual environment where I cannot do anything*” (Riva & Waterworth 2013, 216). This view extends Calleja’s suggestion (see the previous page) that interpretation and agency affect the sense of presence, even if the environment is highly realistic.

Thus, in designing a virtual environment, the authors conclude that the key to success is an ideal synthesis of form and content which support the user’s intended actions. When the mediation of technology evades our conscious preoccupations and our intended actions occur effortlessly, then maximum presence is achieved (Riva & Waterworth 2013, 216 ff).

The above conclusions are in accordance with Pujol and Champion’s (2012, 88 ff) view on cultural presence since they also regard the effortless interpretation and action as crucial elements for achieving high cultural presence. However, they differ in that, for the heritage sector, presence itself is not the goal but just the means for the end-goal which is cultural learning (Pujol & Champion 2012, 87).

CONCLUSION

Virtual reality in the heritage sector has acquired a differentiated meaning, resulting in the incorporation of a broad category of media which are not relevant to the unique affordances of VR technology. We argued that this, in turn, can have a negative effect on the development of best practices for virtual heritage projects. Immersion is still an evolving term as it is dependent on the developing technology and it refers to a spectrum of user involvement while Presence (the illusion of place and plausibility) is the core attribute that makes an experience a VR experience. Cultural presence is a virtual heritage-specific term created to turn the focus of designers towards the effective communication of the cultural content, rather than spatial presence. However, we argued for equal treatment of all three elements, because embodiment and spatial presence are essential to achieving a higher level of cultural perception.

3.1 Communication and Learning

So far, the common mistake made concerning the adoption of computer technologies by museums was the lack of effective communication between computer professionals and the museum staff. The former assumed they knew what museums need and the latter could not adequately reflect on the particularities of that adoption and were unable to articulate clear needs and goals (Chenhall & Vance 2010, 40). Virtual reality has several advantages over the traditional means of communication in a museum environment. It allows for a personalized,

contextual and empowering experience, as the visitor has control over the provided information which can be visualized graphically and overlap. The visitor can also avoid the exhausting roaming from one exhibition room to another, by creating an optimal route based on points of interest. Research has shown that social interaction among strangers is very rare in the physical environment of the museum, whereas in the virtual one people feel more comfortable to exchange opinions and socialize (Bandelli 2010, 150 f).

Research has also shown that people view museum visits as a social activity which is about sharing with others the experience of looking at the exhibits rather than the exhibits themselves. Observing the visitors' social interactions in order to understand how they affect the interpretation and the whole museum experience, has been a recent preoccupation among museum professionals. Modern technology is able to extend the shared and social museum experience between visitors who are physically present in the museum and remote visitors (Galani & Chalmers 2010, 160 f).

The City project (Galani & Chalmers 2010, 161 ff), an experiment to explore how the use of technology can facilitate this type of interaction, took place in the Mackintosh Interpretation Centre and the House for an Art Lover, in Glasgow. The results showed that social interaction was shaping and influencing the experience during the whole visit, through a variety of ways: verbal and gestural expression, the pace of exploration, choice of routes etc. The exhibition had a variety of exhibit types, from real artefacts to virtual environments and the investigation was conducted on groups of three or two participants, a physically present visitor and one/two remote visitors, all of them visiting the exhibition at the same time. The remote visitors experienced the exhibition through a web-based 3D environment and an interactive map, respectively. All visitors could communicate with each other and were aware of the others' position. As the experiment confirmed, visitors always keep track of their friends' position so they can follow them or know what they have been doing, so they can inform their subsequent interaction. Another point is that their discussions around exhibits were not always about them, but they were shifting to self-related commentary (Galani & Chalmers 2010, 163). As Galani and Chalmers note (2010, 164 ff), unlike other studies where the use of personal mobile technologies showed a decline in social interaction and a shift of attention away from the exhibits, the mixed reality social experience created for the City project, showed an important increase in discussions and a stable focus on the exhibits. According to the authors, this happened because the visitors were offered rich multimodal ways of communication and the exhibition was designed with the social aspect in mind and not just as a place to absorb information. The exhibits, unlike the traditional single-user design, were designed with a multi-user approach. The fact that each visitor had access to the artefacts through different media and different but complementary content, incited them to share the different perspectives with each other and thus, explore more and retain their attention to the exhibits. Moreover, the varying degree of appeal the exhibits had in each mode, prompted the visitors to encourage the others to go back and see something they skipped. The sense of engagement was reinforced and retained by social activity. The authors describe the approach as an asymmetrical but complementing physical and digital design. However, they highlight two practical issues, the potential disruption of the *navigational ecology* of the exhibition room and the complexity of maintaining and updating such diverse and interrelated media (Galani & Chalmers 2010, 167).

Scientific understandings on how people learn and shape their perception and particularly the phenomenological concepts have affected the design of museum exhibitions and educational activities. Philosophers such as Merleau-Ponty, Habermas and Gadamer (cited

in Smeds 2016, 115 ff) argued that knowledge is not derived by observing or listening, nor it is situated on objects, somewhere outside of us. It is constituted of our *being-in-the-world* and requires active participation, dialogic and bodily involvement (a.k.a embodiment). Similarly, Heidegger (cited in Smeds 2016, 116) suggested that the act of learning, or meaning-making, happens when a person's horizon of interpretation (that is, prejudice, preconceived notions) and an object, text etc. meet. As Gadamer emphasized that the foundation of human communication is expectation and attention, the same way Heidegger suggests that intentionality guides our every interaction with other people and with objects (Smeds 2016, 116). Material culture not only reveals the human meaning-making but, as Tilley observes (cited in Smeds 2016, 118), things shape us as much as we shape them and they engage us into their world through a dialectic relationship. In relation to the above ideas, sociologist Theodor Adorno (cited in Smeds 2016, 119) supported that to *musealize* an object is to *kill* it since its life-cycle is cut and it becomes a representational material, which we cannot use or interact with. Smeds gives an example of a museum which practices a different approach to musealization, the Small Boat Museum Of Holmön, in Sweden. There, visitors freely interact with the objects, being allowed to use all their senses while almost no object is isolated in a glass case or exhibited taxonomically. They are situated in their original context, surrounded by objects that would normally accompany each other in reality. More than that, people can bring in or borrow objects if they wish to (Smeds 2016, 120 f). As great as this type of museum is, it cannot be more than an exception. There are numerous examples of great artworks which suffer extensive deterioration even though they are isolated and protected, due to the great number of visitors which have been attracting. The damage to a certain degree is unavoidable and may even be caused by restoration attempts. Museum objects have been kept alive in the museums, even as just symbols, protected and immortalized, for a lot of generations to reflect, enjoy and learn by them. *To kill them* would be to allow them to physically deteriorate in the hands of visitors who interact and manipulate them freely, or to never disturb their life-cycle and let them buried.

Ambrose and Crispin (2012, 60 f) outline the main educational approaches used in museums:

- The behaviourist: museum objects are viewed as stimuli whose effectiveness is judged by the visitor's response to them. However, this approach has been criticized because the learner is being given a passive role by not choosing the stimuli but just responding to them.
- The cognitive-developmental: in contrast with the previous one, this approach has the active learner at its core. A person learns by acting on the environment. Museums actualize this approach by designing interactive exhibits.
- Discovery learning: the person here acquires new knowledge through the enactive, the iconic and the symbolic representations of the world, by drawing associations from past experiences and by practical exploration and experimentation with the learning material.
- Multiple Intelligences: the authors improperly use the theory of Multiple Intelligences here. They assumed that humans use several types of intelligence in order to learn: linguistic, musical, tactile/physical, visual/spatial, interpersonal, logical-mathematical etc. However, Howard Gardner (1999, 24), the developmental psychologist who proposed the theory of Multiple Intelligences, defines intelligence as a "*biopsychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture*".

According to him, it is wrong to correlate the types of intelligence with the types of learning, because learning is a process, while intelligence deal with the products of learning: problem-solving and product creation. What is more, whether a person will demonstrate/activate one type of intelligence over another, is context and subject-related, thus, it is inappropriate to categorize learners according to a type of intelligence. Thus, it can be argued that since Multiple Intelligences correspond to abilities and not learning types, it would make sense to make use of them in co-creation and participatory activities which aim at user-generated content.

- Social cognition: this approach views learning as an interpersonal affair. People, by observing and imitating others, they learn. Society and its institutions such as schools and museums teach people how and what to think.
- Constructivism: the learner is an active co-creator of knowledge, who, by using her/his subjective experiences and perceptions interacts with the offered learning material and reconstructs it. This approach is popular in contemporary museums who offer co-creation and interactive activities.
- Play: learning by playing is considered to be crucial to a child's development, as it gets hands-on experience in exploring a subject, discovering issues surrounding it, engaging in problem-solving and role-playing. Museums design activities which structure play so as to achieve the educational goals.

Psychology comes in agreement with the constructivist and phenomenological theories about learning and perception, by using the term *apperception*. Apperception differentiates from Perception, in the same way as the term listening differs from that of hearing. The first one is connected to the individual's personality, mindset and intellectual abilities, while the latter is more general. Two people *hear* the same thing but each of them will *listen* differently. According to psychology then, we cannot view museum visitors as a whole, but as individuals with their unique perceptual and interpretational characteristics (Leshchenko 2016, 155 f).

Keysha Gamor (2013, 637 ff), an expert in Education, highlights that the innate potentials of VR technology, such as the contextual and authentic representation of a narrative, the accommodation of social activities and the process of learning by doing, are fundamental elements of the experiential and constructivist learning. In comparing virtual learning with its predecessor e-learning, she identified some common mistakes repeated in the past and concluded that there are some lessons to be learned. The author suggests starting with *Why* use this technology in the first place. The learning goals and the audience's needs should be based on valid assumptions, in order for the employment of VR technology to be meaningful. Presenting images, lectures and other one-way content in a 3D environment does not add up to what is offered in a 2D environment. Then "*why bother?*" the author asks (Gamor 2013, 641). Thus, the learning experience should be constructed with the aim to exploit the technology's affordances, which according to O'Driscoll (cited in Gamor 2013, 642 f) are: Co-creation, Coexistence, Collaboration, Graphic user interface (GUI), Persistence (convenient access without the time/distance gap) and Presence. Finally, the author highlights a common trap related to the introduction of new technologies, which is the exaggeration of their capabilities and suitability. She notes that virtual learning is only appropriate for specific needs and its implementation comes with costs, as with every other technology (Gamor 2013, 645 f).

Research has shown that culture learning is dependent on the learner's personality traits and attitudes towards a different cultural context, such as linguistic ability and background,

motivation, being relaxed, friendly, curious etc. To get a deeper knowledge of a culture entails having practical experience of the material culture and of the local people. According to Shih (2015, 410 ff), researcher of innovative learning platforms, an analogy of culture learning is the studying abroad experience. It requires a long-term and systematic engagement and interaction with the local culture and it has a formative effect on the learner. Shih developed a virtual learning case study taking as a point of departure the cognitive, behavioural and affective nature of the culture learning process. It consisted of an immersive tour through London streets, where participants were guided by a local and they could interact through their avatars and text/voice applications. The participants had to act, reflect and respond to the ongoing virtual experience and their performance was evaluated by a variety of means: interviews, cultural knowledge tests, blog entries, journals etc. The results showed that the participants acquired cultural insights both of pragmatic and abstract nature and that there is an association between culture learning and the individual's characteristics mentioned above (Shih 2015, 413 ff).

CONCLUSION

Virtual reality as a learning tool is compatible with the constructivist and phenomenological learning theories which are currently employed by museum professionals. More than that, we showed how its affordances can improve the museum learning experience and facilitate the learner's meaning-making process, while we highlighted best practices and avoidable mistakes.

4. The Ethics of Immersion

The present chapter is about examining the ethical state of virtual reality and whether the existing ethical theories are sufficient to deal with potential unethical acts performed in the virtual worlds.

ACTS AND BEHAVIOUR IN THE VIRTUAL REALM

Within the virtual worlds, people engage in activities similar to those in the physical world. They share, buy and sell virtual property, commodities, equipment, avatars etc, but they also steal them or conduct illicit trade. They take care of virtual pets and characters, but they also neglect, abuse or kill them. Some of the virtual activities have harmful consequences in the physical world, yet the laws that regulate the physical world rarely apply to the virtual one. For example, neglecting a virtual dog cannot be viewed as illegal, as opposed to neglecting a real dog, but the act of stealing can have obvious consequences, especially in a growing market which is worth billions of dollars. In few cases where people stole virtual property, either by hacking accounts or by physically forcing the owners, they were punished by the law, but in many other similar cases, the illegal act remained in question (Lastowka 2013, 484 ff).

Since contemporary approaches based on phenomenology view the virtual as part of the real, then, according to the media studies professor Charles Ess (2013, 684), it is logical to apply the existing ethical frameworks that regulate our physical world. He and other scholars specifically oppose the dualist perspective according to which the virtual world being separate from reality entails a separation of identity and thus, moral agency and

responsibility. That is since our virtual acts and personas are not performed in the physical reality, then we are not accountable for unethical and “illegal” behaviour (Ess 2013, 686 ff). Ess and others (mentioned below) propose deontology and virtue ethics (especially Kant’s approach) as the most appropriate when examining questionable acts in the virtual worlds. The fundamental principle in Kant’s morality is the respect of each person’s rational autonomy, the right of each person to be self-regulated and to decide their actions based on principles which are thought to be universal among rational beings (Ess 2013, 690 ff). This has led to the central Kantian doctrine of being our duty to treat other people as ends and not means to our goals. A key point that does not allow us to confuse the Kantian concept of autonomy with the libertarian moral perspective, is that emotions and other factors not deriving from the objective rational mind are excluded from the self-guiding principles (Dryden n.d.).

Litska Strikwerda (cited in Ess 2013, 693 ff), professor specialized in virtual cybercrime, shows that other ethical frameworks like utilitarianism and paternalism end up being problematic when applied in the virtual domain.

Utilitarianism derived from consequentialism views the end results of our actions as the only relevant factors to judge them as ethical or unethical. Thus a society’s or a person’s moral goal should be to maximize the positive aspects of life, such as happiness, pleasure etc. and minimize the negative ones. Utilitarianism as with Kantian ethics rejects the moral laws imposed by external bodies such as governments, religion, tradition etc. (Nathanson n.d.). On the contrary, Paternalism views the need for external interference to a person’s morality as essential. The state and other institutions of society should intervene in order to promote the people’s well-being, by imposing, for example, laws that prevent them from harmful habits (Dworkin 2017). However, both Utilitarianism and Paternalism, according to Strikwerda, are unable to condemn activities such as child pornography and prostitution, and call for legal action, because the harmful consequences are not physically evident. But an ethical framework based on Kantian ethics and phenomenology needs no physical evidence in order to detect the harmful consequences of those acts. People engaged in those activities view the subjects of those acts as objects (means) to their own goal which is pleasure. They deny them the ultimate right of rational autonomy. And since phenomenology has shown that there is a continuum between the human mind, virtuality and physical reality, then no more is needed to justify legal action against those acts (Ess 2013, 693 f).

Philip Brey (1999, 7), professor specialized in ethics of emerging technologies, poses a clear and important question on that matter: What is the moral status of those actions that cause psychological harm to others by offending their sensibilities? He interestingly proposes that the offended should decide whether they trust that the offender has no intention to allocate substance to that behaviour outside the virtual realm. Thus, there has to be established that the motives behind such behaviours are irrelevant to the people who may be offended by these and that otherwise there is mutual respect.

But let us delve into how phenomenology is linked to ethics, by examining the most important argument of those who deny the ethical consequences of immersive and virtual experiences. According to them, immoral acts in the virtual domain are part of role-playing, an exploration of different identities and behaviours which are not related to people’s everyday behaviour. They may even benefit society, by allowing individuals to let loose their toxic feelings and thoughts in a domain out of physical reality (Brey 1999, 5).

But, as we have seen in chapter 3, virtuality is a part of the physical world and can be experienced through embodiment, the feeling that you own and control the virtual body.

Being actively involved and choosing to act in one way or another necessitates the unravelling of our existing personality. Everything people do correlate with their physical reality. Historically, people explore different identities and engage in role-playing and virtual situations in order to give essence or negotiate their physical existence (Bittarello 2013, 93 ff). Video games are a showcase that supports this argument. Research has revealed a connection between video game addiction, gratification need and physical world consequences. People by playing games gain the pleasure of being rewarded and being in a position of power, as opposed to the feeling of weakness and self-doubt when they confront real life's hardships. Results from several experiments regarding video games show a connection between playing violent video games and aggressive or unethical behaviour (cheating, greediness etc) after the gaming experience (Anderson & Bushman 2001; Gabbiadini 2013). Experiments conducted specifically in virtual environments showed similar results. The Proteus effect refers to the avatar-dependent influence of behaviour. Users embodied in taller avatars were more assertive compared to those in smaller ones. In other experiments where users embodied superheroes, aged versions of themselves and dark-skinned avatars, adapted their behaviour accordingly when the experiment was extended in the physical reality (Madary & Metzinger 2016, 7).

In extension to the above, theoreticians hold the view that users not only bring their identity and individual traits in the virtual worlds but also their virtues. Bjørn Myskja (cited in Ess 2013, 691), professor specialized in Kantian ethics, talks about the "virtuous circle", a lifetime process where a person the more she/he practices a virtue (or a vice) the more she/he is being shaped by it and owns it. Since the virtues and vices are not given but acquired through repetition of moral actions, the video-game findings mentioned above are unsurprising under this theoretical scope. An interesting point is stressed by Susan Stuart (cited in Ess 2013, 688 ff), professor specialized in hermeneutic philosophy, regarding the over-simplistic argument that "it's only a game". By quoting the words of a US soldier in Iraq who described his experience felt as a big video game that did not seem real, she argues that when the boundaries between reality and virtuality in a person's mind become unclear, then it becomes ethically problematic. All the more, since the immersive technologies are being developed with the aim to make these boundaries undistinguishable.

Complementing the above, neuroscience during the last decades has provided concrete evidence of the plastic nature of the mind (neuroplasticity), as opposed to the previous belief that the brain develops during childhood and then it remains relatively stable. Synapses and neurons are constantly being added or cut due to a number of factors such as genes, pathology, diet, drugs, environment, and most interestingly, due to experiences, both social and sensory-motor. The important point is that these changes in brain formation are reflected in changes in behaviour (Kolb & Gibb 2011, 265 ff). The virtual pit experiment has demonstrated exactly how sensitive the mind is towards environmental and context feedback. It involved a virtual pit and a physical, slightly elevated platform, where the participants had to stand on and bend forward in order to drop something. By doing so, they demonstrated increased levels of stress, even though they knew the pit was virtual (Madary & Metzinger 2016, 6). The most important finding though is that the mind can also be re-wired by one's self-actions and way of thinking. The mind shapes us as much as we shape it, through our mental and bodily activity and our interaction with the world. This new understanding that takes us away from the biological/social determinisms and dualisms of the past has opened a new horizon of self-improvement potentials and moral change (Van de

Werff 2018, 13-16). Thus, biology complements the phenomenological-Kantian ethical scope with “hard” evidence.

REPRESENTATION AND DESIGN CHOICES

As we mentioned above, people may suffer psychological harm due to the behaviour of others inside a virtual world, but that can also happen due to the design of the content, as Brey and others suggest (Brey 1999). People tend to identify with characters that share common features, especially personas they choose to embody when online and can be offended when misrepresented and stereotyped. Programmers are responsible to allow or omit types of actions, obligate or provide alternatives to actions and designers are responsible for how the effects of these actions and the characters are represented. For example, a user may be obligated to kill, cheat or harm the opponents in order to proceed further in a game. But, may also be given the choice to avoid those actions or proceed through virtuous actions. Brey makes the point that, in any case, the right of free agency should be protected and users should have the option to choose between ethical and unethical actions (Brey 1999, 6 ff; Ford 2001, 118 f).

Paul J. Ford, professor specialized in Ethics, adds another parameter by considering the taking over of user’s agency by AI bots, who act as representatives. For example, there are games where artificial intelligence takes control of the user’s persona when they go offline and perform acts, by reproducing the user’s behavioural patterns occurred when online. He extends his argument to a situation where a bot tricks a user to believe it is an actual person, probably someone she/he trusts, and acting as a spying device, they extract personal information. Then he poses the interesting question of who is to blame for a malicious act in that case? The designer, the user or the bot (Ford 2001, 116 f)? Ethical concerns are also raised regarding how things are represented in virtual reality, especially when VR applications make certain claims on realism. Which consequences of an action are chosen to be depicted and to what extent they are accurate compared to physical reality should be in accordance with those claims (Ford 2001, 116). This is exactly the conclusion regarding authenticity we reached in chapter 2.2, and here we have the chance to reflect on its ethical dimension. Both Ford and Brey note that the level of accuracy is usually undermined for the sake of functionality and avoidance of distraction from the application’s purpose. Brey (1999, 7) gives the example of a virtual action such as killing or polluting a river. Displaying all the consequences that would arise from such actions, in reality, would distract the user from the purpose of the game and would demand excess programming efforts. This way virtual reality ends up misrepresenting reality. But, Brey supports that these design choices should be ethically disapproved only when they offend the values and interests of individuals and groups and sustain biases. Therefore, designers should consider all stakeholder interests and inform the public about the occurrence of such inaccuracies and biases. Ford though, suggests it is not enough to inform people, but designers should make the necessary corrections to eliminate such incidents (Brey 1999, 7 ff; Ford 2001, 115).

OTHER ASPECTS OF ETHICAL CONCERN

Since immersive technology brings about a new way of experiencing the virtual world that is through the sense of embodiment, researchers have addressed new aspects of the traditional risks related to the internet, video game and social media (mis)use. Madary and Metzinger (2016, 13) pinpoint that psychological trauma due to malicious acts or offensive content will

be much more significant since the users will experience a strong sense of presence. Long-term addiction to video games and the internet is connected by psychologists to negative psychological impact, loss of authenticity and a distorted sense of agency. The “I Spy” experiments have demonstrated how easily the sense of agency can be manipulated with modern technology. Participants were unconsciously led to believe they were controlling a cursor on a computer screen, while in reality, it was someone else moving it. The participants were being manipulated by audio and visual feedback. In a virtual environment where the feedback can be continuous and much richer, it is easier to create a false sense of agency and influence the user’s behaviour for profit (Madary & Metzinger 2016, 14). People who will spend a significant amount of time immersed could suffer from symptoms of Depersonalization/Derealization disorder. In the first case, people feel their own body as unreal, while in the latter they have the sense that the external world is unreal. Since VR technology affects the cognitive mechanisms that control our sense of what is real and what not, this could be a possible scenario. Addiction to the internet and video games has led people to abandon their real life with lethal consequences in extreme cases. Thus, VR content creators should take that into account and eliminate this possibility by, for example, forcing the users to take breaks before they can use the application again (Madary & Metzinger 2016, 14 ff). The loss of the authentic self has been much discussed since the use of social media became widespread. Technological mediation and artificiality have infiltrated the so far natural mechanisms by which people present themselves, communicate and socialize. People who prefer to engage in those activities through an artificial environment, it is argued that they become more shallow and dependent by external aid for decision-making. They miss the context, environmental and bodily hints which in the physical world help us deepen our perception and assessment of a situation (Madary & Metzinger 2016, 16 f).

CONCLUSION

Through the comparison of dualistic and phenomenological views on the ethical nature of behaviours in the virtual domain, we ended up embracing the latter, according to which virtual reality is linked to the physical reality from an ethical point of view. According to ethics experts, the concern rises when unethical choices in the virtual domain “leak” to the physical reality. The existing ethical theories have been employed to examine the subject-matter, while Kantian ethics and phenomenology proved to be more appropriate. Examples from VR experiments, video-game research and recent conclusions from neuroscience and psychology were used to support the above ethical theories with tangible data and to show the extent and manifestations of that influence. Moreover, we examined the designer’s choices which can manipulate the users’ agency, influence their behaviour negatively or harm their sensibilities. Finally, we presented additional ethical issues expressed by researchers, which could potentially occur with the widespread adoption of VR.

5. Guidelines for the Design of Virtual Museum Experiences

The present chapter serves as a collection of instructions proposed by experts, regarding the design of museum exhibitions in general and the design of virtual experiences in particular. As these experiences should not be stand-alone, but organic parts of the exhibition

environment, the aim is to compile these diverse guidelines into a meaningful and functional framework tailor-made for museum use, which will be presented in a later chapter. The established London Charter framework will be discussed in comparison with other frameworks, in order to highlight any deficiencies or unsuitable instructions for the Virtual Heritage.

THE BROADER MUSEUM EXPERIENCE

Tina Roppola (2012, 9 f), an expert in Museum Exhibition and Industrial Design, pinpoints the root of all evil within the problematic area of museum experience: it is the failure to inform design choices with the so far derived knowledge from the visitor studies. As she suggests, this failure is due to the absence of a shared language between the two fields of expertise and the immature state of their synergy. It is also a failure of methodology, as the whole museum experience is based on the museum experts' voices who speak for the visitor's sake, without actually being informed by them or having them as a starting point. Thus, Roppola (2012, 41) suggests the necessity of a User-Experience design approach, because museum visiting, more than anything else, is the experience of a three-dimensional environment. Museum objects are put together to form a context with a narrative, wherein a variety of relationships and interactions are formed. Those who oppose the user-centered approach base their argument to the traditional false notion that visitors want nothing more than a superficial and entertaining experience, and, if museum professionals attend this need, they will lead the institution away from its superior values and mission. In the following paragraphs though, it becomes evident why this claim is false.

According to museum expert Jay Rounds (cited in Roppola 2012, 47), the visitor studies have concluded that only a tiny number of visitors pay the required attention in order to gain a clear understanding of the exhibition. As he explains, that is because most people go to museums to satisfy their curiosity and learn for fun, or for the sake of learning. Since they are curiosity-driven, they are particularly selective concerning where they spend their focus and attention. On the other hand, museums have a different perspective on how an exhibition visit ought to be like. They stage the exhibition according to a visitation strategy which has specific learning goals, informed by their own sense of what should be learned.

As Falk & Dierking (2016, 60) point out:

“Museum professionals have failed to recognize that visitors create their own museum experience”

Falk (2009, 56) supports that museum experience is an intrinsically free-choice learning experience, a combination of leisure and learning for fun. In this context, what is valued by the visitors is the process itself and not the end-results. Jan Packer's research (cited in Falk 2009, 57) identified the valued-by-visitors elements which are, exploration, discovery, mental stimulation and excitement, and the nature of this experience, which should appear effortless, be enjoyable, appeal to multiple senses, have the availability of choices and be potentially transformative.

Visitor studies have progressively reached three significant conclusions regarding what happens when a visitor meets a museum object. The latest realization occurred in the mid-'90's when visitor experts defined the “what happens” as an *experience*. More than that, it is a multidimensional experience, as the personal, socio-cultural and physical background of each visitor merge with the exhibition. The other two conclusions were that this experience is improved by the visitor's active physical involvement (participatory and multisensory-

interactive exhibitions) and influenced by exhibit type in relation to the visitor type. Multiple studies have shown there are types of visitors who are naturally drawn by specific types of displays, but this conclusion has not been very helpful, as researchers have a hard time getting to know the visitors well enough as to properly fit them in categories (Roppola 2012, 21, 39).

However, Falk's research based on the visitor's motivations and entering expectations has been very impactful, as it goes beyond superficial statistics and reaches the individual's identity traits which actually matter to a museum experience. According to Falk, there are seven types of visitors with different needs but it is possible for each visitor to be classified in more than one categories since they can have mixed motivations:

- Rechargers and Professionals/Hobbyists have specific goals and interests regarding the exhibition and they walk towards the exhibits they like, without usually getting distracted by the rest. Rechargers come for contemplation and spiritual refreshment, while Professionals/Hobbyists want to gain a deeper understanding of what matters to them.
- Explorers and Facilitators are those who wander around the galleries having a more generic interest and cannot articulate it until they stand in front of it. Explorers seek something that interests them, while Facilitators seek something that interests the people who accompany them.
- Experience Seekers are typically infrequent visitors who visit a museum for the sake of it. Their main goal is to see the famous and important exhibits the museum holds, so they can enlist it to their package of experiences. However, they commonly start by reading every label, until they get tired and start skimming the exhibits because they want to reach the end and to have seen everything.
- Respectful Pilgrims and Affinity Seekers visit a museum out of a need to connect with heritage. The former go to a museum out of a sense of duty and obligation, while the latter seek to connect heritage with their sense of personhood (Falk 2009, 173 ff).

How could this typology improve the museum experience in practice though? Digital solutions could customize the exhibition to fit everyone's needs. Experience Seekers could be provided maps with an optimal route towards the main points of interest, while Professionals could be provided with a mobile application with additional information for each exhibit. Regarding Explorers, the museum could make sure the whole exhibition spatially facilitates their wandering and enhances their selective process by, for example, making quickly recognizable what each section of exhibits is about and which area it occupies. As for Affinity Seekers, the designer could provide them with an optimal route towards exhibits with personalization, co-creation or participatory features.

Roppola notes that participatory activities have been proven as a way to enhance the experience, particularly in the form of user-generated content but depending on the design and aims of the activity, the meaning may appear distorted and irrelevant to participants, as they deal with recontextualized concepts. Also, for the sake of making the engagement easier and entertaining, the subject may be interpreted as fun and easy, while in its real context would be evaluated much differently (Roppola 2012, 23, 35). Overall, research has coincided on the most attractive types of exhibits, which are those which appeal to multiple senses because they combine diverse media, they convey the subject lively and make the ideas quickly understandable, they are not limited to the interests of specific age-groups and are memorable. Interestingly, visitors do not think participatory and interactive exhibits are

automatically ideal. That is because they may demand more effort than it makes them comfortable, or they may overload them with interactions and information which disrupt the sense of flow. It is statistically observed that after thirty to forty-five minutes of walking around the exhibits visitors start to pass them by quickly as tiredness catches them up (Roppola 2012, 21 f).

VR EXPERIENCE

As we have seen in Chapter 3, Riva & Waterworth concluded that **action** is the decisive factor that affects the feeling of presence, while Calleja adds the sense of **agency and interpretation** as the subjective determinants of the experience. Pujol and Champion highlight the importance of **content** through the term cultural presence, by suggesting that cultural learning should be the end-goal while presence just the means. Galani and Chalmers (see The City Project, chapter 3.1), emphasize **social interaction** as a decisive factor that affects the perception and quality of an immersive experience.

Starting with Witmer and Singer (1998) who carried out a very insightful study on Presence, we are going to delve into more practical guidelines on how to design a virtual reality experience. Their study presents the four factors that affect the sense of presence which will be juxtaposed and complemented by the latest insights from the design of VR experiences presented by Frank Spillers:

A) Control factors

Degree of control: The greater control a user has over the interactions taking place in the virtual environment the more present will feel (Witmer & Singer 1998, 228f). Spillers, on the other hand, argues that the level of control (agency) has to be decided depending on the goals we set regarding the scene, flow, narrative and interaction events. That is because the user can feel overwhelmed by having to make constant choices and may lose focus on the narrative which is what binds all the elements of the experience together. A Vr experience can employ four degrees of control: The agency of the observer who can only watch, a Little agency which gives the user the sense of having a choice but not in reality, the Local agency where the user can influence the scene and interaction events but not the flow and narrative and the Global agency where the user as a “God” can influence all the above. Thus, if the level of control is not decided wisely the presence will decrease (IDF 2018, 3.4 Use Narrative Essentials). Spillers makes an important point about how the Global agency can negatively affect empathy. The user as a “God” and a protagonist in a situation will act and respond and thus, become a bit emotionally detached from the event, but the user as an observer will absorb the event that happens to others without focusing on the task and self-reactions. Therefore, a designer has to achieve a fine balance between interactivity and empathy (IDF 2018, 3.1 Storytelling in VR/MR: 7 essential musts).

Immediacy of control: An action has to be followed by a consequence that is being made apparent to the actor so as to create a sense of continuity (Witmer & Singer 1998, 229). This, according to Spillers, should not only apply to content (depict the real-world physics of action-reaction) but also for the interaction mode. For example, if the user points at an object in order to select it, the object should be highlighted in order to let her/him know that the intended action is going to be successfully fulfilled. In other words, the user must be provided with cues that make her/him constantly aware of what is going on, so that the sense of control is retained. (IDF 2018, 6.1 Designing your 3D Experience).

Anticipation: Being able to predict and expect what comes next will increase the sense of presence (Witmer & Singer 1998, 229). Spillers notes that this is a storytelling technique that deepens the engagement and is linked with the stimulation of emotions and curiosity. He suggests that all VR experiences have to be designed on the principles of storytelling because a narrative holds the experience together, it is a guidance system and a way to spark emotions, guide the discovery and activate immersion (IDF 2018, 1.9 Storytelling Essentials).

Mode of control: The way a user interacts with the virtual environment has to be intuitive, to feel natural. If the user has to learn a new way of interacting with familiar objects then presence will decrease (Witmer & Singer 1998, 229). Spillers gives the example of a virtual door. A user expects to grab the door handle or push it in order to open it and that is an intuitive act because objects that are familiar to us communicate how they should be used. Thus, presence will break if a user has to learn a new way to open a door (IDF 2018, 2.4 The Reality of your User's brain in 3D: Gaze & Gesture). He also suggests that whether an interaction will be direct (physical movement, haptic interaction, gaze) or indirect (use of a keyboard/mouse) has to be decided depending on which one is right for the specific task, flow and narrative. However, as he says, direct interaction is the "winner technique" and is based on the "don't make me think" design principle but it should be used strategically to avoid tiredness and thus breaking presence (IDF 2018, 6.1 Designing your 3D Experience).

Physical environmental modifiability: Being able to modify the virtual objects as we do in real life verifies our natural ability to control our environment, thus feel more present (Witmer & Singer 1998, 229). However, just because we can does not mean we should enable this option uncritically. Why should a user be able to rotate an object if this action is not meaningful for the task or story flow? Again, as Spillers supports, all interactions have to be strategically selected, designed to support the focus on the narrative and maintain Presence (IDF 2018, 6.2 Defining Spatial Interactions).

B) Sensory factors

Sensory modality & Environmental richness: Since we mainly use vision to absorb information there should be a hierarchy of modalities through which the user will experience the virtual world. A virtual world where sensory stimuli are limited will result in minimum presence (Witmer & Singer 1998, 229). On the other hand, a 3D space can overwhelm if the various stimuli are not used wisely. Spillers suggests that the principle of "less is more" should not only apply to interactions and movement but also to visual input and menu density. (IDF 2018, 2.6 Your Designer Brain in 3D: What you need to know?) He specifically notes that the optimal Field of View (the coverage of observable area) for VR is 90 degrees not 180° neither 360°. That is because in real life we rarely use the peripheral vision and we tend to focus on narrow viewing areas so our comprehension becomes greater (IDF 2018, 1.8 Exploring Spatial Interfaces). Moreover, the "resting" gaze angle is 10 to 20 degrees below the horizon while more than 10° above the horizon and 60° below the horizon should be avoided. This way a user can concentrate on the main action without getting lost in space and get physically tired by unnecessary neck and eye movements. (IDF 2018, 2.4 The Reality of your User's Brain in 3D: Gaze & Gesture).

Multimodal presentation & Consistency of multimodal information: Coherent and complete sensory stimulation will result in increased presence. When different sensory modalities are used to convey the same message there should be a caution to not contradict

each other (Witmer & Singer 1998, 229). Here, the “Less is more” principle, as discussed in the previous paragraphs applies as well.

Degree of movement perception & Active search: Being able to perceive self-movement, change the viewpoint, identify the source of a sound and perform tactile search will highly increase presence (Witmer & Singer 1998, 230). Regarding navigation, a designer has to take into account whether the user is sitting, standing or walking in the physical space and adjust the content according to these positions. If the user does not control the movement but is transported by the system through animation, vertical motions should be strongly avoided since humans are very sensitive to the direction of gravity. The same applies to unexpected or unstable camera movements. Providing the user with a spot in the environment where they want to move and starting a rapid simulated motion at 100 m/s (“teleportation”) is the safest choice to avoid disorientation, fatigue and getting lost in space. Movement as with all the interactions should be part of the narrative and not used just for the sake of it (IDF 2018, 2.3 The reality of your user’s brain in 3D).

C) Distraction factors

Isolation & Selective attention: Devices that can isolate the user from the physical environment such as head-mounted displays and headphones help users focus on the virtual world stimuli and avoid local distractions, thus experience more presence (Witmer & Singer 1998, 230). However, Spillers notes that this advice does not apply to Mixed Reality where presence, in that case, increases exactly because the physical environment is used in the experience (IDF 2018, 7.3 Measuring Presence).

Interface awareness: Interface devices that are bulky and feel unnatural distract the user from the effortless interpretation and interaction with the virtual world (Witmer & Singer 1998, 230).

D) Realism factors

Scene realism & Consistency of information with the objective world: Scene content may not resemble the physical world but light sources, the field of view, resolution, dimensionality and texture have to be experienced as in the real world (Witmer & Singer 1998, 230). Spillers makes an important point of considering the emotional and social physics as well. As he notes, low emotional arousal results in low presence. Emotions can be used not only as an end, not only to make the plausibility of interactions stronger but also as a means to guide the user throughout the narrative (IDF 2018, 6.1 Designing your 3D Experience). The experience should also match real-world social behaviour (especially when it is a collaborative, multi-user application) by making use of important social characteristics such as:

- **Social signifiers:** are things interpreted the same way by a group of people and signify an appropriate behaviour/activity or manage a social expectation. Spillers gives the example of a time-buzzer given by some restaurants to customers as they wait for their order so they do not get nervous.
- **Social focus:** it refers to cues that coordinate social behaviour. For example, when a teacher raises her/his voice to bring the students back in order (IDF 2018, 5.1 5 Important Social UI characteristics)

Meaningfulness of experience: When the user feels motivated to complete a task or learn during the virtual experience, or has a previous positive experience then she/he will feel more present (Witmer & Singer 1998, 230). Spillers advises employing game mechanics such as, points, levels, challenges, leaderboards, virtual gifts etc. which are behaviour motivators and attend to the human desires for reward, status, altruism, achievement etc (IDF 2018, 6.7 Gamification for Any Immersive Experience).

Separation anxiety/disorientation: Experiencing these symptoms after returning to the physical environment is an indicator of a high level of presence (Witmer & Singer 1998, 230).

DISCUSSION OF THE LONDON CHARTER, SEVILLE PRINCIPLES AND THE ENAME CHARTER

The London Charter (2009) was developed in 2006, to serve as an internationally acknowledged framework of objectives and principles, regarding the use of computer-based (CB) visualizations of cultural heritage in a variety of fields. The aim was to resolve the lack of intellectual transparency, reliability, documentation, sustainability and access, which was characterizing those projects. The Ename Charter was created in 2007, by the ICOMOS international organization for the conservation of world's heritage, to serve as a universal framework of objectives and principles regarding the Interpretation and Presentation of cultural heritage sites in general, regardless of the means used. Thus, the two frameworks have different objectives and focus areas, but as we will see below, some of their principles overlap or could be complementary. The Seville Principles (IFVA 2011), is an addition to the London Charter framework, conceived with the aim to specify some guidelines of the London Charter, but also to highlight specific points regarding the archaeological heritage, as a distinct area from the much broader cultural heritage. Archaeological heritage differs in that, it includes only the tangible legacy with its surrounding context which, regardless of whether it is extracted or not, underwater or on the surface, it can be studied using the archaeological methodology (excavation, survey, prospection) as the primary one.

Concerning the interdisciplinarity of the projects, the Seville framework is more specific, as it advises to adopt a non-compartmental structure of the working environment, in order to achieve more effective communication among the professionals. It also stresses the mandatory involvement of an archaeologist/historian, preferably one who managed the excavation (IFVA 2011, 5).

As for the suitability of a computer-based visualization with regards to the purpose, both the London charter (2009, 6) and the Seville framework state that the level of sophistication should not exceed, or be inferior to the needs of the specific purpose. However, the Seville framework adds the dimension of complementarity as a stand-alone principle, advising that a CB visualization should be used only as a complementary tool to the other means of research or dissemination. Another interesting point is that the term "Purpose" is only used by the Seville framework as a stand-alone principle and it incorporates the attendance of the professionals' and the wider society's needs, as well as the timely identification of secondary objectives that should address potential problems (IFVA 2011, 5 f). On the other hand, the London Charter under the term "Aims & Methods" does not specify other dimensions of the purpose than the ones already mentioned, while the Ename Charter does not treat the aims or purposes as separate, but it incorporates many dimensions of them in the other principles.

Specifically, it states that the programmes should motivate the public to reflect, form their own interpretations and identify, but also extend their interest, learn and explore more. Moreover, the public should be made aware of the nature and significance of the conservation work. In relation to the content, the programmes should promote a holistic awareness and continuous updates on the sites' significance, across cultures, communities and historical times (ICOMOS 2007, 6, 8).

Scientific integrity is equally stressed in all three frameworks, addressed by two principles in each of them. The London Charter (2009, 7 f) dedicates much more space regarding the documentation, as it classifies it into categories with regard to the whole process of work and attributes general guidelines to each of them. It stresses the evaluation of the research sources and it specifically calls attention to the visual sources, as they may hide biases. The other two frameworks provide more limited documentation guidelines, but they name specific sources to be used in the projects: The Ename Charter incorporates the oral testimonies and traditions as sources of equal value (ICOMOS 2007, 7), while the Seville framework incorporates the charcoal, paleobotanical, paleozoological and physical paleoanthropological evidence as equally important sources (IFVA 2011, 7). With regards to the content integrity, the London Charter (2009, 8) provides only one guideline, according to which the visualization should make obvious the different certainty levels of the models. In contrast, both the Seville and the Ename frameworks stress the importance of communicating a holistic view of the site/reconstructed remains, by presenting them in all of their historical phases and environmental and cultural contexts (ICOMOS 2007, 8). The Seville framework emphasizes the obligation to avoid any idealization attempt, regarding both the site/artefact itself or the people and contexts related to it (IFVA 2011, 7), while the Ename stresses the importance of incorporating the intangible elements and the cross-cultural perspectives on the particular subject (ICOMOS 2007, 8).

Sustainability is a common principle in all three frameworks. The London Charter (2009, 10) provides the guideline that, sustainability strategies should be planned for both the documentation and the virtual reconstruction, and should ensure the existence of non-digital formats in case the digital ones become non-accessible. The Seville framework uses the term "efficiency" to include a more specific guideline, according to which, priority should be given to systems that may initially require high investments, but ensure lower costs on the long-term and high reliability (IFVA 2011, 7). Evaluation, which should include more than visitor attendance and revenue, as well as effectiveness and assessment of the potential impacts on the site due to management are included in the Ename guidelines for sustainability (ICOMOS 2007, 10).

Authenticity is one of the principles included in the Seville and Ename frameworks, but not in the London Charter. According to the Seville principle, there should be alternative visualizations, when the hypotheses are of equal scientific validity, otherwise only the main hypothesis should be endorsed (IFVA 2011, 6). On the same matter (but included in the "Information Sources" principle), the Ename Charter similarly advises creating alternative virtual reconstructions, when the hypotheses are based on enough evidence. However, regarding the Interpretation, the guideline is to include all hypotheses for reflection, regardless of their level of certainty (ICOMOS 2007, 7). This differentiation could be due to the increased certainty that visualizations convey with their concrete form, as we have seen in a previous chapter. Also, the Seville framework attributes the need to distinguish between the real/authentic and the hypothesized parts, to the Authenticity principle, while the

London Charter to the Documentation principle. The Ename charter though correlates the Authenticity principle with the more general idea of securing the site and the local culture from impacts that would alter their identity and values.

Access is a shared principle in both London and Ename Charters, but the former provides more precise guidelines. The London Charter (2009, 11) advises exploiting the CB visualization's full potentials of maximizing access while considering health, safety, economic, political, environmental and other reasons which make heritage inaccessible. Moreover, it suggests designers should consider the types and degrees of access according to the different needs of stakeholders. The Ename highlights that the programmes should consider the diversity of audiences, their different language background and abilities for access. A similar principle to Access is added in the Ename framework under the term "Inclusiveness", which stresses the need to consider the rights, interests and responsibilities of all the groups involved, and ensure their meaningful collaboration (ICOMOS 2007, 6).

Training and Evaluation is a shared principle in both the Seville and Ename frameworks. The former stresses the importance of academic training in virtual archaeology, while the latter proposes on-site programmes for both the staff and the public. Regarding the Evaluation, the Seville guideline is to evaluate the projects aiming at public communication through the visitors' studies, while the projects aiming at research and conservation through end-users (professionals). The Ename Charter though, advises the direct participation of the public in the evaluation process, along with the participation of professionals. One important aspect the Ename highlights, in a combination of the Training and Evaluation with the Research principle, is the importance of continuous revision/expansion of the content and consultation (IFVA 2011, 8 f; ICOMOS 2011, 12 f).

Overall, all three frameworks have strengths and weaknesses, but the London Charter has the most generic approach. The explanation behind it can be found if we look at the language it uses. Unlike the other frameworks, there is no use of terminology that could ring a bell to an archaeologist or a cultural heritage professional. Apparently, this is due to the attempt to establish the London Charter as a framework with a common/understandable language to a broad variety of professionals who work together in the heritage field. Although the avoidance of terminology may not be a problem in general, in this case, it is followed by an avoidance to provide focused guidelines on issues which are not shared by all the involved professions but are of a specific profession's concern. For example, the London Charter mentions that research sources are all the types of information, digital and not, considered for the project and "*should be selected, analysed and evaluated with reference to current understandings and best practice*" (2009, 7). This guideline allows a lot of space for interpretation. In contrast, the other two frameworks apart from naming the types of the research sources, they stress the need to incorporate specific types of evidence, such as archaeobotanical and oral testimonies, as of equal scientific value. In this way, the other two frameworks have pinpointed a gap for which they provided a guideline, which is of no concern for the computer scientist, but for the archaeologist. The question is, how effective is a framework which deals only with the shared issues among the professionals involved? Apparently, the widespread adoption of London Charter shows that such a framework is helpful to a certain point, but on the other hand, the creation of additional, more "specialized" principles, the Seville Principles, shows that the London Charter was not enough.

CONCLUSION

In this chapter key-conclusions from the visitor's studies were presented, along with common misconceptions about the needs and experience of museum visitors, which still

affect the attitude of museum professionals towards them. We clarified further what a museum experience is and ought to be and who the visitors are and what do they expect. Guidelines and suggestions from several professionals were presented and discussed, mapping out key-elements for the optimal design of exhibitions and virtual experiences in museums. Particularly we highlighted propositions and concepts which fall within the scope and concerns of the UX design methodology, which will be further discussed in the next chapter. Finally, the principles and guidelines of three widely established frameworks were compared and reviewed, highlighting their weaknesses and strengths.

5.1 The User Experience (UX) Design

“User Experience is not about good industrial design, multi-touch, or fancy interfaces. It is about transcending the material. It is about creating an experience through a device”
(Hassenzahl 2013, “User Experience and Experience Design” para. 4)

The above sentence outlines the philosophy behind this design approach, which emerged along with the Western world’s shift from the material to the experiential. This shift is due to a post-materialistic culture which societies embrace in times of continuous material prosperity, where *“they transform into highly individual Experience Societies whose members equate happiness with the acquisition of positive life events”*. Superficiality and consumerism are giving place to meaningful engagement and the dissociation of experience and expenditure. The Experiential shift is characterized by different values which are relevant to personal improvement. According to Gerhard Schulze (cited in Hassenzahl 2013), professor of social science and philosophy, other signs are *“deceleration instead of acceleration, less instead of more, uniqueness instead of standardisation, concentration instead of diversion, and making instead of consuming”* (Hassenzahl 2013, “From the material to the experiential”). Thus, the post-materialist people are not interested in the products themselves, nor in the ownership, but in the experience that they provide (Hassenzahl, 2013, “Experience and business”).

At this point, it is worthwhile to summarize the main conclusions of this thesis regarding experience and add the perspective of UX design on the matter. We have concluded that a meaningful (virtual) museum experience is authentic, engaging, relevant and causes change. An authentic experience is truthful to its claims and, as it is based on trust, it transcends to a relationship between the provider and the visitor/user (see chapter 2.2). In general, the experience is subjective, contextual, correlated to the individual’s background and affected by her/his prior expectations (see chapter 2). An engaging museum experience is one that employs physical and social interaction, multi-modality, multi-sensory elements, requires minimum effort, attends the visitor’s need for exploration/discovery, enjoyment, control and choice, sense of achievement and acceptance and is potentially transformative (see chapter 5 & 2.1). Hassenzahl (2013, “The evasive beast called User Experience”, para. 2), driven by understandings from psychology and philosophy, defines experience as :

“an episode, a chunk of time that one went through [...] sights and sounds, feelings and thoughts, motives and actions [...] closely knitted together, stored in memory, labelled, relived and communicated to others. An experience is a story, emerging from the dialogue of a person with her or his world through action”

What constitutes a positive and pleasurable experience though, according to psychology, is connected to the fulfilment of the universal psychological needs (Hassenzahl 2013, “The evasive beast called User Experience”, para. 3). According to Maslow’s Theory of Human Motivation, these needs “*are organized into a hierarchy of relative prepotency*”, which means that once lower needs are satisfied, new ones, higher in hierarchy emerge (Maslow 1943, 375). Maslow’s initial five-stage model expanded during the ‘70s to include three additional needs, the cognitive and aesthetic right above the esteem needs and the transcendence right above the self-actualization need (Maslow 1970, 2 ff). The first four are deficiency needs since we are able to sufficiently fulfil them and then we cease to be motivated by them. On the other hand, the last four of them are growth needs, since, once we meet them we do not stop being motivated by them. Because motivation theory views the individual as an *integrated, organized whole*, the satisfaction of needs entails a satisfaction to the whole. As Maslow explains, hunger does not affect only the individual’s stomach, but her/his perceptions, memories, emotions and the content of her/his thinking. A hungry individual is different than what she/he used to be prior to that (Maslow 1970, 19 ff). However, later in his revision of the model, Maslow proposed that the order of needs should not be treated as rigid, but it could change due to life’s circumstances or individual differences. For example, some people perceive self-esteem as a more urgent need than love or friendship. He also stressed that most of human behaviour is multi-motivated, as several needs may determine behaviour simultaneously (Maslow 1970, 51 ff).

Concluding from the above, a museum experience, in order to be a positive experience, could attend to the following needs:

- Belonging: social interaction, trust, acceptance, affiliating, communication, support
- Esteem: self-respect, autonomy, respect of others, sense of contribution and achievement through an activity, being accepted and valued
- Cognitive: gain knowledge, meaning-making, exploration, discovery
- Aesthetic: appreciation of beauty, balance, form, surroundings, creativity
- Self-actualization: the realization of personal potentials, seeking continuous personal development and peak experiences (euphoria, joy and wonder), make the most of our abilities
- Transcendence: values which transcend the self, care for others, the environment, the world, spirituality, feeling of being part of a bigger whole.

However, is the fulfilment of a need by itself what constitutes a meaningful experience? The answer is no. If we asserted that, then, as Hassenzahl implies, every time we used our mobile phones to speak with our loved ones, we would have that kind of experience and the work of a designer would have been much simpler. Instead, the determinants of fulfilment are personal, situated and dependent on the context. A device designed to be charged with experiential orientation has the ability to transcend the momentary use and become an integral part of the context, part of the personal story (Hassenzahl 2013, “Experience Design: Designing the post-materialistic”). An example of such a device is the Swantje Krauß’s bucket for grape harvesting. This bucket is used by the workers to gather the grapes and load them into bigger containers. At that point, it is a tool, but she added a feature which transcends its mere practicality: it can be transformed into a seat so as the worker can take a rest. This way the bucket communicates that rest is an accepted part of the whole activity, that rest and work should not happen at the same time (the bucket has to be emptied before it turns into a seat), thus it signifies the advantages of a proper break and, finally, it implies that rest can take place on the spot, in the vineyard, in the context, along with the co-workers.

In short, the product added value to the work experience by empathizing the user's psychological needs, emotions and thoughts (Hassenzahl 2013, "Experience Design: Designing the post-materialistic", para. 14). Thus, the UX design starts with the Why question, aiming to understand the needs, feelings and thoughts involved in an activity and only after gaining this knowledge a UX designer can decide the form, functionality and features - the What and How (Hassenzahl 2013, "Why, What and How").

UX design is mostly connected to interactive products/services, computer-based products namely, but it is so broad and flexible at employing various methodologies, that can be useful in many fields (IDF 2018, 5). According to the Interaction Design Foundation (IDF) (2018, 10 ff) the "design thinking process" is the most common methodology used. It is particularly useful when the problem is hard to define or unknown and it is human-centric at its core.

The five stages of this process are:

- **Empathize:** emotionally connect with the users, try to be in their position
- **Define:** the user's needs, problems and the understandings derived
- **Ideate:** challenge assumptions, brainstorm ideas, creative and innovative thinking
- **Prototype:** create/materialize the solutions in a raw form
- **Test:** test and evaluate the different solutions

Design thinking is also called "outside the box" thinking because it incorporates the element of proving whether an assumption is legitimate or false, and it gives weight to the research part and iteration, thus the improvement and update of the product/service. Apart from rationality, this methodology incorporates obscure elements, such as emotions, needs and motivations which contribute to an empathetic and holistic approach (IDF 2018, 13 ff).

According to IDF (2018, 21 ff), there are seven factors that influence the User Experience:

1. **Useful:** this term should not be related to the meaning of practical, as there are objects, such as art or games, which some people find useful because they fulfil a need. Thus, products/services must communicate their purpose effectively, so the users can relate to that.
2. **Usable:** A product/service is usable when it facilitates the user to easily and effectively achieve their goal by using that product/service. Often the first versions of a product have poor usability because usually with the increase of sophistication less effort is demanded by the user.
3. **Findable:** This element is particularly important in the digital and internet sector. If a website does not make it easy for the User to find the content she/he wants, she/he will leave the website. There is an unofficial rule of the UX design on websites according to which the user should be able to find what she/he searches for within "three clicks". Findability is connected with the respect of the user's time.
4. **Credible:** Since for today's people there are a lot of alternatives, they will not hesitate to reject a service or product which did not stand up to their expectations. Credibility is like authenticity, if a product claims it does something, then it should. It is easier today for disappointed users to provide negative feedback and affect the choices of others.
5. **Desirable:** Designers charge a product with desirability through branding, aesthetics, identity and emotional design. That is because some products communicate popular desirable traits, such as power, status and glamour.

6. **Accessible:** The EU created a legal obligation to ensure that certain categories of products and services are accessible to people with disabilities, while 19% of the population in the USA has some kind of disability, a percentage that translates into 1 in five people. However, design for accessibility means making the use of products easier for all people.
7. **Valuable:** The product/service must deliver value both to the creators and the users. Value is what keeps people emotionally attached to certain brands/products/services, even when their fashion, initial success, sophistication etc. is superseded. Value creates loyal audiences which show their support in times of crisis.

According to the IDF (2018, 29 ff), **usability is a key factor** to UX design, which attributes five traits to products in order to be usable: effectiveness, efficiency, engagement, error tolerance and ease of learning.

Effectiveness is when the product/service helps the user to achieve her/his goal with minimum effort. In other words, the product/service should be designed so as to support the user's intended actions and result in accuracy, and be informative enough so as to provide meaningful guidance. Simple and clear language, minimum use of technical terms, a balance between fast navigation and the provision of alternative options for navigating.

Efficiency can be confused with effectiveness, but efficiency is more related to speed. Its goal is to help the user do what she/he intends to do in a faster way. Reduce the clicks, or buttons needed, clearly label the provided options, offer shortcuts. Also, provide different interaction approaches/tools that fit different means, such as smartphones, laptops etc.

Engagement occurs when the use of a product is pleasant and gratifying. Aesthetic appeal contributes to that, but the interaction also needs to feel right.

Concerning Error tolerance, complex products/services such as computer-based applications are likely to contain errors, but designers have to minimize their occurrence and make sure their impact on users is subtle. This could be achieved by making links/buttons clear and distinct, using simple and clear language, offering a "reset" or "undo" option and limiting the options to correct and expected choices.

Ease of learning is necessary to keep the users comfortable and avoid causing frustration, especially when the product/service is updated with new functions and features. The way to achieve it is to consider the user's existing mental representations and their familiarity with doing things in a certain way. An example is the widespread use of virtual buttons in digital products since people are familiar with pushing real buttons and their form predisposes them towards the desired action.

There are several effective techniques for conducting UX research in order to extract the needed information from the users (IDF 2018, 35 ff):

- Interviews: By interviewing the users we can gain a first-hand assessment of their experience and test the validity of our assumptions. However, interviews can be misleading if they are not accompanied by a prior observation of the user's actual interaction with the product/service (contextual interview). That is because people's responses in hypothetical questions often do not match with their actions when they are involved in the actual activity. Also, since people cannot clearly recall details which matter to the designers or interviewers, they tend to recreate those details based on what they thought happened and not on what actually happened.
- Card Sorting: This technique originated from psychological research. The users are asked to categorize cards (by priority/grouping etc.) with phrases or words written on them. It is a fast and easy way to gain user's feedback on what matters to them most

and how they perceive the relationships between the data, features etc. of the product/service.

- Expert Review: A single expert can review the product and pinpoint flaws in the factors that impact the user's experience. However, an expert's input should not exclude direct testing with the users, as the latter can lead to deeper insights.
- Eye Movement Tracking: This technology has lately become discreet, more advanced, reliable and less costly. It helps to appreciate the design's effectiveness and what kind of content to prioritize.
- Field Studies: It includes ethnographic research, (contextual) interviews and observation which constitute the most effective ways to gain the deepest insights on user's behaviour.
- (Remote)Usability Testing: It is the most established way for UX designers to get the user's feedback by assigning them tasks related to the product and observing their behaviour. For better results, the testing can take place remotely in the user's natural environment and the subjects should be a representative sample of the target groups.
- User Personas: This method is an advanced form of the traditional user profile, which provides a deeper and clearer image of the user. Each fictional persona is attributed with a name and a background story in order to be closer to real-life situations and help the designers reflect more effectively on potential problems, needs and motivations of the real users.

CONCLUSION

The philosophy and socio-economic developments which gave rise to the UX design approach were briefly presented, along with examples which illustrate its core values and constituent elements. Particularly, we highlighted how our previous conclusions about the museum experience fit perfectly under the scope of this methodology.

Finally, we presented the steps of the design thinking process, the factors (or aims) the UX design is preoccupied with, the product/service traits which are viewed as essential and the techniques for conducting the UX research.

5.2 An Optimal Framework for Museum Use

In this chapter, a framework will be developed based on the findings of the research, which have been discussed in the previous chapters. As it was argued before in the present thesis, virtual reality experiences have characteristics, needs and affordances of a different nature than the broad category of 3D visualizations for which the established frameworks provide guidelines. Most importantly, they need to be perceived in conjunction with the museums and the visitors/users, as all three are interrelated and may have contradicting needs and aims. Unlike the other frameworks which are created based mainly on the interests, needs and perspectives of the cultural heritage professionals behind the projects, the point of departure of this framework is the visitor. By merging the visitor, the museum and the VR experience perspectives into a single framework as equal categories to be considered, we will examine how all three of them can contribute to a meaningful experience.

In the following table, the framework is developed around the four principles (Authenticity, Engagement, Relevancy and Change) which were identified through the research as

constituent elements of a meaningful museum experience. Each principle is accompanied by different aims (indicated by the letters A, B, C etc.) which in turn are accompanied by guidelines that are classified next to the “museum experience” and “VR experience” sections accordingly.

FRAMEWORK FOR A MEANINGFUL (VIRTUAL) MUSEUM EXPERIENCE -
AUTHENTICITY

Authenticity	A. Authentic experience	
	Museum experience	Museum objects should be experienced as constituent elements of a narrative that binds together the material culture and the people who created it, including the intangible aspects in between such as the mental, emotional and social contexts. The nature of this experience for the visitor should be a perceived practical experience of that world.
	VR experience	It should be an organic part of the exhibition’s narrative which reconstructs a piece of it through visual, auditory and, if possible, tactile input. It should take place in a VR room or an enclosed space that ensures that the user’s focus stays in the virtual environment undistracted by what happens in the physical space. The level of immersion and interactivity has to be decided depending on the content and desired outcomes but the more immersive and interactive it is, the more authentic it will feel: in this case head-mounted displays with headphones and direct interactions (gaze, haptic interaction, physical movement) are suggested. In general, the mediation of technology should be discreet and the interactivity intuitive.
	B. Control and Meeting of expectations	
	Museum experience	The purpose and features of the exhibition should be efficiently communicated so as to control the visitor’s expectations and match them with the actual experience.
	VR experience	The purpose and type of experience should be communicated efficiently so the user knows beforehand what to expect in terms of immersion (how deep?), interactivity (or absence of it) and content (narrative-based or not).
	C. Scientific integrity	
	Museum experience	Use all types of available information to construct the interpretation, while filling the gaps of knowledge with hypotheses, in order to present a coherent narrative. In the absence of hypotheses, a museum should present the questions raised around the subject-matter, so as the continuum of the narrative does not break and the visitor has something to reflect on. What is based on evidence and what on assumptions should be effectively communicated. Alternative narratives or cross-cultural perspectives should be presented for comparison and holistic interpretation.

	VR experience	Depending on the content and purpose of the experience the need for scientific integrity differs. If the experience is designed as a fictional tale that aims to represent intangible aspects or provide a generalized idea of a past environment/community then communicating scientific integrity should be kept to meaningful levels and not disrupt the flow of the narrative. If, on the other hand, the goal is to simulate a specific site, architectural remains or artefacts then the user should be made aware of the different certainty levels of the virtual simulations and reconstructions. This can happen by using different reconstruction methodologies according to the different perceptual needs: evocative models, hybrid models, virtual anastylis or holistic reconstruction. In this case, detailed documentation of the research, processes, results and methods used for the development of the project should be published and be accessible for review. In both the above cases, the supervision of the project by a specialized archaeologist/historian must be mandatory. Any biased or idealized reconstruction of the people and their culture should be prevented.
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ENGAGEMENT

Engagement	A. Fulfilment of universal psychological needs	
	Museum experience	A museum should be able to meet (most of) the following needs: Belonging (social interaction, acceptance, trust, affiliation), Esteem (autonomy, being accepted and valued, sense of contribution & achievement), Cognitive (exploration, discovery, meaning-making, knowledge), Aesthetic (beauty, creativity, balance, surroundings), Self-Actualization (realization of personal potentials, peak experiences), Transcendence (values that transcend the self, spirituality, feeling of being part of a bigger whole).
	VR experience	In the case of an interactive experience, the above needs can be met by employing game mechanics: provide points/trophies for the completion of a task, challenges with a gradual level of difficulty, leaderboards and exchange of virtual gifts (in social VR). Design choices that could cause psychological harm, disrespect a user's (socially acknowledged) sensibilities or manipulate the user's agency in a negative way should be prevented.
	B. Social interaction	
	Museum experience	The museum visit is a social activity, thus there should be: Multi-user exhibits, so individuals can have equal participation in the experience. Multimodal exhibits, so people can discuss the different ways they experienced the same exhibit. Exhibits with complementary content, so people get into a cooperative process of combining content. Sharing options through social media, so visitors are encouraged to incorporate their museum experience into their social and networking activities. Co-creation and participatory activities.

VR experience	<p>Since the visitors come in groups of two or more individuals the experience should be designed as a multi-user VR attending to the museum-specific social needs (eye-contact, chat, collaboration) or at least allowing the co-visitors to watch on a screen what the others do while immersed. The use of avatars increases the sense of co-presence and should be designed with sufficient expressions, body language cues and simulate real-world behaviours. The users should be able to communicate, collaborate in common tasks and exchange virtual objects with a focus on the narrative.</p>
C. Personalization	
Museum experience	<p>Since there are different types of visitors with different motivations behind their visit (Falk's classification: explorer, experience seeker, recharger, professional/hobbyist, facilitator, respectful pilgrim, affinity seeker) the museum should facilitate what each type of visitor is looking for. The museum should combine different learning methods and communication means (visual, audio, haptic) to facilitate the learning and perceptual process of a diverse audience and also ensure accessibility and ease of use to people with disabilities and diverse needs.</p>
VR experience	<p>Personalization options in the VR experiences should not conflict with the authentic traits of the culture and its people which are being virtually reconstructed.</p>
D. Enhancement of the experience	
Museum experience	<p><i>Create atmosphere:</i> use appropriate lighting, sounds, spatial arrangement, visual and decorative elements, in order to intensify the perception and feeling of the context. <i>Create memorable stories:</i> multi-sensory elements should accompany the exhibits while the information should be linked together in a coherent and lively way, creating a sense of flow and stimulating emotions. Use simple, clear, dynamic language and avoid jargon. <i>Facilitate trajectories and minimize effort:</i> offer the visitors options to organize and customize their tour and provide effective cues to guide them through their navigation, interpretation and interaction process. Interactive exhibits should be developed in accordance with the 5 usability traits of UX design: effectiveness, efficiency, engagement, error tolerance and ease of learning. <i>Offer immersive & interactive virtual experiences:</i> employ the affordances of VR technology to create a sense of embodiment and enhance the perception of the subject matter.</p>
VR experience	<p>Use cinematographic and storytelling techniques to enhance the engagement, sense of presence and interpretation process. Evaluate the project on the basis of the 5 usability traits: effectiveness, efficiency, engagement, error tolerance and ease of learning. While immersed the user should be provided with sufficient cues that will guide her/him through the goal, task, navigation and interaction performance.</p>

RELEVANCY

Relevancy	A. Start with the Whys	
	Museum experience	Acquire a concrete understanding of the visitors' needs, feelings and thoughts (empathize and get feedback) and adjust the exhibition design accordingly. Form a solid idea of the purpose of each activity, identify a core value and communicate it in a clear and simple way, so as the visitors can relate and get involved.
	VR experience	During the concept stage of the design, the developers should empathize with the end-users by identifying problematic design choices prior to the development stage and core values the visitors would relate to. There must be also a prototype testing stage with actual end-users (museum visitors) to make sure that the final design offers an experience that is pleasant, easy to use and meaningful.
	B. Responsiveness	
	Museum experience	The visitors' contribution to the meaning-making should be a two-way process. The museum should ensure that their input during participatory, interactive or co-creation activities is additive to the interpretation, it is utilized and treated as worthwhile.
	VR experience	In interactive experiences, an action has to be followed by an immediate consequence that affects the content/narrative according to real-world physics. In addition, the user must be provided with sufficient cues (e.g. highlighted object after selection) in order to have constant feedback from the system and do not lose the sense of control.
	C. Target "communities"	
	Museum experience	An exhibition can become relevant to more people, especially the locals and the non-visitors when it targets groups with the same characteristics. By getting feedback from their representatives, or the members of such groups and even incorporating them in the exhibition design, the exhibition will create an emotional and active connection between those people with the past.
	D. Accessibility	
	Museum experience	Factors that can be obstacles for an inclusive experience should be taken into account: disabilities, language, age, personal budget, educational background etc. Ease of use regarding the technology and interaction with the exhibits should be provided for all audiences.

	VR experience	Familiarity with the technology must be considered as a factor that could exclude specific groups from the experience, thus the technology must be discreet and the interactions intuitive, easy to learn and the error occurrence and impact should be minimum. The requirement for physical movement should be kept to meaningful levels to avoid fatigue especially for the elderly. Language and literacy should also be considered.
	E. Participation and Sharing	
	Museum experience	Allow visitors to contribute their thoughts, perspectives and personal expression with a focus on the content. Facilitate the creation of discussions during the experience through multi-user, multimodal and complementary-content exhibits and activities. Employ the use of social media to extend the experience outside the museum. Provide them chances to take tangible elements of the experience back home and to distribute their own contributions.
	VR experience	Allow the users to have different degrees of control over the narrative, flow and interactions so as to participate actively in the meaning-making process. Enable co-visitors to enjoy the experience together, record and share it through social media.

CHANGE

Change	A. A Forum for dialogue and receptiveness	
	Museum experience	Invite the public into discussions and activities around the museum's offer and the ways it renders the past relevant in today's society and in their lives. Motivate the public to explore connections through the exhibitions between the past and the contemporary issues the world faces, in order to raise awareness and render the institution as an active and empathetic organization in the service of the modern everyday people. Incorporate recent advancements (technological, scientific, theoretical etc.), in order to update the institution's methods and tools and benefit the public.
	B. A transformative experience	
	Museum experience	The effective implementation of the guidelines proposed by this framework will result in a constructive change of the individual's inner world, with the potentiality to spread in the society, thus, realizing the institution's ultimate mission.
	VR experience	The role of emotions, storytelling, interactivity and embodiment are crucial to the learning and perception process and result in memorable and engaging experiences. In combination with content and ideas that the visitors can relate to, become inspired and motivated, a positive change can occur.

C. Evaluation	
Museum experience	The museum should evaluate the effectiveness of their exhibitions on the basis of Authenticity, Engagement, Relevancy and Change, by examining, through qualitative and quantitative ways, the overall visitor experience. This is especially important for prototype exhibitions which aim to set standards in the use of new technologies and approaches. The results of such evaluations should be published for the improvement of other endeavours of this kind.
VR experience	VR experiences should be evaluated on the basis of the 5 usability traits of UX design: effectiveness, efficiency, engagement, error tolerance and ease of learning. They should also be evaluated in terms of achieving high levels of cultural presence and in conjunction with the rest of the museum experience, for example, whether they are organically linked to the rest of the experience, whether they facilitate the perception and learning outcomes of the exhibition etc.

CONCLUSION

All the key-elements which were identified by this thesis as constituents of a meaningful (virtual) museum experience, were incorporated into a visitor-centered Framework, while the museum and the VR technology were equally considered. At the same time, specified guidelines were created with the aim to prevent or resolve problems of a specific nature, which were spotted throughout the thesis research.

6. Case Studies

THE EVOLUTION OF VIRTUAL HERITAGE PROJECTS

In connection with the previous chapter, the established VR research firm Gartner Inc. published a report in 2008, which concluded that nine out of ten VR projects fail within 18 months. Focusing on the technology rather than on the users is the reason behind it, according to the analysts. As Steve Prentice, vice president of Gartner Inc., states: *“...the transition from web pages to web places and a successful virtual presence starts with people, not physics”* (Gartner Inc., 2008)

The report also highlighted that the quality of the graphics and the naturalistic interaction are not enough if the presence is not engaging and adds value to the users. The lack of clear objectives and the poor understanding of the audience’s needs, behaviour and characteristics lead to failure.

Maurizio Forte, expert in Virtual Archaeology who contributed in award-winning projects for e-content, pinpoints that most of the virtual archaeology projects do not actually communicate the archaeological research and interpretation of the data and context, rather they are technological exercises which focus on presenting the final image of the subject-matter. According to Forte, that means that a whole range of information which contributes to the final picture is not communicated in the virtual projects for archaeology. Also, there is no transparency of the data, so people cannot identify what is based on assumptions and

what is certain, or whether there are alternative interpretations. In other cases, the incorrect scaling and reconstruction of building phases, along with the lack of proper navigational and hypermedia tools and cognitive maps, have actually led to confusion and a decrease of the user's perception of the subject-matter (Forte 2000, 247 ff).

During the '90s 3D visualizations in cultural heritage were discussed on the basis of methodological and theoretical issues. At the beginning of the 21st century, the focus shifted on the exploration of best practices, while today the use of 3D visualizations is well-established and it resulted in interdisciplinary collaborations aiming at the creation of appropriate platforms for research and dissemination. Immersive, collaborative and interactive virtual environments followed, namely large-scale displays such as Powerwall, Cave systems and 360° 3D panoramic spaces. (Galeazzi & Di Giuseppantonio Di Franco 2017, "Introduction").

The earliest example of virtual heritage in a museum is known to be a 3D reconstruction of the Dudley Castle (1994, British Museum), designed by Colin Johnson and named "Virtual Tour", where the user could navigate the screen mounted display by pressing buttons. The first augmented reality example was created in 1996 by the University of Columbia's Computer Graphics and User Interfaces Lab under Steven K. Feiner, where a 3D model of the Bloomingdale Asylum was projected on the physical landscape through head-worn see-through equipment, connected to a computer carried as a backpack. A step forward to the virtual reality development was made with the creation of the VRML file format, which allowed virtual reality models to be web-based and platform independent (Champion 2013, 270 f). The reconstruction of Aztec city Tenochtitlán (1996) was a showcase of this development and other models of Mesoamerican cities followed, characterized though, by crucial omissions from the archaeological perspective. As Champion notes (2015, 44), the scale, mass, orientation and spatial relationships of the buildings could not be perceived by the users because the models did not convey a sense of place and embodiment. The users could rotate the models and remove some parts to see how the buildings were built. But, the absence of the culture's landscape and sociocultural context was making it impossible to perceive how life was affected and regulated by the spatial structure and relationships of both the physical and artificial environment. Champion strongly suggests using the multi-user capabilities of the technology regarding the exploration, solving of puzzles and performing tasks, as it will make the experience more engaging and may improve the users' ability to reflect and recall (Champion 2015, 45 f). The 2005 recreation of the Mayan site was an improved game-based, wall-projected version, developed in a powerful game engine, where the users could navigate through joysticks and physical movement in a three-dimensional space. Champion highlights the higher level of perception that people acquire through the embodiment and the large three-dimensional space. However, he noticed that incorporating intangible elements like sounds, rituals and other elements based on assumptions or elusive ideas, creates problems in separating facts from hypotheses, in providing appropriate interaction methods and conveying unfamiliar belief systems in a conceivable way for the contemporary audience (Champion 2015, 46 f).

Started in 2008 the Western Han Dynasty Virtual Museum (Galeazzi & Di Giuseppantonio Di Franco, 2017, "Case Study 1. Western Han Dynasty Virtual Museum") was a state of the art project resulting in a Powerwall display, a 360° 3D panoramic space and a 3D real-time environment. It was the outcome of a collaboration between the Xi'an Jiaotong University, the University of California-Merced and the Italian National Research Council (CNR-ITABC). As the authors note, despite those immersive systems' effectiveness, they are rarely

used in museums due to their cost, technical support and infrastructure requirements. The first one was a high resolution, large-scale display on a wall, of a 3D Han Dynasty tomb reconstruction. A full-body tracking system allowed the user to immerse and interact with a cybermap which was overlapping the 3D model and highlighting important details and spatio-semantic relationships of the paintings. The cybermap helped in navigation and narrative understanding by organizing the tour with an appropriate sequence of interactions and selection of paths. More than that, by revealing the spatial relationships of the paintings and other semantics, it made it possible to communicate intangible aspects of the monument and its culture. The second installation, a 360° visualization and interaction environment (AVIE), was composed by a cylindrical projection screen which surrounded the user, unlike the Powerwall where the user was standing in front of a flat screen, but less immersive than a CAVE system, where the ceiling and floor would have been also simulated. As the authors note, AVIE allowed for an improved feeling of immersion and along with the use of a movement-tracking camera, the user could navigate the tomb. The cybermap was used here as well, but an additional system, the object viewer (OV) was added. This allowed the user to manipulate the artefacts, change their scale and examine them through their mesh. The third outcome was a 3D real-time environment (tele-immersive) which allowed the simultaneous participation at the same virtual space of up to five remote users. It was made for scholars who could navigate and interact with the tomb and artefacts in the first-person mode while collaborating in real-time. Several research options were provided, such as the acquisition of the artefacts' metadata, repositioning, measurement etc., in order to facilitate the study and interpretation of the monument (Galeazzi & Di Giuseppantonio Di Franco, 2017, "Case Study 1. Western Han Dynasty Virtual Museum").

CONCLUSION

A brief presentation of the developmental course of VR projects in the heritage sector attempted to show their evolving form, equipment, features and potentials, along with the issues and deficiencies arose and the ways the next generation projects resolved them.

6.1 Framework - Cases of Excellence: Points of Convergence/Divergence

The present chapter is about evaluating, in a way, the Framework for a Meaningful (virtual) Museum Experience, through state-of-the-art projects that have been tested in the museum context. Evaluation, in this case, means finding elements in the projects which meet or contrast the Framework's principles and guidelines, or even lack any of these. The end goal is to reach conclusions about whether the framework could have prevented important omissions if applied during their development. However, since the information acquired for these projects is not sufficient for a detailed and accurate review, we will restrict the examination to some basic observations.

ULLASTRET 250 B.C.

The Archaeological Museum of Catalonia in cooperation with the Catalan Agency for Cultural Heritage and the creative studio Burzon*Comenge, worked together in a project during

2015-2016, with the goal to virtually reconstruct the Iberian Iron Age town of Ullastret. The outcomes were an immersive room installed in the museum and a VR headset application which was not intended for museum use, but as a showcase to conferences. It was developed in accordance with the London Charter's principles. The enormous amount of information acquired from the site during the latest years, through the use of the latest technologies and methods for prospection survey, was the reason behind the idea to reconstruct the town. The team wanted the reconstruction to be a highly detailed simulation, characterized by great scientific rigour, thus, they decided to depict only the phase of the town which corresponds to the biggest quantity of data and archaeological knowledge (250 B.C.). Nevertheless, they still used comparative and theoretical models which could not be archaeologically verified (Sierra A. et al. 2017, "Ullastret, a 2,200-year-old Iberian Town" & "The process of virtual reconstruction").

The simulation included the reconstruction of the surrounding landscape and vegetation, the settlement's structure and buildings and the interior of the buildings with the culture's objects and furniture. The team included objects, such as shields, amphorae etc. which the visitors would encounter in the museum collection. For this project, video-game software was used: Cinema4D and 3D Studio Max for the landscape and the architectural features, Maya for texture and color, while all the models were imported into the Unreal Engine 4, in order to generate the greatest graphic realism (Sierra A. et al. 2017, "The process of virtual reconstruction").

The 3D reconstruction was turned into a six-minute, audio-visual storytelling projection on three walls in a small room (10m²) inside the museum. A number of visitors would stand in the middle of the room, surrounded by the synchronized projections on the three walls, while the floor was covered by a rubber which simulated the feeling of stepping on the town's pavements. The visualization was characterized by continuous camera movement having the visitor's position as a constant point of departure, so as to create the sense of first-person navigation. 3D high-quality sounds were coordinated with the camera movement so the visitors could identify their source. The navigation was following the narrator's journey, a member of the elite, as he was recalling events from his life and the town's history connected with spaces and objects depicted in the visualization (Sierra A. et al. 2017, "The outputs: Internet, immersive room, and virtual reality experience").

According to the developers, the reception of the immersive room was enthusiastic by people of diverse ages who most of them never tried a VR experience before. They note the virtual flight over the town and the incorporation of objects which are displayed in the museum as particularly impactful. They also mention that the experience was liberating for people with restricted mobility (Sierra A. et al. 2017, "Public Response").

COMPARISON WITH THE FRAMEWORK

A) **Authenticity**: Regarding the guidelines for aim A, "Authentic Experience", the project is linked to the museum objects and narrative but the users cannot participate in the narrative through embodiment and interaction which could have increased the sense of authenticity. However, the project meets the framework's guidelines since it is designed as a multi-user environment with minimum technological presence and in a separate room to avoid distractions. As for aim B, judging from the public's response it seems that the developers managed to control and meet their expectations. Concerning "Scientific Integrity", the

project was developed after a thorough archaeological investigation of the site and was depicting accurate data, although the developers had to rely on assumptions as well, as they admit. That of course, does not contradict scientific integrity since the goal was to present a generalized idea of the place and life there through narration.

B) **Engagement**: The project fulfils to some extent cognitive and aesthetic needs and allows social interaction but since there are no tasks and interaction for the visitors there is no sense of exploration, collaboration and discovery, control, autonomy and achievement. However, the developers enhanced the experience by creating a proper atmosphere in the room through sound, lighting and floor modifications and by focusing on storytelling and cinematographic techniques to convey a memorable narrative. The developers aimed at achieving immersion through the large-scale projection and the significant work in graphic realism, though the Framework views interaction and embodiment as crucial elements for an immersive experience.

C) **Relevancy**: According to aim A of the Framework a core value needs to be identified and communicated to the audience so they can relate to it. The team of Ullastret project decided to create a virtual simulation of the town as it was in 250 B.C. because they could achieve great scientific rigour. However, is scientific rigour a value the visitor will easily relate to? Maybe showing more phases of the town's development or the everyday life of different people would have been more meaningful to a visitor than an empty town of great realistic detail. More than that, why spend time and resources in a 3D reconstruction while a 2D movie could have had the same results? As we have seen in previous chapters, just adding the three-dimensional aspect, without accompanying features that would transform the perception and the interaction with the content, is not that useful. Furthermore, the visitor cannot contribute or actively participate in the whole experience and see how it is affected by them.

D) **Change**: The fact that the visitors made positive comments about their experience, should not define the evaluation of such projects since the vast majority of the visitors did not have prior examples for comparison and they judge based on the highly realistic graphics and the unusual, for a museum, storytelling elements. Hence, as the Framework suggests, the evaluation should be based on qualitative and quantitative research of the visitor's experience, using different methods, such as interviews, observation, questionnaires etc. More importantly, it should be evaluated in terms of achieving high levels of cultural presence and in conjunction with the rest of the museum experience.

Overall, the Ullastret 250 B.C. project belongs to the most commonly seen category of virtual heritage projects: a 3D visualization projected in large-scale dimensions, with little, if none, relation to virtual reality. The Virtual Multimodal Museum (ViMM), an EU funded organization which aims to establish best practices and standardization in the virtual cultural heritage sector, categorizes the Ullastret project as immersive² but there should be a distinction from projects where immersion is connected to embodiment which requires bodily, emotional and perceptual (inter)action with the virtual place.

THE VIRTUAL MUSEUM OF THE ANCIENT FLAMINIA / LIVIA'S VILLA RELOADED

This project was designed during 2006-2008, specifically for museum use and took place at the National Museum of Rome's Diocletian Baths. It was the result of a collaboration between the Italian National Council of Researches (CNR-ITABC) and the E.V.O.CA

² <https://www.vi-mm.eu/case-studies/>

company and it was awarded as a best practice example and recognized as the first multi-user virtual application for museum use. The vision was to reconstruct and communicate through virtual reality, both the in situ and the potential ancient landscape of Via Flaminia, the road connecting Rome with Rimini, including four sites of interest where Livia's Villa is the most important one. The purpose of such an attempt was to make an important heritage more accessible to the public, since it is an area away from the touristic routes, to communicate directly and effectively a huge amount of information which correspond to a range of archaeological phases and to reach new interpretations (Forte 2008, 1 f). Virtual reality was selected not just to reproduce reality but to enhance the real and "*join perception and interpretation*" by exploiting its unique affordances (Dell'Unto et. al. 2007, 2).

The whole endeavour was based on extensive prior archaeological research and interpretative work, which were sufficiently documented and published (Pescarin 2009, 45 ff). Thus, up to this point, the project is characterized by "scientific integrity" (Aim C - Authenticity), but since we have no access to the whole VR content and the research sources, it is impossible to assess whether the framework's guideline about the idealization of virtual characters or aspects of the culture, was in the minds of the developers. In contrast with other projects, here different reconstruction methodologies were used:

- *Virtual anastylosis*, where importance is given to visualize the form and spatial arrangement, the architecture of the existing remains, rather than texture, materials etc.
- *Holistic reconstruction*, where something is reconstructed as a whole, including architecture, materials, colour, texture, objects, furniture etc.
- *Evocative and hybrid models*: the first one refers to generic models created to depict a type, an approximation, usually because there are not enough data from fieldwork. The latter refers to a mixed visualization of the actual site/object as it is now and as it was in the past. The hypothesized parts were overlapping in a transparent view.
- *Landscape, organisms and behaviours*: The artificial environment were connected to its physical context (vegetation, soil, ground elevations etc.) which was reconstructed after in-depth research on historical maps, ancient and modern accounts, botanical and other relevant data extracted from fieldwork etc. Avatars and agents animated the virtual world through passive and active behaviour (Forte, 2008, 6).

A variety of communication and interaction techniques was employed, as well. The installation was placed in a VR room, separated from the areas where the original objects were displayed (aim A - Authenticity) and was comprised of four stands, each containing a screen and a joystick. The important question here is why is it characterized as a Virtual Reality experience when it was just a computer-based 3D experience? There was no eye-tracking technology, the essence of VR as we argued in a previous chapter. However, we need to note that this project was developed ten years ago when the understandings on Virtual Reality in the cultural heritage field were not mature. Each user could navigate the 3D reconstructed world in third-person mode, through an avatar of her/his choice and collaborate in real-time with the other users to discover the cultural content and create common narratives. Those narratives were then projected in a wall-mounted screen in front of the four stands, so other visitors who were sitting behind could watch through 3D glasses and in a way participate in the experience. Apart from the navigation, the users could interact with points of interest and other users or virtual agents (3D characters). The above characteristics correspond to important aims and guidelines which are being proposed by the Framework: responsiveness (Aim B - Relevancy), participation and sharing (Aim E -

Relevancy) and social interaction (Aim B - Engagement). In the first occasion, the interaction was initiating videos with a descriptive and more scientific style of narration, while when meeting an agent an emotional narration was initiated. Communication and interaction were particularly important to the project since they were employed to allow perception to access intangible, non-material aspects and inform the interpretation process. What is more, the users could explore the world in two different levels of detail, the navigation into the whole territory (20x40 km) and into the sites of archaeological interest which were reconstructed with more details and in high-resolution (Pescarin 2009, p.107 f & 186 ff; Dell'Unto et. al. 2007, 1 ff).

The important part of this project is that, unlike other projects, here the important elements of co-creation, coexistence and collaboration, have been employed. However, providing the option of free navigation without sufficient cues and guidance results in fatigue, disorientation and loss of interest, as we saw in a previous chapter (Aim D – Engagement). The project, providing the option to choose between four avatars³, both female and male with diverse facial and racial characteristics, probably enhanced the engagement (Aim C). However, the avatars had athletic bodies in tight futuristic costumes that resembled more action-game characters than visitors of an ancient site. It is possible this detail could have caused a conflict (Aim C – Engagement).

The developers of this project did not fall into the trap of providing excellent graphic detail as a means to engage the users, rather, they focused on how the users could be engaged through interactions, content and storytelling, with focus on enhancing the perception process. However, it is unlikely that the developers evaluated the project according to the five usability traits of the UX design methodology, as it is proposed in the Framework. If they have done so, the issues described below would not have occurred. It is noteworthy that all of the issues are linked to the principles of Relevancy and Engagement. So, after almost four years of employment by the museum, the problems that came to the museum's staff and the developers' attention were:

- a need to make the experience available in more languages than just Italian (divergence from aim D - Relevancy).
- a need for better management of the user's time since the option of free, limitless navigation was not suitable in the museum context (divergence from aim A – Relevancy, Aim D-Engagement).
- a need for a better means of interaction, since several visitors found the joystick to be not familiar and easy to use (divergence from aims A & D - Relevancy).
- A need for less involvement of the museum staff concerning the start and end of the equipment's operation (automation)(divergence from aim D - Engagement).

(Galeazzi & Di Giuseppantonio Di Franco 2017, "Case Study 2. The virtual museum of the Ancient Flaminia").

An improved version of the above project was developed in 2014, titled *Livia's Villa Reloaded*, aiming to resolve those issues and focus this time only on the Villa. It took place at the same VR room, using existing 3D models, narratives, graphic interfaces and research sources, but with some enhancements. A major difference was that it was re-designed as a single-user VR environment, where storytelling, multi-sensory, emotional and perceptive aspects played a bigger role in the experience. What is more, the use of Unity 3 platform

³ <https://www.youtube.com/watch?v=krmH8H9I-tc>

changed the interactions drastically, as it enabled the users to use simple body gestures and steps, instead of the joystick. This change aimed at improving the visitor's experience by minimizing technological mediation and reach a wider audience by offering natural and intuitive interaction with the content. Improvements in lighting and rendering of the models resulted in a more reminiscent atmosphere, while avatars of real actors represented original characters of the site and acted as tour guides and narrators. Cinematographic techniques were employed to make the experience more attractive and effective as a learning environment, especially with regards to the limited time the visitors should spend at the VR room. The project was designed in accordance with the London Charter and Seville Principles and is recognized as an example of best practice, regarding the re-use of existing data and the integration of different media (Galeazzi & Di Giuseppantonio Di Franco 2017, "Case Study 2. The virtual museum of the Ancient Flaminia"; Pietroni et. al. 2015, 511-518).

THE "KEYS TO ROME" EXHIBITION

This project was a showcase of how best practices of the new technologies can transform the museum experience in the future and it was organized by the V-must European network of excellence on Virtual Museums and the Italian National Council of Researches (CNR). It was developed within four years of cooperation between more than fifty professionals of different expertise, and took place in 2014, in four museums of four different countries, at the same time: Italy (Rome), the Netherlands (Amsterdam), Serbia (Sarajevo) and Egypt (Alexandria) (Pescarin et. al. 2014, 1 ff). The idea behind this endeavor was to show how thematic exhibitions can be derived from permanent collections, having a narrative approach and it was theoretically articulated by a V-MUST project which aimed at incorporating the virtual museum into the museum's physical space. The main subject was the Augustan Age and selected objects from the permanent collections of all four museums were made virtually accessible to all the visitors of the shared exhibition (Pescarin et. al. 2014, 7 f). Storytelling, interaction, exploration, multi-modality, multi-sensory and affect-based elements were the pillars around which the exhibition was developed. The title and introductory narrative were inspired by a roman key which is part of the Sarajevo's museum collection. According to the fictional story which informs the visitor about the subject-matter and transforms her/his visit into a guided task, an old merchant gives four keys to his grandson and invites him to open the chests, which are treasured in the family's storage room, and to discover, through the objects, the story of his family and of the entire Roman culture. The characters of this story act as narrators and guides throughout the museum visit and they are first introduced through a video made of 3D graphics and animation, the moment a visitor enters the museum (Pescarin et. al. 2014, 1f & 9).

The following step was to download a mobile application (Matrix) and choose one of the characters to help them find the physical objects in the museum. Once a user found one, the application provided detailed auditory information through a character's narration and created a connection with the objects located at the other three museums. The stories were available in five languages. The busts of Livia and Agrippa, Augustus' second wife and faithful lieutenant, narrate through the app the story of Augustus from two different perspectives: his personal and family life and his achievements and strategies that changed Rome (Pescarin et. al. 2014, 9 & 166 & 171). Further on, the visitor would walk on a digital map projected on the floor, which was showing a satellite image of an area in Rome, where important monuments of the Augustus era were highlighted. The visitor could use one of the installed monitors to watch short videos with historical images and virtual reconstructions of

the monuments, connecting thus, the past and the present in one place. In Amsterdam's museum RFid(Radio Frequency Identification) technology was employed to provide personalized itineraries which corresponded to three different perspectives: the Egyptian, Roman/italic and Lowland perspective. A visitor could use her/his chosen RFid key-card to have access to the specific content once she/he encountered a technological installation (Pescarin et. al. 2014, 169 ff). Two 3D printed objects, Augustus' statue and Ara Pacis, an important monument, were turned into interactive storytelling devices through the Virtex technology. A sensor inside the object would interact with the user's touch on eleven points of the surface and would initiate audio and video narrations at a nearby screen. Further, the "revealing flashlight" was comprised of a sensor and a micro-projector inside the exhibition case which enabled the users to use their finger and its movement as a flashlight so as to project augmented images on the surface of the exhibit. In Rome's museum, the exhibit was a marble slab with traces of painted decoration, where the user could project the reconstructed colourful decorative motives (Pescarin et. al. 2014, 175 ff). What is more, the AR-tifact system uses augmented reality to virtually project the missing context of an exhibited fragment and in this case, the fragment was part of a statue of Mars and Venus. The user by holding an iPad in front of the fragment would project the reconstruction of the whole statue, with the fragment accurately positioned on it. Finally, Admotum is an interactive VR installation developed with a serious game approach. It consisted of a big screen with a natural interaction system, connected to the Holobox, an installation that looked like an exhibition case, where the user could manipulate high-resolution holograms. The user was interacting with the content through hand gestures and the task was to find specific objects in the reconstructed ancient environments and send them to the Holobox. There, the same user or her/his companion could rotate and change the scale of the holographic objects through hand gestures. The available scenarios were four, each linked to one of the exhibition's cities and monuments: Rome, Amsterdam, Sarajevo and Alexandria (Pescarin et. al. 2014, 183 ff).

Overall, it can be said that the "Keys to Rome" was an impressive concept, as it aimed to organically combine a diverse range of exhibits, content, narratives, technologies and interactions. Virtual reality and all other technologies were used meaningfully for their unique affordances and in a complementary way to the rest of the experience. Everything was developed with a focus on enhancing the visitor's perception process, minimizing the learning and interaction effort and facilitating their trajectories and selective process. Auditory, haptic and sensory-motor stimuli enriched the experience and contributed to a more balanced use of the senses. Personalization options were meaningful as they were used to actually enhance authenticity, by selecting between cross-cultural perspectives, for example, the Egyptian themes (RFid), or the objects and stories of the Sarajevo museum (Matrix app). Multimodality (walking map, AR-tifact, revealing flashlight) and exhibits with complementary content (Admotum-Holobox, Matrix app) instigated and facilitated socialization and cooperation around the content. The narratives and characters were diverse, lively and engaging.

Judging on the basis of the available information it can be concluded that the Keys to Rome project is generally in convergence with the Framework's principles. However, did everything work as it was intended to? Was the employment of so many new technologies overwhelming for the visitors? Did the visitors concentrate on the content or the way the content was presented to them? Was the interchange between so many narratives, information and media as smooth as it is implied or did it result in frustration and overload? Which of these

techniques and equipment could be used regularly in a museum, without increasing the costs? Since Keys to Rome was a prototype exhibition for others to follow, its results concerning the overall visitor's experience must have been examined in detail and published (if not already) so as to inform the developers of other ongoing or future projects.

CONCLUSION

The above case-studies were selected on the basis of their different characteristics, to show the range of form and capabilities of the virtual heritage projects. Starting from the simplest and most common one, Ullastret 250 B.C., a wall-mounted, animated 3D visualization and continuing with the Ancient Flaminia/Livia's Villa, a 3D computer-based and interactive experience that made use important affordances, we ended up with the most complicated project, the Keys to Rome, which managed to incorporate in the exhibition context, all the new technologies a museum can use. An interesting point is that Ullastret, Virtual Flaminia and Livia's Villa Reloaded, all were based on the London Charter, but they were all developed very differently, with different approaches and results. Thus, it becomes evident that there is a need for more concrete guidelines which focus on specific problematic areas. Moreover, this review of the projects highlighted the importance of incorporating the user's perspective and empathizing with them prior to make decisions on the design of their experience. In addition, it must be noted that these projects were developed in a time where the understandings on immersion were not as evolved as they are today. Finally, this chapter illustrated how the potential application of the Framework could have had prevented problems and omissions.

7. Discussion

In the following chapters, the main outcomes of this dissertation are being discussed in conjunction with the research problem (How can a virtual experience be meaningful for the visitor, the museum and the VR technology itself?), the research questions/objectives and the studies of other researchers. The reasoning that led to the following proposals and conclusions is being explained, along with their implications and potential contribution to the field.

7.1 A Reframed Museum definition (Research Objective 1)

Since one part of the research problem was to investigate how a VR experience can be meaningful to the museum, several preceding questions had to be answered: why are museums interested in virtual reality, what a museum is today and what transformations is it going through? In the quest of answering this question the author encountered a number of socio-economic and technological developments, which have been identified by other researchers (see Meijer et al. 2010, Freeman et al. 2016, Ambrose & Crispin 2012, Davis 2016, Smeds 2016, Harris 2016, Simon N. 2011, Janes 2009, Anderson 2004, MacArthur 2011, Roberts 1997) as factors contributing to the ongoing museum transformation, which is

described by the scholars as an “experiential” or “visitor-centered” shift. As a result of these impacts, an increasing number of museum professionals are becoming interested in a more active role for the visitors, willing to ask for their feedback and their participation in the meaning-making process. They are also curious to get to know them better, explore their identities, needs and interests, so the museum can facilitate and optimize their experience. Several researchers have contributed important insights regarding the nature of the museum experience and its multiple dimensions: the *turn to affect*, the *dialogic museum*, the *mindful museum*, the *participatory museum*, are some of the inspiring attempts to re-conceptualize what a museum ought to be in the present and the future world (see chapter 2&2.2)(see Falk 2016, Weiser 2016, Smeds 2016, Harris 2016, Simon 2011, Roberts 1997, Janes 2009, Skramstad 1999, Soares 2016, Rechená 2016).

Thus, museums are interested in the new technologies (mobile devices, interactive interfaces) and the VR technology in particular, because they are great tools towards the above aspirations, since they can significantly improve the navigational and selective process of the visitation, the interpretation and learning outcomes, the feelings involved in the experience and the social aspects of it. The affordances of VR technology, Immersion and Presence being the most definitive ones, have the ability to fulfil all the above at the same time, if properly implemented (see chapters 2, 3, 3.1) (Bandelli 2010, Galani & Chalmers 2010, Gamor 2014).

From the above understandings, it became obvious that a re-negotiation of the museum’s identity itself is currently on the table. However, this empathetic and inclusive attitude and all the above changes of perspective, have not yet become the rule. In fact, they encounter rigid hesitation in their applicability, because museum professionals fear that the museum will lose its authority and quality due to the visitor’s empowerment and due to popularization and it will deviate from its superior goals (Dufresne-Tassé 2016, MacArthur 2011, Davis 2016).

Thus, it became necessary for the further development of this thesis to explore the evolutionary course of the museum, in order to identify the transformative processes it went through and to better understand its slow adaptability to changes. This attempt was realized through the study of articles written by museum pioneers in the course of eight decades (1917-2000)(see Dana 1917, Low 1942, Wittlin 1970, Cameron 1971, Weil 1990, Ames 1992, Roberts 1997 Skramstad 1999, Rand 2000) and the examination of the official museum definitions from the ‘50’s until the most recent one (ICOM 2007).

An unexpected finding derived from that study was that today’s needs and museum pursuits have been the same since those early years when the museum became a public institution: the need to be relevant towards their visitors and the wider society by offering engaging and meaningful for them experiences and the need to influence change for the betterment of society. In addition, through the review of the museum definitions, it was possible to identify key-changes in the institution’s identity, functions and purpose, but also to confirm that the museum is indeed receptive to changes (its definition is being updated almost every five to fifteen years).

The correlation of the above results with the previous ones revealed that the current official museum definition, established in 2007 by ICOM, does not reflect the developments and the visitor-centered shift which are transforming the today's museum.

This realization has led the author to propose a re-framed museum definition (the words in bold are the proposed changes) that would articulate more clearly the museum's mission, functions and aims as a solution to the ongoing identity crisis and the unresolved issues of relevancy and influence which block a decisive adoption of innovative ideas:

A museum is a non-profit, public institution which **protects, shares**, researches and communicates the tangible and intangible heritage of humanity and its environment by offering **engaging, relevant and authentic experiences, for the purpose of inspiring individual and community reflection, dialogue and change**.

The reasoning behind the proposed reformation of the official definition was analyzed in chapter 2.2. In the following chapter it becomes even more apparent how the updated museum definition contributes to the resolution of the research problem.

7.2 The Constituents of a Meaningful (Virtual) Museum Experience (Research Question 2)

The four principles described above (authenticity, engagement, relevancy and change), are also fundamental elements of the meaning-making process. Perceiving something as authentic or not changes how people process the information and their feelings about it, as we have seen in chapter 2.2. Authenticity renders something as trustful, thus it signals that people should spend time, money or effort on it. It also creates a connection, a relationship and this feeling will inform future expectations and behaviour on the subject. Similarly, an engaging and relevant experience entails investing more time and attention, but also the thoughts and feelings which are shaping the meaning-making process are surely different than those involved in the opposite situation. Regarding Change, it is related to the situation where a visitor undergoes the impact of an experience. That means she/he has absorbed elements which were then processed, consciously or unconsciously, and resulted in something new: a different perception of a topic or the realization of a new dimension, a shift of emotions about something etc. In such an occasion the meaning-making process becomes personal, active and transformative. To sum up, a meaningful (virtual) museum experience is constructed by authenticity, engagement, relevancy and change, which are fundamental elements of the meaning-making process. The second research question is also answered by these results (What principles constitute an optimal framework for the creation of virtual experiences, compatible with the museum context?).

7.3 A Need to Reframe Immersion in the Cultural Heritage Sector (Research Question 3)

The present research brought to light a problematic area in the virtual heritage sector, which is due to the distorted reception of virtual reality in this area of studies. As we have seen in chapter 3, virtual reality cannot exist without the eye-tracking element since the novelty of this technology is the simulation of the real-life process of perception through visual input. (Bryson 2013). However, in the cultural heritage sector, most of the projects called virtual or

immersive have little to do with the actual virtual technology and its affordances. As a result, “virtual experience” in the heritage sector has become an umbrella term which includes a wide range of formats and technologies, even 2D (Champion 2014, also see chapter 6.1). Champion, though, is not critical about that, on the contrary, he defended this situation on the grounds that the eye-tracking technology is not important because “cultural presence” is what concerns the heritage sector, meaning that Presence should be the means to the end-goal which is cultural learning (Champion 2014, Pujol & Champion 2011).

Based on the findings derived from computer science, philosophy, neuroscience and VR design we argued for the equal treatment of Presence and cultural content since in a VR experience they are interrelated and interdependent. Specifically, in Chapter 3, we clarified that Presence refers not only to the sense of “being there”, but also to the “plausibility” of what happens there, which is directly connected to the content. This second part of the Presence definition is often disregarded in the cultural heritage sector, resulting in projects with a weak connection between content and spatial presence. In Chapter 5, by presenting Witmer & Singer’s results on Presence and in conjunction with contemporary VR design insights, we made apparent this relationship and highlighted important guidelines for an optimal design.

In chapter 5, where a review of the established Frameworks was conducted, it was highlighted that they are insufficient to deal with virtual reality projects since its character, features and capabilities have not yet been approached as distinct from the wide category of computer-based projects. The consequences from a lack of framework with guidelines specific to VR projects were also highlighted in chapter 6.1, through the review of state-of-the-art projects.

From all the above, it was concluded that there is a need to reframe immersion and virtual reality in the cultural heritage sector and construct a VR specific framework. At the same time, the above results answer the third research question of the thesis (How the immersive process of meaning-making benefits archaeology and the museums?)

7.4 Conclusions about the Ethical Concerns Related To Virtual Reality (Research Objective 3)

One objective of the present research was to examine whether the existing ethical theories could apply to this new technology, or if there is a need for a new ethical framework. Through the study of other researcher’s work (see chapter 4), it became obvious that there is a dispute concerning the ethical nature of people’s behaviour in a virtual environment. The dualistic perspective supports that the virtual world is separated from the physical one which entails a separation of the user’s identity and thus, of moral responsibility. On the other hand, the phenomenological perspective supports that virtual reality is inseparable from the physical reality and that the impact of virtual behaviour can be extended to the physical world. Thus, according to the first, there is no need for ethical concerns, while according to the latter, the ethical theories which regulate the physical world, especially Kantian and phenomenological ethics, should be applied to the virtual worlds as well (Ess 2013, Brey 1999, Madary & Metzinger 2016, Lastowka 2013).

Already in chapter 3, in the quest of defining the nature of virtual reality worlds through the computer science, philosophy and neuroscience (Massumi 2013, Bittarello 2013, Brey 2014, Boellstorff 2013, Riva & Waterworth 2013), we reached to conclusions supporting the phenomenological perspective. Through additional research in chapter 4, especially through examples from VR experiments and the video-game research (Madary & Metzinger 2016, Ess 2013) and through the new understandings gained from neuroscience regarding the function of the brain (Bryan & Gibb 2011, Van de Werff 2018), it was confirmed that the Kantian ethics and the phenomenological perspective are sufficient to deal with the subject-matter.

7.5 The UX Design Approach Should Become A Standard Museum Tool (Research Question 1)

During the present research, it was observed that the UX design approach has begun to reluctantly infiltrate the museum domain. In the work of Roppola (2012) the user experience design methodology was employed to create a commonly understood (among the different professionals) structure of the visitor's museum experience and in the work of Pagano et al. (2012 and 2013) it was used for the evaluation of virtual heritage projects. Skramstad (1999) has noted the need for incorporating experience designers in the museum. What is even more indicative of this development though, is the incorporation of a session titled "*User Experience Design in Archaeology & Cultural Heritage*", in the CAA International Conference (Krakow, 2019). Since this methodology was derived from the field of designing digital products, this development is surely one of the positive outcomes from the collaboration of the museum with computer scientists and designers on digital projects.

Chapter 5.1 is an attempt to highlight the shared values and perspectives between the UX design and the museum, while identifying in which aspects this approach can benefit the museum. The experiential shift of our era is their common basis, while the interest towards the users/visitors is the point of departure for both the work of designers and museum professionals. However, what the UX design can teach the museum professionals is that the nature of this interest towards the visitors should be empathetic. Empathy is a key concept of this approach and it means, to approach in a personal way, ask questions, engage in dialogue, observe, listen and customize your work so as to reflect an understanding for their feelings, thoughts and needs. So far, as we have seen throughout this research, museum professionals do not really empathize their visitors, rather they have a detached approach, studying them through superficial surveys, basing their work on assumptions about them, or struggling to interpret the results from the visitor studies into concrete solutions for the visitors. The UX design methodology comes with a number of techniques for conducting user research (which are briefly described in the chapter), while its methodology ("design thinking process") provides the way to translate the results from the user research to concrete design solutions for their best experience. Furthermore, in our quest to explore what constitutes a meaningful (virtual) museum experience, chapter 5.1 added the insights from the UX design field, widening thus our understanding of how meaningful experiences can be achieved: by taking into account the seven factors which influence the user's experience and the five traits which define the usability of a product/service, museum professionals will know where to look when the outcomes are not as expected. That is particularly useful concerning the VR experiences, the interactive exhibits and other uses of digital technology in the museum. Thus, UX design methodology offers also a very effective evaluation framework. Overall, the above results answer the first research question (How can

we evaluate the visitor's experience in terms of their participation in the creation of meaning?)

7.6 A Need for a Visitor-Centered Framework Which Incorporates Virtual Reality in the Museum Context (Research Objective 2)

The review of the three most commonly used frameworks in the cultural heritage field (chapter 5), revealed a gap in providing meaningful guidelines for virtual reality projects, but also their weakness in incorporating the visitor's needs and perspective. The principles based on which these frameworks were developed, hugely reflect the interests and needs of the cultural heritage professionals. Thus, since through the present research we identified four principles which reflect both the museum's and the visitor's needs and which are also relevant to the VR technology, it was a natural step to attempt the creation of a more appropriate framework (developed in chapter 5.2). Moreover, all the important insights gained from the present research were used to create the guidelines.

Each Principle (Authenticity, Engagement, Relevancy, Change), is broken down to aims which in turn are followed by guidelines that correspond to the broader museum experience and the virtual reality experiences. By putting three very different worlds together (the visitors, the museum and the VR experience) and connecting them on the basis of the four common principles, it enabled us to merge different needs and perspectives under a single framework and create guidelines tailor-made for each category. More specifically:

In order to achieve Authenticity, it is proposed to target at three specific aims, authentic experience (A), the meeting of expectations and entering motivations (B) and scientific integrity (C).

Engagement could be achieved by fulfilling four aims: the attendance of psychological needs (A), the promotion of social interaction (B), personalization (C) and the enhancement of experience (D).

Relevancy can be achieved through five distinct aims: starting with the Whys (A), being responsive (B), targeting to "communities" (C), being accessible (D), allow participation and sharing (E).

Change could be achieved by aiming at rendering the museum a forum for dialogue and receptiveness (A), a transformative experience (B) and by systematically evaluating its work (C).

8. Limitations and Future Studies

The present research started with the intention to gain in-depth knowledge on the user's experience of the virtual heritage projects by conducting interviews with the developers of these projects and researching the user's descriptions and perspectives. However, it was soon realized that such an attempt would not be possible due to a master's program time limitations. More than that, it would require the developers' compliance to share information

which is not yet published or even processed and studied. In addition, a sufficient amount of visitor's comments, interviews and footage from their experience, as well as a specialized approach for the interpretation of these data, would be required. But most importantly, such an attempt would not be meaningful if it was not based on thorough theoretical research and informed by conclusions such as the ones derived from the present research. Thus, this dissertation could be the point of departure for a future research which will acquire qualitative and quantitative data from the stakeholders themselves, through surveys which will be designed upon the realizations and arguments developed in this thesis.

One more obstacle was the insufficient documentation and publication that characterizes the vast majority of the virtual heritage projects. Particularly absent is the information about the reception and impact of these projects, thus the evaluation through the end-users. What is more, the VR projects which actually were used in a museum context are very few. Thus, the selection of state-of-the-art projects for analysis in this thesis was dependent on the amount and quality of information which was accessible. As a result, some conclusions formed about these projects were not based on absolute certainty, while some questions remained unanswered.

Regarding the framework developed by the present research, it needs to be verified whether the proposed guidelines and aims will be endorsed by the museums and to what extent they would find them practical and applicable or even relevant. Consequently, a further step would be to test the framework in a real context in order to validate its effectiveness and refine it.

Finally, the UX design approach in the museums has just started to emerge, more as a concept and less as a methodology. The examples of its application in the heritage sector are very few and hard to identify since the sources are not explicit or detailed. The present thesis highlighted why and how this methodology can interpret the results from the visitor studies into concrete design solutions for the museums. Therefore, future research should be conducted on case studies which are developed using this approach and the consequent results should be studied.

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