TURUN YLIOPISTO

Virtual Reality in (Finnish and British) Museums:

A study into its use, role, effectiveness and potential

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Master's Thesis

European Heritage, Digital Media and the Information Society

School of History, Culture and Arts Studies

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This thesis studies the ways in which virtual reality (VR) is currently being used in museums, using select examples from Finland and the United Kingdom. It will illuminate the current uses of VR and how they got to this point; the effectiveness and potential of VR in a museum setting; as well as the role it has in museums. The use of VR in museums is a straightforward look into different ways museums have incorporated this new media technology - although the main focus is on experiences and exhibitions brought to audiences through VR headsets, as these are the most popular and talked-about examples, thus providing a good angle for research. On the other hand, 'effectiveness' and 'potential' are subjective concepts, but the chapters included will raise and attempt to answer questions on whether VR has affected the number of visitors or their experience in addition to the perspective from museum professionals, as well as whether it could be used in different or prominent ways to increase its value to museums. The final chapter relates to the larger question of what is the role of museums in a changing world and how VR fits into this.

The research methods used in this thesis are varied. In addition to academic sources, it consists of largely qualitative research in the form of first-hand observation, informal talks as well as lectures and seminars, a questionnaire and reviewing of documents and news related to the subject. This is partly due to the lack of available material since VR is still considered an emerging field, and partly because the nature of qualitative research seemed to suit the subject matter the best in order to get a more full picture. Therefore a lot of the material used is not from written sources. The approach is also from a micro level, as I use examples of the use of VR from Finnish and British museums to further understand the wider context and landscape - which hopefully provides new interpretations on the material available.

By looking at a subject that is still "new" such as VR, the hope is to offer new insight into how museums can utilise VR to its full potential so that it best serves them. There are always contrasting opinions, especially on new subject matter, but, for me, the conclusion to take is that VR can be an effective tool for museums even if it is not crucial - as long as they know how to use it, keeping content at the centre instead of the medium - and as it develops, we have not yet seen all it can do in a museum setting.

Key words: virtual reality, museum, heritage, new media technology.

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List of Abbreviations

3D - Three-dimensional

AI - Artificial Intelligence

AR - Augmented Reality

CAD - Computer-aided design

GIS - Geographic information systems

ICOM - International Council of Museums

IRL - “In Real Life”

MR - Mixed Reality

NHM - Natural History Museum, London

TBM - The British Museum

UK - United Kingdom

VR - Virtual Reality

V&A - Victoria and Albert Museum

I Introduction

1.1. Background

With the rapid advancement of technology and the increasing thirst for entertainment in everyday life, virtual reality (VR) has seen a general growth in popularity and also gained a footing in the museum and heritage sector. With museums and heritage sites striving to find new ways to reach audiences and to engage them, the role of new media technology has visibly increased and new innovations have been appearing in the sector steadily for the past 30 years. After the appearance of the first virtual tours of museums in the late 1990s, virtual tours and other forms of incorporation of technology have only evolved and become almost a staple in a museum setting.[1] The quality of these virtual tours has become better, the forms of audio-visual aids inside the museum have become more novel and realistic, and these new media technology innovations have given way to fully immersive augmented reality (AR) and VR experiences and exhibitions within museums, as well as the combination of these two, mixed reality (MR).

While a museum visit 25 or more years ago would have been informative and entertaining, it does appear that nowadays museums offer more to their visitors. What once was a mere broken artefact can now be reconstructed and virtually restored to its former glory, what once was a simple story or an intangible idea can now be transformed into a vivid virtual reality that can be experienced in a way that brings the past or other unreachable elements to the public. In one exhibition, seeing information, artefacts and video relating to Nebamun, an ancient Egyptian official, at the British Museum in itself is an experience. But an added interactive 3D animation of his tomb-chapel makes this experience more tangible and involves the visitor in a very different way, giving them an active role.[2] Thus, new technological additions to museums, such as the use of VR, are bringing new aspects to these institutions and in a way changing the nature of them. The use and the role of VR is becoming – or has become – something worth discussing, and will be analysed in the following chapters.

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[1] Colin Johnson, *Computer Visualisation of Dudley Castle c1550* <http://www.exrenda.com/dudley/dudley.htm> [accessed 11 November 2021].
[2] The British Museum, 'A 3D interactive animation of the tomb-chapel of Nebamun' <http://www.britishmuseum.org/visiting/galleries/ancient_egypt/room_61_tomb-chapel_nebamun/nebamun_animation.aspx> [accessed 15 November 2017].

The incorporation of technology since the early installments of sound, moving images, and the 90s virtual tours in museums and heritage sites has drastically progressed. With the developments in technology, the more crude graphics and sound effects have given way to quite realistic experiences: one noteworthy example being the partnership between the Natural History Museum, Alchemy VR and Sir David Attenborough, including projects such as David Attenborough's Great Barrier Reef in which visitors were able to take a tour of the coral reef in an almost life-like way with an expert.[3] Now, although there still is a fair amount of gimmicky audio-visual technology in use in museums, there is also an equal amount of possibilities and examples of good implementation of AR and VR, whether this be in the form of exhibitions, experiences, games, education programmes, touch screens or any number of ways. And especially the number of VR exhibitions and experiences seems to be on the rise. A number of these examples will be reviewed in the main chapters of this thesis, to get a better understanding of VR as a whole in museums.

VR in museums and elsewhere is often only discussed in terms of learning and education, which is why another perspective feels more than justified. By looking at the use, role, effectiveness and potential of VR mainly from the point of view of the museum, the material in this thesis paper should raise and answer some new questions relating to the matter.

1.2. Research Questions

Since its emerging prominence in today's world, in this thesis I intend to look into the use and the role of VR in museums in the current decades (2010-2020s). This main question in itself comprehends a plethora of sub-questions and avenues to explore. It starts with the process of how VR came to be a part of museums' repertoire, as discussed above and in more detail in the next chapter, continues with the uses of VR in today's museums, and finally concludes with what the ideal of the use of VR is, what is its future and whether or not these two meet – or have already met. Topics that will be touched upon include the effectiveness of the use of VR, its potential, and its role and impact in the museum sector.

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[3] Natural History Museum, 'Explore the Great Barrier Reef with Sir David Attenborough' (2015) <http://www.nhm.ac.uk/about-us/news/2015/november/explore-great-barrier-reef-sir-david-attenborough.html> [accessd 17 November 2017].

The different uses of VR, whether they be virtual tours, experience days, permanent exhibitions, will be illustrated via examples of how various museums in the United Kingdom (UK) and in Finland have incorporated the technology. The countries and museums have been selected based on access to their exhibitions and data as well as the degree of interest in the use of VR. I have chosen to limit my research to Finland and the UK partly due to my own background as a dual citizen which gains me understanding and access, and partly because they both have had good examples available. The chosen museums from these countries have also been selected due to access, interesting VR adaptations and the willingness of the institutions to collaborate. In addition, although the main objective is definitely not to compare these two countries or these museums directly with each other, by comparing museums of different sizes and resources it is effortless to see the importance of VR and the variety of it. Although the variety will be demonstrated, the main focus is on VR exhibitions and experiences that include the use of VR headsets since this is the most common and most talked-about form in the industry.

Talking about the 'effectiveness', the 'potential' and the 'role' of VR can all be seen as subjective concepts. Some of the issues concerning 'effectiveness' that will be looked into are whether or not the use of VR has increased the visitors in numbers, created more revenue, or resulted into positive feedback and whether it is overall an advancement to what the museum offers. Similarly, when looking into 'potential', I intend to find out what the ideal for the use of VR is conceived to be, especially on part of museum employees. As the field of VR is new and still in development, opinions on its ideals and potential vary and it is of interest to look into how it is expected and hoped to work today as well as to reach its potential in the future. Lastly, I ask what is the role and place of VR in museums? Whether museums are memory organisations with their main activities being collecting and preserving or if it is their position to also act as a place of entertainment and not merely education is a debate in which VR definitely plays a part.

Another essential element in the world of VR and museums is that of partnership which will also be explored below. Practically every VR component in museums owes its existence to a technology company getting involved in projects with museums. Partnerships with Google and Samsung are common but smaller technology companies are often included as well, and these collaborations seem to be beneficial to both parties.

1.3. Sources and methodology

Bearing in mind that VR, not unlike many other branches of new media technology, is a very contemporary concept, it does not come as a surprise that there is somewhat a lack of academic material to research. The research on this thesis began tentatively in 2016 and the increase in writing on the subject from then to now is already staggering. This novelty inevitably gives precedence to conducting this study into the subject, but also creates a challenge in finding relevant material that fully correlates to the topic of VR in museums specifically. As VR has been used in, for example, archaeology for a longer period of time than it has in museums, I have used examples and adapted research from the world of virtual archaeology (and other relevant disciplines) when it has felt appropriate. Thus, although more traditional academic material provides a backbone to this research, the focus is on different sources.

The websites of various museums, such as those of the British Museum and the Victoria and Albert Museum, have provided a wealth of information, not least because of their publication of the museums' own research.[4] In addition to the museums' websites, the Google Art Project, Google Arts & Culture, showcases some of the most exceptional and accessible examples of the museums' incorporation of VR.[5] Other websites and newspaper articles have similarly been of great importance, especially when looking into the reception of the use of VR and VR exhibitions in museums by the public. When talking with museum representatives, I have taken notes that act as source material and for the use of which I have acquired informed consent. Although the focus is more on the side of the museums, there is also material from an online questionnaire that illuminates the point of view and reception of VR by audiences.[6] The discussions as well as the participants to the questionnaire have been kept anonymous. All of this material, mainly to be found online, is instrumental in understanding the merging worlds of technology and the museum and heritage sector, in which the different uses of VR is a prime example. These primary sources illustrate the intention, research and production on part of the museums and technology companies, the

[4] The British Museum website <https://www.britishmuseum.org/> ; Victoria and Albert Museum website <https://www.vam.ac.uk/> [accessed 11 November 2021].
[5] Google Arts & Culture <https://artsandculture.google.com/> [accessed 11 November 2021].
[6] Appendix A.

impressions, experience and reception of the visitors or other outside parties, as well as how these two sides interact and intertwine with each other.

However, in this research qualitative research has been used to better understand and interpret the subject matter that is still largely unknown and incomplete. As such it relies heavily on data obtained by myself from first-hand observation, lectures and seminars, informal talks, questionnaires, documents and artefacts. Qualitative research is often used to create theories rather than to verify them, and hopefully the material presented in these pages offers some theories relating to the use and future of VR in museums.

Some observations and experiences mentioned below will be of a personal nature, and some from those around me as a person and as an academic. During my research I have attempted to visit most of the museums and exhibitions that are referred to, had discussions with or listened to museum professionals and staff, and evidently looked at and experienced the exhibitions or events available on any electronic device. Whenever this is the case, it will of course be stated and, although personal, these observations will be from academic and professional perspective, and therefore of as objective of a nature as is achievable.

The following chapters will include multiple examples of the use of VR in museums, but the museums that have received most attention are the V&A in London and the Helsinki City Museum and The National Museum of Finland, both in Helsinki - all of which have incorporated VR in their activities and all of which were helpful in responding and conversing with me. The approach used is somewhat similar to microhistory in that it allows to review social and societal effects in detail. Although I move on micro levels by looking at particular museums and their VR adaptations, the intention is to understand the wider context in the museum landscape through these examples and provide new interpretations on the material available.

II The current use of VR in museums

This chapter chronicles the use of "new" media leading up to VR and looks at the current ways it is used in museums. The emerging prominence of VR in today's world as well as the attempts to find new ways to reach audiences on part of museums have created new ways in which these two sides meet. As VR is still relatively new, there is not a plethora of examples from the beginning to now, but this chapter explores how much it has and continues to evolve.

The focus is on experiences and exhibitions provided through VR headsets, but I have attempted to introduce examples of the full spectrum of the uses of VR in museums. These include virtual tours, VR exhibitions and VR experience days, and virtual objects.

Some of the most notable usages of VR in museums have been VR experience days or exhibitions with very limited time and access, and usually in partnership with other (technology) companies. These partnerships will be discussed in subsection 2.6., including funding and resources. In its entirety this should provide a somewhat comprehensive understanding of what VR in museums looks like today.

2.1. The road to VR

Different media has always been used in museums and the use of new media in the museum and heritage sector is continuously growing. Virtual reality as a concept is not new either, although it has evolved. As museums are increasingly looking for new ways to engage, it is obvious they adapt new media and try new things. The attitude of the museum and heritage sector towards new technology is usually split in two: either curious to try new things or hesitant or reluctant, either because of doubts regarding their own ability to adapt and to understand new technology or because they see the role they occupy as "guardians of physical objects" that gives them pleasure, purpose, nobility and/or status as it is.[7] Regardless, museums have adapted and continue to adapt as the world changes and brings new ideas and media with it.

New technology is constantly replacing the old: smartphones replacing older mobile phones that replaced pagers; wifi replacing broadband connections that some see having replaced payphones or other means of communication.[8] The same applies to museums from

[7] Fiona Cameron and Lynda Kelly, ed,. *Hot Topics, Public Culture, Museums* (Newcastle-upon-Tyne: Cambridge Scholars, 2010), pp. xi-xii.
[8] Trevor J. Blank, *Folk Culture in the Digital Age: The Emergent Dynamics of Human Interaction* (Logan: Utah State University Press, 2012), p. 2.

the first incorporation of sound and moving images to other audio-visual technology to 90s virtual tours and the creation of websites or adding more things on them.[9] From touch screens (for information or other uses) to games and now finally to AR and VR and MR. If one does not replace the other, they at least coexist and bring new aspects to the museum. From going from institutions that simply display objects to providing different experiences through technology has been a real transformation, although it has happened within the span of decades and received a lot of criticism along the way. The required technology has evolved drastically to bring us to the 21st century. Photogrammetry from the 1970s and the early 1980s computer-aided design (CAD) tools finally brought as to the 1990s that added geographic information systems (GIS) and 3D scanners. These all and their growing availability provided the foundation for tools and technology that make digital capture technology, modelling as well as VR possible and suitable for museum-use.[10] In terms of 3D and virtual models and reconstructions it was also in the 80s when the first reconstructions of smaller objects were made and 90s when the software started slowly improving and models of whole buildings and sites became possible. These became more mainstream and made their way to the museums in the mid-90s.[11] The fact that only in 2006 3D scanning, that is relatively widely used today, was still considered a maturing technology indicates just how new all of this still remains.[12]

The concept of VR has existed for almost 100 years, but the meaning has not stayed the same as in 1938 when Antonin Artaud described the theatre as "la réalité virtuelle" - an illusion and a fiction.[13] The criticism against VR in museums often includes this; the theatrics of it and how it is not real. However, 'virtual' can mean many things: something "not physically present as such but made by software to appear to be so from the point of view of a program or user", something "that is a computerized or digitized simulation of something … established or conducted using computer technology rather than more traditional means" or

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[9] Elisa Giaccardi, *Heritage and social media: understanding heritage in a participatory culture* (Abingdon, Oxon: Routledge, 2012), p. 147.
[10] Yehuda Kalay, Thomas Kvan and Janice Affleck, *New heritage: new media and cultural heritage* (London; New York: Routledge, 2008), pp. 28-9.
[11] Donald H. Sanders, 'Virtual Heritage: Researching and Visualizing the Past in 3D', *Journal of Eastern Mediterranean archaeology & heritage studies* 2:1 (2014), 30-47.
[12] Emmanuel Baltsavias, et al., ed., *Recording, modeling and visualization of cultural heritage* (Leiden : Taylor & Francis, cop. 2006), p. 285.
[13] Dennis Moser, 'Understanding the Impact of the New Aesthetics and New Media Works on Future Curatorial Resource Responsibilities for Research Collections', *Art Documentation: Journal of the Art Libraries Society of North America,* 32:2 (2013), 186-201 (p. 193).

simply something that your senses relate "to essential, as opposed to physical or actual, existence" and if we understand 'reality' as "the quality of being real or having an actual existence", the difference between VR and "real" reality - although still existing - is less divisive: VR also has an actual existence even if it is not physical.[14] The phrase "virtual archaeology" was first introduced by Paul Reilly in 1990 to refer to the use of 3D computer models of archaeological sites and artefacts and this has been extended to VR, not as a generic blanket-term anymore, but to refer to environments where the operator is transferred into an interactive environment via devices that sense the actions of the operator which is basically the way that the Oxford English Dictionary describes virtual reality as and what is meant by VR in this thesis: "a computer-generated simulation of a lifelike environment that can be interacted with in a seemingly real or physical way by a person, esp. by means of responsive hardware such as a visor with screen or gloves with sensors; such environments or the associated technology as a medium of activity or field of study; cyberspace."[15]

Mere virtual tours have been a part of the museums' repertoire since the 1990s with the first virtual tour of and in a museum being that of Dudley Castle in 1994, represented as it would have been in 1550. This was an interactive virtual "walk-through" of a 3D reconstruction designed by engineer Colin Johnson. The project was opened and experienced by Queen Elizabeth II when she opened the Dudley Castle visitor centre, and the virtual tour stayed in play until 2005. Some have claimed that the term 'virtual tour' is because of this; a mix of 'virtual reality' and 'royal tour'.[16] Although, they have existed for three decades, these early virtual tours and hybrid systems were often quite crude, with low capability and high cost - this has been changing, but the nature of VR that differentiates it from other, more

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[14] Oxford English Dictionary, *Virtual* <https://www-oed-com.ezproxy.utu.fi/view/Entry/223829?redirectedFrom=virtual#eid> (2013) [accessed 13 November 2021]; Oxford English Dictionary, *Reality* <https://www-oed-com.ezproxy.utu.fi/view/Entry/158934?redirectedFrom=reality#eid> (2013) [accessed 13 November 2021].

[15] Juan A. Barceló, Maurizio Forte and Donald H. Sanders, ed., *Virtual reality in archaeology : Computer Applications and Quantitative Methods in Archaeology (CAA)* (Oxford : Publishers of British Archaeological Reports, 2000), p.3; Oxford English Dictionary, *Virtual Reality* <https://www-oed-com.ezproxy.utu.fi/view/Entry/328583?redirectedFrom=virtual+reality#eid> (2013) [accessed 13 November 2021].

[16] Colin Johnson, 'Computer Visualisation of Dudley Castle c1550', *Exrenda* <http://www.exrenda.com/dudley/dudley.htm> [accessed 13 November 2021]; Norman, Jeremy, 'The First Use of Virtual Reality in a Museum or Archaeological Context', *Jeremy Norman's HistoryofInformation.com: Exploring the History of Information and Media through Timelines* <https://www.historyofinformation.com/detail.php?id=4082> [accessed 11 November 2021].

traditional media like 3D models and animation has stayed the same: its immersive and interactive qualities.[17]

From these first VR tours that were mostly reconstructions of empty spaces without signs of sociability or life we have moved on to experiences that are interactive and engaging, and the equipment is able to handle more diverse and complex tasks: through VR we can attempt to "perform" the past, not only reconstruct it.[18] 2016 saw a range of new headsets finally reach the consumer market and a number of exciting, new applications made it look like these new technologies could reach mainstream - and the more time goes on, the more common VR and related headsets are becoming.[19] In 2019 wireless VR sets, such as the Oculus Quest, became available, changing the field yet again. With museums and heritage sites trying to find new ways to reach audiences, with the role of new media technology increasing, and with new innovations having been appearing, it feels more than probable that these changes are here to stay. VR is evolving but it has also been part of the museum landscape for nearly as long as it has existed, which is why it can be seen as both new and old, and something we still have not utilised to its full potential.

2.2. General examples

The most extensive example of VR is that of virtual museums, that most major museums have where one can see and experience in different ways their artefacts, collections, galleries and museum spaces in a realistic way.[20] Some even have exhibitions and art work that is exclusively online. These can be explored on their own or in complement or parallel to the "real" museums and what they offer on site. The digital and virtual presence can be impressive, but some see this largely as a means to showcase the museums' extensive collections and in this way engage visitors and attract them to make a physical visit through the samples of a variety of visually attractive elements - more of which is at the museum.[21]

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[17] Baltsavias, p. 385.
[18] Fabio Remondino and Stefano Campana, *3D recording and modelling in archaeology and cultural heritage: theory and best practices* (Oxford: British Archaeological Reports, 2014), pp. 115-126.
[19] Jack Ashby, 'Museums and Virtual Reality: VR in the Grant Museum', *UCL Culture Blog* (15 February 2017) <https://blogs.ucl.ac.uk/museums/2017/02/15/museums-and-virtual-reality-vr-in-the-grant-museum/> [accessed 13 November 2021].
[20] Janet Marstine, *New Museum Theory and Practice: An Introduction* (Chichester: John Wiley & Sons, 2005), p. 228.
[21] Toni Weller, *History in the Digital Age* (London;New York: Routledge, 2013), pp. 111-124.

The Google Art Project from 2011 and the continued addition of new digital and virtual material to the Google Arts & Culture -page has been instrumental in showing the demand for content like this. Initially Google partnered with 17 museums to create high-definition images, video and ultimately VR, and the number has only increased. Google Arts & Culture offers online exhibits, virtual reality tours and so much more - which is ideal especially for those who, for whatever reason, are unable to physically access a particular museum, object or piece of art.[22] Critics have noted the isolation and absence of physical and social contact on the internet or with computers and computerised materials does not serve museums, but this can be a way of museums expanding their range and including the digital and virtual in their social space.[23] Besides, digitalisation and providing virtual content online makes the museum more accessible and only showcase a small section of the museum's collections and content - putting everything online would be too time- and cost consuming. Iit has also been predicted (if not yet proven) that these examples will only make audiences more inclined to visit in person, too, as the virtual, the digital and the "real" are not in competition but complement each other.[24]

One example of the Google Art Project is the VR experiences made to the Natural History Museums, in London and in Berlin. The London VR experience brings to life the Rhomaleosaurus, an extinct Jurassic marine reptile, and one can learn more about it both at home or further by visiting the museum.[25] It is a good example of a VR experience that can be its own, separate item, but that also complements the museum's collection and invites interest in seeing and visiting the collection to either learn more or to see the "real" but lifeless Rhomaleosaurus in person. In addition to this VR example that is widely available (to anyone with an internet connection), the Natural History Museum in London has hosted a variety of more limited VR experiences. These have been hugely popular and often include Sir David Attenborough to add even more appeal to them. Visitors have been able to experience widely

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[22] Nancy Proctor, 'The Google Art Project: A New Generation of Museums on the Web?', *Curator* 54:2 (2011), 215-221 (pp. 215-6); Google Arts & Culture.
[23] Andrea Bandelli, 'Virtual Spaces and Museums', *The Journal of Museum Education* 24:1-2 (1999), 20-22 (p. 21).
[24] Proctor, pp. 216-221.
[25] Framestore VR, 'Natural History Museums' <http://framestorevr.com/natural-history-museums/> [accessed 13 November 2021].

different things through VR, from exploring the Great Barrier Reef to looking at the world through the eyes of a mantis shrimp.[26]

An example from Finland is the 'Turku goes 1812' VR experience that launched as a pop-up but is projected to be made a more permanent fixture in a Turku museum. The VR experience is a reconstruction of the Old Great Square of Turku in 1812, before the Great Fire. Much like bringing to life an extinct species, this brings to life an environment that does not exist anymore, which is a great advantage of VR. 'Turku goes 1812' is the first VR environment made in Finland that can be experienced by multiple "players" simultaneously and was guided by a museum employee as a character in the game, adding the element of sociability.[27] Research was conducted especially to match what is being made for the virtual world and this foundation is set up in a way that can be built on in the future with more research, updated graphics, added elements and different VR experiences. In the virtual world one could inspect select objects, communicate with other visitors through their avatars and the guide acted as both a guide to the virtual setting and the history that was conveyed in VR. Even if the graphics were not realistic, the experience was received well and is bound to evolve into something even more impactful in the future.[28] This felt like one example of the potential VR has to offer in the future.

As well as recreating and reconstructing life forms, buildings and environments that do not exist anymore, just like with 3D modelling and reconstruction as well as other high-definition recording, VR can act as a means to protect cultural heritage and artefacts that are made of fragile materials, preserve fragile sites from visitor impact, and give access to inaccessible places.[29] Archaeologists, who have utilised VR for longer than museum

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[26] Natural History Museum, 'Explore the Great Barrier Reef with Sir David Attenborough', <https://www.nhm.ac.uk/discover/news/2015/november/explore-great-barrier-reef-sir-david-attenborough.html> [accessed 17 November 2017]; Natural History Museum, 'Virtual reality partnership launches with mantis vision experience', <https://www.nhm.ac.uk/discover/news/2016/june/virtual-reality-partnership-launches-with-mantis-vision-experience.html> [accessed 13 November 2021].

[27] Turku, 'Turku goes 1812 vie virtuaaliselle kierrokselle aikaan ennen Turun paloa', <https://www.turku.fi/uutinen/2019-03-11_turku-goes-1812-vie-virtuaaliselle-kierrokselle-aikaan-ennen-turun-paloa?fbclid=IwAR04UR4toJlgyVEcRxBzSi6qUkgGRS-Zs3jxFepLtkNG7pPGJ_OvZpoXtnM> [accessed 13 November 2021].

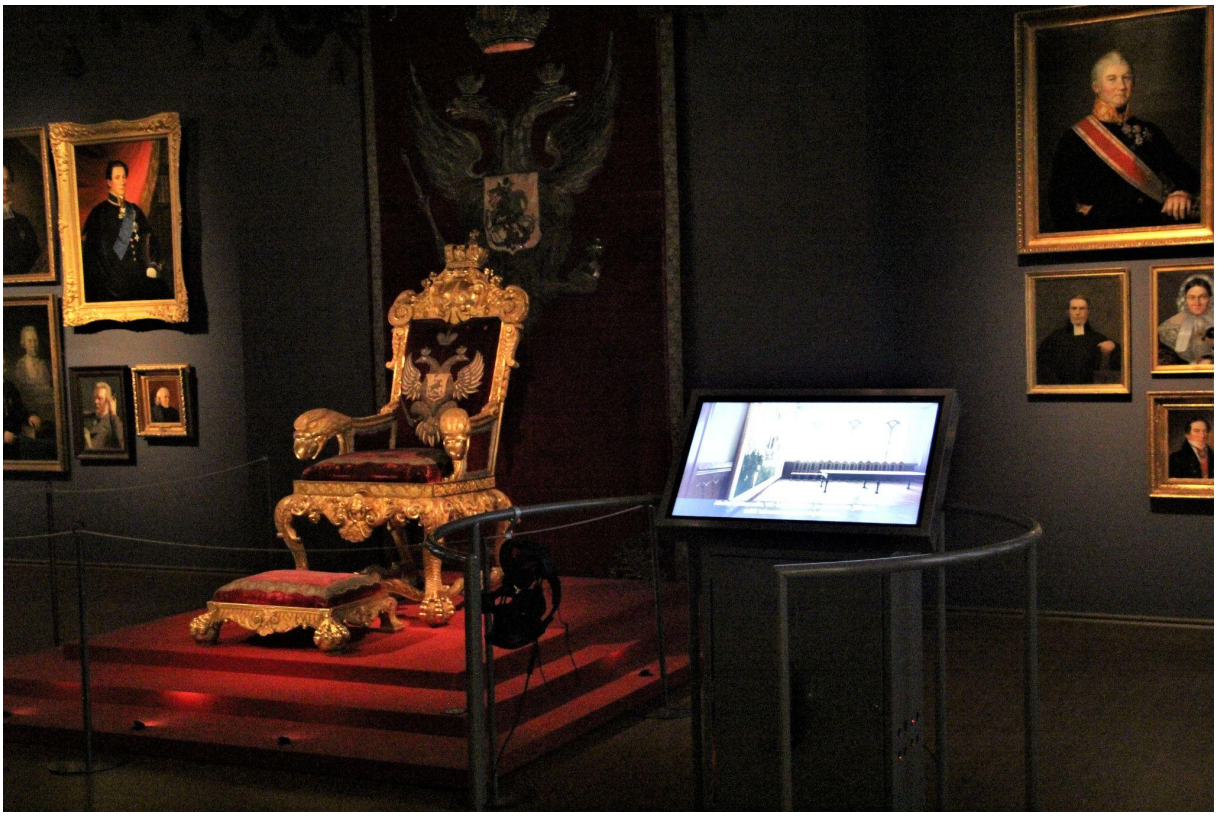
[28] Turun Museokeskus, 'Turku goes 1812 - VR-kokemus', *Youtube* <https://www.youtube.com/watch?v=E8B8-I5abkw> [accessed 13 November 2021].

[29] Eugene Ch'ng, Vincent Gaffney and Henry Chapman, *Visual Heritage in the Digital Age* (London: Springer London, 2013), p. 28.

personnel, have used GIS and animation to reconstruct sites such as the Roman Forum.[30] Reconstructions like this in a VR world allow one to walk through places that do not exist anymore, other than as ruins - creating an interesting contrast between what is now and what has been in the past, and allowing immediate reactions and interpretation by the user. One can even get a more real sense of place and an understanding of the lost worlds and societies, even when they are not actually made real in the virtual world. VR is good for multisensory learning, and it can be used to document processes as well. 3D models can document and track the progress of artefacts in danger of damage or worse, provide partial reconstructions of artefacts that are already damaged with smaller (or bigger) cracks or breaks, and work as a point of comparison between reconstructed or repaired artefacts to see possible changes occurring.[31] This all shows that VR is not "just" entertainment, but it includes multitudes. In museums it is based on research, serves museums' internal purposes, engages audiences and all in all is very versatile.

[30] David J. Bodenhamer, John Corrigan and Trevor M. Harris, *The spatial humanities : GIS and the future of humanities scholarship* (Bloomington : Indiana University Press, 2010).
[31] Annukka Debenjak-Ijäs, A lecture called '3D-mallinnus museotyössä' (2020) (Notes in the possession of the author).

2.3. National Museum of Finland



The VR exhibit in the "1860 the State History" exhibition space at the National Museum of Finland. Photo by Laura Jones.

The National Museum of Finland opened their VR exhibition in 2018. One can step inside the painting by R. W. Ekman, "*Emperor Alexander II Declares the 1863 Diet Session Open*, 1865" which is then brought to life and there is the option to "talk to" or listen to various characters; Emperor Alexander II himself, Johan Mauritz Nordenstam, Aurora Karamzin, J. V. Snellman, and Erik or Erkki Klami.[32] The experience is approximately 6 minutes long and provides some interactivity as one can choose who to interact with, but once selected the monologue has to be listened to in full before moving forward. One headset is provided, surrounded by a frame around for the safety of the users (so they do not wander off or bump into something) and those around (so that they are not collided into and they can be mindful

[32] Kansallismuseo, 'Aikamatkailu on sittenkin mahdollista. Kansallismuseon uusi virtuaalitodellisuus heittää vuoteen 1863.' (13/02/2018) <https://www.kansallismuseo.fi/fi/ajankohtaista/aikamatkailu-on-sittenkin-mahdollista-kansallismuseon-uusi-virtuaalitodellisuus-heittaa-vuoteen-1863> [accessed 13 November 2021].

of the person in the headset), but the view of the user is also projected on a screen that others can follow.

The experience is more cinematic, but enjoyable, providing the visitor with an experience as well as information and context. The incorporation of different characters and the research that went into this allows for a more comprehensive image of the Diet as it gives slightly different perspectives. The equipment is easy to use and a member of the museum staff was there to guide in using the VR headset and the hand-held console as well as assist with any problems that might arise. The safety frame works up to a point, but having someone monitor the situation to ensure nobody injures themselves or others seems to be a requirement.

The exhibition came about as the exhibition space for "1860 the State History" was being renewed and as the museum wanted an interesting execution they settled on VR.[33] As the VR experience is in the "1860 the State History" space, it ties in the room that has real artefacts such as the painting of Alexander, his uniform and throne in, giving context to both the objects and the virtual experience. The actual painting that the VR experience replicates is in a different location at the House of Nobility. This is a good example of a VR experience made with content in mind and VR seen as a good way to convey this content, instead of the other way around, and it also serves well in the exhibition space. The key idea for the exhibition was to provide "time travel" and in this way the Head of Public Programmes, Hanna Forssell's remark - "We found it truly fascinating that VR can offer our audiences a chance to be a part of a historical event or another reality." - has become reality.[34]

Initially the exhibit was made with young people in mind, but actually it has been people 60+ in age that use the VR headset the most.[35] This indicates that museums are seen as safe environments to experiment as well as that VR is for everyone. The Diet is admitted by the museum staff not to be the most interesting topic and VR manages to make it more

[33] A discussion with a representative from The National Museum of Finland on the use of VR and other new media technology at their museum 04/05/2018 (With Laura Jones, notes in the possession of the author).
[34] Kadja Manninen, A lecture from the National Museum of Finland (2020) (Notes in the possession of the author).
[35] A National Museum of Finland representative.

compelling, making it an interesting way of learning history and adding a "wow factor" to the exhibition and the museum overall.[36]

The staff, the audiences and the media have mostly viewed the addition of VR to the exhibition as a positive. However, there are some issues, as is always the case, especially when it comes to technology. Creating and maintaining a VR experience takes up a lot of financial and other resources, and it comes with an array of technical problems. The National Museum of Finland has experienced overheating and even the exhibit suddenly stopping to work entirely, and training inexperienced museum staff was also time- and resource consuming.[37] With this in mind, it seems that simplicity is key when it comes to VR at the moment: simplicity will make it easy for visitors and staff to use the equipment, keep the technology manageable and offer an experience that is not confusing. Yet, simplicity should not go too far and it should be noted that at the moment the VR experience is only available in Finnish which limits the accessibility of it to everyone.

It is mainly museums that have something more unusual, more "interesting" that gain media attention and VR fits the bill for this. At the time of these discussions and tours of the exhibition, the museum had received only positive feedback and good media coverage both nationally and internationally. Yet rumours were heard outside the museum stating that some people had been disappointed in the National Museum's VR exhibit - possibly because it had been so talked about and possibly did not live up to the expectations of interactivity.[38] Visitor expectation can vary noticeably, as there are early adopters of new media who are already familiar and experienced with VR thus setting their expectations and wants more highly and realistically, those who have never experienced VR before to whom the novelty itself is notable, and everything between these two extremes. On the museum's part, their first foray into VR has been a positive and great experience and an indicator that they would like to use VR again in the future. As of 2018 there were no concrete plans yet, but the National Museum was already looking to develop more VR or similar content for other locations in the museum next.[39]

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[36] A National Museum of Finland representative; The National Museum of Finland, New Technology at the National museum tour (2018) (Notes in the possession of the author).
[37] A National Museum of Finland representative.
[38] A discussion with a representative from the Helsinki City Museum on the use of VR and other new media technology at their museum 03/05/2018 (With Laura Jones, notes in the possession of the author).
[39] A National Museum of Finland representative; New Technology at the National museum tour.

2.4. Helsinki City Museum

The “Time Machine” exhibition room at the Helsinki City Museum. Photo by Laura Jones.

The National Museum of Finland’s VR experience was described as a “time machine”, but it is the Helsinki City Museum that actually has a VR exhibition titled “Time Machine” - clearly travelling back in time via VR is the leading trend, at least in Finland. The exhibition room opened in 2016 for the first time, but has since been updated already in 2019, demonstrating how quickly the technology in VR and other new media changes. At the time of the author’s visit, the “Time Machine 2.0” was in talks but personal experience concerns the earlier version. The “Time Machine” presents a “changing Helsinki” through Signe Brander’s photographs from the 1900s that have been transformed into “an immersive and interactive spatial installation”.[40] The exhibition room provides two headsets that are in their own little areas, relatively safe for visitors to experience, and on the other walls lightly moving images depicting different eras of Helsinki are projected with some sound effects, creating a bustling atmosphere to accompany the VR exhibit.

[40] A Helsinki City Museum representative; Helsinki City Museum, ‘Time Machine’, <https://www.helsinginkaupunginmuseo.fi/en/exhibitions/time-machine/> [accessed 13 November 2021].

The experience was not seamless as sometimes one would be standing in the air, but issues with this and the resolution was acknowledged by staff and was one of the reasons for the upgrade as in three years the technology had advanced and gotten significantly smoother.[41] Unfortunately only one of the headsets was working which presents another problem: the lack of supervision leads to mischief or even vandalism, yet committing a staff member to this one area is not an option either. This illustrates how much VR takes up the museums' resources, in terms of finances, manpower, and time. Although two headsets are in use at any one time, the museum goes through eight pairs per year due to vandalism or technical issues.[42] Just as the context for the National Museum's VR experience is around it, the photos by Signe Brander used in this VR exhibition can be found elsewhere in the museum's exhibitions, seen and researched in the archives and bought at the museum shop, providing context and continuity throughout. As it was at the time, the exhibition was interesting and one could see the potential of it, in showing and letting one experience pictures and video of Helsinki at different times in a different way and more, but the technical issues hindered the ideas and meanings the museum wanted to convey. It seemed to attract children especially, and with the upgrade one can expect it to serve larger audiences.

In a similar manner as at the National Museum of Finland, the VR exhibition got its beginning as the museum was being renewed and the staff wanted to find something new to fill out this particular space. The concept was content-driven yet again, with the idea coming first and VR being chosen as the medium only at the end, suggested and conceptualised by Futurice. The staff at the museum were very aware of how, even with a desire for new, it has to serve a purpose and content has to come first. Things that the museum wanted from VR were a full 360° view that was not game-like, shortness of length to keep audiences captivated and immersion - all of which were actualised in the exhibition. VR should not be and was not used for VR's sake, and had to take into account spontaneity, sociability and people coming together which is still problematic when it comes to VR.[43] I would argue VR serves a purpose in the "TIme Machine" exhibit but at the same time it could have been executed as a non-VR exhibition as well: projecting the same images and videos onto a wall or even a circular room would provide similar 360° immersion that is not game-like.

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[41] A Helsinki City Museum representative.
[42] A Helsinki City Museum representative.
[43] A Helsinki City Museum representative.

In a technology-based exhibition, the technology obviously has an impact on the design. Even though it was not originally not intended, the design of the entire exhibition room is steam-punkish - or Doctor Who-esque in some people's view - and it works well with the concept. Despite looking good, the exhibit has technological issues, similar to those at the National Museum; the central processing unit tends to overheat and sometimes stops working completely.[44]

At the beginning the feedback Helsinki City Museum received was positive, the exhibition was asked about a lot, and at a glance the "Time Machine" was mentioned often in customer feedback, mentioned as the museum's best feature. But as it started to get more dated, some of the feedback turned more negative as well - mainly concerning the technological glitches and bad integration that affected the enjoyment of the subject matter.[45] This shows how challenging working with new media technology is as it can age very quickly. As a still emerging field, the rapidity of changes in VR technology means that new media can turn old quickly, and the novelty wears off. The concepts of "old new media" and "new new media" are already in use, and perhaps VR cannot be considered the newest of "new media" anymore.[46] This reflects in the contrast between Helsinki City Museum's VR exhibit being "old" and in the process of being reinvented and renewed, and the National Museum's new exhibit that had only been in place for a few months at the time of my visit.

As the "Time Machine" started out as a more static exhibit, with the upgrade, reformation even, the museum wanted more interactivity, more possibilities for commands, and a more historically diverse display, without forgetting to keep it as an immersive experience.[47] The new exhibit is constructed from Brander's photographs depicting Helsinki as "a mix of national romanticism, Art Nouveau and Nordic classicism" at the start of the 20th century.[48] Updating a project such as this is a great example of how a museum has to adapt and change with the technology to stay relevant: the aging technology brings problems with it but also opportunities that in this case made the "Time Machine" and the museum

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[44] A Helsinki City Museum representative.
[45] A Helsinki City Museum representative.
[46] Moser, 188.
[47] A Helsinki City Museum representative.
[48] Helsinki City Museum, 'Signe's birthday and opening of Time Machine 2.0', <https://www.helsinginkaupunginmuseo.fi/en/events/signes-birthday-and-opening-of-time-machine-2-0/> [accessed 13 November 2021].

more talked-about and surely attracted the audiences again. Even so, the Helsinki City Museum seems content with this display of VR and has now been more focused on AR, seeing this as the better new media option for their museum for future projects at this point.[49] AR presents a different way of representing the museum's content and presenting it to the audiences, and there are differing views as to which is better - mostly it is up to the museum's preference.

2.5. Victoria and Albert Museum

At the time of my visit to the V&A, they did not have any current VR exhibitions on display, but this does not mean that the museum did not work with VR in any capacity. Their Google/Samsung Digital Classroom that provides education, workshops and public events included the use of VR technology in e.g. workshops. They started using 360° filming and Google cardboard (among other considerably more expensive equipment) in around 2013 which enabled the museum to start creating, viewing, and presenting VR content. They also hold evening events that include VR, even if there are no permanent VR experiences or exhibitions.[50] The Digital Classroom created a space for 16-24-year-olds to engage "in creative technologies and digital design practice", including working with VR.[51] Using Google cardboard is a cheap way to experience VR and available to more people, making it suitable for, for example, workshops where more people would be in a virtual world at the same time, thus eliminating the need for numerous headsets and other equipment. With Google cardboard one only needs to add a smartphone. As an example of the V&A range of VR, they have held a 'Composition for Immersive VR' workshop on cinematic VR filmmaking and a 'Magic Butterfly VR Experience', an immersive virtual reality experience with scenes from the Madam Butterfly and The Magic Flute operas.[52]

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[49] A Helsinki City Museum representative.
[50] A discussion with a representative from the Victoria and Albert Museum on the use of VR and other new media technology at their museum 27/01/2017 (With Laura Jones, notes in the possession of the author).
[51] Alex Flowers, 'V&A Samsung Digital Classroom: creative digital design education for young people', *A Flowers Website* <https://aflowers.co.uk/projects/va-samsung-digital-classroom-creative-digital-design-education-for-young-people> [accessed 13 November 2021].
[52] V&A, 'Composition for Immersive VR' <https://www.vam.ac.uk/event/8KqLRRAa/composition-for-immersive-vr> [accessed 13 November 2021]; V&A, 'Opera Weekender: Welsh National Opera presents Magic Butterfly VR Experience' <https://www.vam.ac.uk/event/xRr3Bq51/welsh-national-opera-presents-magic-butterfly-vr-experience> [accessed 13 November 2021].

Both the exhibitions at the Finnish institutions discussed above toe the line between being history and art. The National Museum's VR is based on, or even a recreation of, a painting and plays almost as an interactive film, whereas the Helsinki City Museums' VR presents photography in a new, virtual environment, both combining art and history - not to mention the idea that VR in itself can be considered art. At the V&A, presentation of art through VR is more clear.

The V&A has housed exhibitions where the artist may use VR as their medium. This can create impressive exhibits, but also brings its own problems as even artists may not be experts in their own art anymore because of technical challenges. The enthusiasm for something new can be easily shadowed by technology that becomes outdated quickly, is difficult financially, and requires staff training to deal with the new technology, as well as the installation and maintenance that are both expensive and time-consuming.[53] This is increasingly true for temporary VR experiences, even in a well-established institution such as the V&A. The growth of new technology results in new art and art forms, and VR art is definitely among these.[54] Yet, even boundary- and category-pushing VR work like the Björk Digital that was received well, gets criticised for the lack of shared experience and lack of sociability that museum visitors expect and look for.[55]

2.6. Partnerships and collaboration

Nearly all of the most notable usages of VR in museums (e.g. those of The British Museum and Natural History Museum) have been in partnership with large technology companies such as Google or Samsung. This is why it is important to look at these partnerships and funding of VR in museums. Do these partnerships reflect the museums' insufficient funding and resources to work with VR on their own or the insufficient technological knowhow and resources to successfully implement VR: since even the world's leading museums work in collaboration, it is safe to say that VR simply requires specialist knowledge that outside

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[53] Susanna Hujala, A lecture called 'Taidemuseoiden tulevaisuuden näkymät' (2020) (Notes in the possession of the author).
[54] Moser, p. 187.
[55] Somerset House, 'Björk Digital' <https://www.somersethouse.org.uk/whats-on/bjork-digital> [accessed 13 November 2021]; Joe Muggs, 'Björk Digital review – to virtual reality and beyond', *The Guardian* <https://www.theguardian.com/music/2016/sep/01/bjork-digital-review-somerset-house-vulnicura-virtual-reality-vr> [accessed 13 November 2021]; A V&A representative.

partnerships can provide. These partnerships also bring visibility to both parties, making it beneficial to all involved.

Similarly to the V&A and their Digital Classroom, The British Museum and Samsung Technologies have been in collaboration to grow the engagement and interest of young people - mostly under 18s - in historical and cultural content via digital media technologies. The on-going partnership has been in play since 2008 and the Samsung Digital Discovery Centre at The British Museum hosts various activities, workshops and family events for free.[56] The co-operation has been titled as the most extensive on-site digital learning programme in a UK museum, and as such it is representative of the direction in which the museum and heritage sector has been going in recent years with the incorporation of digital and multimedia technologies and ways to explore and discover museums' content. Partnering with big technology companies such as Google (NHM) and Samsung (TBM & V&A) provides needed funding and resources, making VR experiences in museums possible. This collaboration between academia, heritage organisations and commercial (technology) companies is an important characteristic in digital heritage.[57] With the Google Arts Project, it also took an outside company to start and produce a project on such a large scale; and a large company such as Google does have the resources to maintain big projects like this as well as potentially include more in it.[58] But if these companies do not wish to maintain the projects they have created, it falls on the museum and is perhaps something they should not be fully relying on.

With a well-established museum such as the V&A, technology companies are the ones approaching the museum. In addition to the partnership with Samsung and the equipment they provide, the V&A has collaborated and collaborates with smaller companies. For example, Woofbert VR, who are experts in creating experiences for e.g. cultural organisations, have worked with the V&A for free.[59] For smaller companies this gives an opportunity to grow their portfolios and to have a wider audience be exposed to their work and what they do. Usually, sponsorship comes from a company "with a direct interest in the subject matter", but working with VR is slightly different.[60] A gas company might sponsor an exhibition on gas,

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[56] The British Museum website, 'Samsung Digital Discovery Centre' <https://www.britishmuseum.org/learn/schools/samsung-digital-discovery-centre> [accessed 13 November 2021].
[57] Ch'ng, p. vi.
[58] Proctor, p. 218.
[59] A V&A representative.
[60] Sharon MacDonald, *Behind the scenes at the Science Museum* (Oxford: Routledge, 2002), p. 66.

but with VR it is less about the subject matter and more about the means to convey it that a technology company can showcase at a museum. What exhibitions are produced and how they are displayed are still a reflection of the industries that are thriving at the moment and the prominence of VR tells us that as a field it is doing well.

The situation is also somewhat different in Finland, where bigger technology companies are not as available to work with museums. For the National Museum of Finland, Zoan Oy executed the VR experience in partnership with the Presidential Palace and the House of Nobility, and the project was connected to "The Availability and Maintenance of Digital Cultural Heritage" scheme from the Ministry of Education and Culture to enlivening history.[61] Although Zoan is now the biggest VR studio in Finland, at the time they were still a start-up and this was their first "bigger" project.[62] This was a bought service but due to the nature of the work, Zoan using it as a portfolio case and it being the first VR experience for a museum for both parties, it felt more like a collaboration.[63] In every way this seems like a good model for producing a VR exhibit: all involved benefit from working together. The technology company gains experience and new audiences by working with big cultural organisations, and the museum gets what they want technologically and also reaches new audiences through new media. Moreover, collaborating with experts makes it an interesting experience for the museum staff. The collaboration between the Helsinki City Museum and Futurice, who did the first evolution of the "Time Machine", was similar: a paid consultation. [64] But in their case the museum was still fairly unknown and Futurice could be seen as an impressive pioneer in Finland. Nonetheless, this was a beneficial collaboration for both, which it has to be when the museum's revenue from the state, the city, from sales and from the Finnish Heritage Agency's innovative aid is not altogether a massive one.

In creating such large and complex exhibitions, there needs to be collaboration within the institution as well. Most museums work with task groups that incorporate personnel from different departments in order to get a holistic approach and differing viewpoints to the exhibition. At the National Museum over 30 people worked to create the VR exhibit and Helsinki City Museum's task force included people from all of their departments.[65] The V&A

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[61] Kansallismuseo; Manninen.
[62] A National Museum of Finland representative.
[63] The National Museum of Finland.
[64] A Helsinki City Museum representative.
[65] Manninen; A Helsinki City Museum representative.

also involves learning and other departments in any of its forays into VR - the support between departments is crucial in building a successful exhibition, experience or event, even if pragmatically there is always difficulty in inter-departmental collaboration.[66] Most departments view their work as the most important element at the museum. VR is still a new idea to many and getting people fully behind it can take work, in order to come to an agreement as to whether it is feasible and worth it to invest in it when still figuring it out and how it fits the museum.

Both Eilean Hooper-Greenhill (1994) and Stephen Weil (1999) have posed that "the focus of museums is shifting away from the care and storage of their collection toward serving and collaborating with their audience."[67] This can be seen, in example, in the Helsinki City Museum's approach in involving the audience, the museum and the city in building their exhibition. The input from visitors and the museum staff was used in deciding what era(s) people wanted to see the most in the "Time Machine", and even in developing the technology in the initial planning phase they crowdsourced ideas via hackathons to hold experimental challenges to create something suitable for the museum exhibit.[68] In this way the audience can feel it has a say in what happens in its community; promoting the role of museums as partners to local communities.[69] Collaboration such as this also shows the move towards a more participatory museum, for which VR is ideal. Over the past two decades participation in museums has been encouraged increasingly, promoting "a change towards a collaboration of joint interest, joint views, feelings and sensitivities" between museums and their audiences.[70] In this case the participation is both in the form of getting to provide input for an exhibition and then possibly being able to see and participate in this input being realised in the VR exhibit.

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[66] A V&A representative.
[67] Cameron and Kelly, p. 176.
[68] A Helsinki City Museum representative.
[69] Graham Black, *The Engaging Museum: Developing Museums for Visitor Involvement* (London: Routledge, 2005), pp. 1-24 (p. 1).
[70] Giaccardi, p. 72.

III The effectiveness of VR in museums

It is difficult to measure the success or effectiveness of exhibitions and museum experiences since all of these are highly subjective: 'success', 'effectiveness' and 'experience. Visitor numbers are only a part of the picture and measuring customer satisfaction through customer surveys takes too much continuous work for museums to regularly implement them. And measuring the impressiveness or impact of an exhibit is just as subjective. Some ways to look at effectiveness is by inspecting whether or not the sponsors' expectations are fulfilled, by in-house evaluation and by visibility on social and traditional media.[71] This chapter will attempt to touch upon these issues as well as briefly mention visitor numbers, revenue, feedback, and the workload of employees. But mostly the effectiveness will stem from both the museum reaching its goals (whatever they may be, especially in relation to VR) and the audiences' response. The point of view of the museum and that of the customer will be considered. Thus it should be illustrated whether or not VR in museums can be seen as an effective means of expression and whether or not its use has been a success.

In the following chapters, I will also begin referencing a questionnaire - 'VR, Museums and Visitors' and its answers to bring forward the perspective of museum visitors.[72] With limited access to material on it, the side from the point of view of the visitors has not been considered in as much detail as would possibly be ideal - however, visitor impressions and opinions are not the main point of this thesis. The survey conducted by the author aims to look at the museum habits and attitudes toward VR in museums and in general, to gain insight into how VR affects audiences, how it is received and how it can be seen as effective and potentialised from this viewpoint.

3.1. Questionnaire results

Most answers to the questionnaire are from the year 2018 and it should be kept in mind that the majority of the people that answered are either humanities' students and/or friends of the author, but the sample group of 52 does give an appropriate insight into potential museum visitors and their views nonetheless. As this was the sample group, the majority were young adults; only 5,8% were over 45 and nobody under 18, leaving 50% of those answered as 18-25-year-olds. The majority (75%) were female which could have left

[71] Hujala.
[72] Appendix A.

one to believe that there would be less interest in a subject like VR since technology is still traditionally seen as a male-dominated field, but this has made no discernible difference. As we all know, interest in science and technology is not gendered. From a locational point of view the survey covers the research countries - not perfectly, but covers them. The majority by 86,5% will give a Finnish perspective whereas 7,7% were from the UK and a few representatives from Norway, Sweden and the United States. The group consisted of people who visit museums at a different frequency, although this will not include a perspective from those who do not visit museums.

As the group is mostly involved in the humanities field, it comes as no surprise that many were avid museum visitors and that most check for exhibits and other museum programmes that might interest them actively. Although, actively may mean different things for different people - anything from every day to regularly every year - this would indicate that the people who answered in this manner are well-informed about the museum landscape and what goes on in museums near them. Yet 76,9% were not aware of VR exhibitions nearby or in their country - even if 67,3% were actively checking what museums have to offer. This poses the question - do museums not promote their VR in an efficient way.

When it came to VR 42,3% had experienced VR in museums (most mentioning the Helsinki City Museum's "Time Machine") and 50% had experienced VR in a setting other than a museum. This provided a good group of experienced and inexperienced users, who would have different views and opinions on VR and how effective or desirable it is or was. The examples of VR that most people were aware of were the National Museum of Finland and Helsinki City Museum's VR exhibitions that have been covered in this thesis as well. As will become clearer in the following chapters, the general consensus seemed to be that VR is an interesting tool that is a nice addition to a museum, as long as it serves a purpose.

3.2. Effectiveness - museums' goals

Initially the idea for this chapter was to review items such as visitor numbers, revenue, online traffic, feedback, and the workload of employees to assess the effect and effectiveness VR has played in the museum setting, or whether it has not had any noticeable impact. However, data relating to this is not widely available and very little research has been done on it. Museums themselves do not have the resources to conduct extensive customer research or to extensively evaluate every exhibition and how it has affected visitors, revenue, the museum staff or how it

has been received by all parties. Therefore the term ‘effectiveness’ is used quite broadly in this thesis.

Virtual experiences and VR offer “increasingly complex environments in which to interpret and develop compelling narratives” which is important to the relationship between museums and audiences in the ways in which museums can meet audience expectations while remaining true to their own goals and missions.[73] To react to the demands of the 21st century, “museums today must justify their existence much more effectively, must generate far more of their own income, must broaden their audience bases, must reflect their communities, and must enhance their role as learning institutions”, as Graham Black says.[74] And often this is through a variety of experiences, including VR. In recent years museums have increasingly searched for new ways to engage audiences, and MR (including VR and AR) still interests an increasing number of historians and audiences. VR especially has been seen as a new and effective way of understanding and presenting the scenery, buildings and sometimes even created atmospheres of the past, and the public and the media are aware of this too.[75]

Approximately 50% of those surveyed were interested in VR in museums, but approximately 50% also want to read or hear about the subject matter. Words such as ‘experience’ and ‘participate’ were used as the preferred way to interact with a museum, for example “I would say experience the "real things" [rather] than only see.”[76] This all applies to VR, so even when some people might be reluctant to approach VR due to its novelty or for another reason, VR actually can provide the participatory, interactive experience that they are looking for. The “participatory culture” tha Henry Jenkins heralded has been brought to reality with technological innovation such as VR as it enables people to interact with culture and cultural discourse in a personal and playful way.[77] This participatory practice is also what VR brings to the museum in an effective way.

However, a VR exhibition is not necessarily to be seen as something more likely to attract audiences. The response to the question “Would a VR exhibition/experience make you more likely to go to a museum?” was split almost at 50/50, though a little yes-leaning.[78] Those that answered saw VR as fun and interesting, a means to interactive learning - largely the aims

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[73] Giaccardi, p. 149.
[74] Black, pp. 266-7.
[75] Simo Ahtee, ‘Yhdistetty todellisuus avaa unohtuneita näkökulmia’, *Lilja* 3 (2019), 11.
[76] Appendix A.
[77] Weller, pp. 39-57.
[78] Appendix A.

that museums themselves set for exhibitions of this kind. It was recognised that content should come before the medium in which it is presented. Some wanted to go to a museum to experience VR for the first time, others simply said they were not interested in VR, and others would visit museums regardless of whether or not they have VR - thus being interested in seeing it if it is offered, but not being bothered to go out of their way to find it or not disappointed not to experience VR in museums. This illustrates that even visitors know VR or any other new media should never be used as technology for the sake of the technology itself: the museum needs to ask why and what one wants to say, how to make it participatory if desired, and how to adapt information into an experience; what is the best medium?[79] It will not always be VR. And as long as the subject matter is good, outdated or bad technology can be excused by the audience as well. There was no clear preference for the use of VR or other media for an exhibition on a subject one is interested in: further strengthening the desire for a content-driven approach where audiences enjoy the subject matter if it is presented in an attractive, interesting and appropriate way that works well.

As they take part in the creation of a VR exhibition or experience through collaboration museums are in a position to lead the design to match their wants and needs and to make VR serve the purpose it should in a museum setting; museums can define VR's "potential benefit, and evaluate the effects for different audiences" before implementing it.[80] If audiences have no clear preferences, it may be difficult to gauge these effects and how to approach building exhibitions. When surveyed, there was no clear preference as to what people wanted to see in VR exhibitions. Top choices were history and heritage that does not exist anymore as well as natural and other sciences, but at around 40% each history and heritage that still exists in full or partially, history of art and modern art were not long behind. It is quite clear that people want VR experiences and exhibitions that add something new to the subject, whether that be a new perspective, interactivity, a new way of storytelling. As long as the use of VR and the experience of it is positive, adding it to a museum feels justified. At the beginning of the new millennium, under 35year-old adults were the least likely group to visit museums and heritage sites, and interactive additions such as VR must have seemed a tempting and viable option to combat this and to attract new audiences. To some extent this seems to have worked successfully, bearing in mind that e.g. the majority

[79] Lauri Viinikkala, A lecture called 'Museot ja yhdistetty todellisuus' (2020) (Notes in the possession of the author).
[80] Kalay, p. 237.

responding to the VR, Museums and Visitors -survey belong to this age group and appear to be fairly enthusiastic museum-goers.

One of the main objects of museums is disseminating knowledge and information and enhancing and encouraging learning. With VR as with any museum exhibition the challenge is “to provide an environment in which - if audiences desire to - they can learn from the experience of their visit to the extent that they are motivated [toward] developing learning cycles”.[81] Even without a guide, the experience is a guided, instructed one. In VR providing any kind of guidance or instructions is paramount as visitors - especially those in a VR environment for the first time - will need help as they often do not know what to do inside a virtual environment. Data on the effect of VR on learning is not conclusive as it stands, but it has been proposed that it encourages specific types of learning and increases motivation in learning even if there are no specific intellectual effects.[82] The potential in education and motivation is something that still needs more research. Regardless of the medium used, “if a museum exhibition communicates effectively, it will reveal meanings and relationships, and this in turn may enable learning, the acquisition of knowledge and enhanced understanding.”[83]

Like AR, VR can be seen as a method in achieving and guiding a personal, first-hand experience in fun and interesting activities. But in this case a VR environment will have to had added guidance. It has been noted that “visitors tend to focus excessively on the content of the AR system and the additional information in the AR, thereby neglecting the physical surroundings and environment".[84] In a VR environment forgetting about the physical surroundings is even desired, as the difference between the nature of the two is that VR is immersive. But if a guide is added to a VR world as well, its interface and content should be considered carefully as it would play a significant role in increasing participatory behaviour in the user, making them more likely to spend more time and pay attention to exhibits. If AR can enhance learning motivation and achievements in a museum or heritage setting, it could be assumed that this applies to VR as well.[85] In 1994 W. J. Lewis concluded that “It is generally recognised that people retain about: 10% of what they hear, 30% of what they read, 50% of

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[81] Black, p. 133.
[82] Kalay, pp. 253-5.
[83] Black, pp. 133-147.
[84] Yu-Lien Chang, Huei-Tse Hou, Chao-Yang Pan, Yao-Ting Sung and Kuo-En Chang, ‘Apply an Augmented Reality in a Mobile Guidance to Increase Sense of Place for Heritage Places’, *Journal of Educational Technology & Society*, 18:2 (2015), 166-178 (p. 167).
[85] Chang, pp. 167-175.

what they see, 90% of what they do."[86] When one applies this logic to VR, it makes it an attractive and effective means to distribute information on part of museums, as VR can incorporate hearing, reading, seeing and doing all in one.

It is difficult to say how VR exhibitions have affected visitor numbers or revenue, as the museums studied did not have data on this. At the Helsinki City Museum the exhibition would not bring in more revenue, as the entrance is free. The V&A has free entry, but temporary exhibitions often include a fee, and temporary exhibitions bring in extra revenue.[87] The National Museum of Finland is the only one of these museums that had both an entrance fee and additional charges to temporary exhibitions. The VR experience is included in the regular ticket, however. Visitors were split about paying for an exhibition at a museum: the majority (67,3%) does not mind paying extra for an exhibition in a museum with free entrance, but the case is the other way round and closer in museums with an entrance fee: 55,8% would mind paying in this case.[88] This could have an effect on how likely audiences are to go to a temporary VR exhibition, based on whether one would have to pay extra for it. According to Janne Itäpiiri from Zoan people are willing to pay 10% more for a VR experience compared to a "regular" or "physical" experience, but this has not been researched in detail.[89]

If one thinks of the collaborating technology companies as sponsors (even if they were in a paid partnership), it appears their expectations were fulfilled, as the reception and response to the VR exhibits has been positive and it has made these companies more well-known to those who were not familiar with the VR world previously. As the feedback has been positive, the in-house evaluation and visibility on social and traditional media can be seen as effective as well. The use of VR does have a possibly negative impact on the museum employees workload. Helsinki City Museum mentioned their inability to have someone monitor the VR exhibition room which resulted into issues, and the National Museum's staff had added work when having to attend to the VR users' needs and queries. Staff is in need of more training to be more comfortable in using new tools, services and technology.[90] Without

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[86] Black, p. 198.
[87] Marstine, pp. 8-12.
[88] Appendix A.
[89] Janne Itäpiiri, A lecture from Zoan (2020) (Notes in the possession of the author).
[90] Monica Bulger, Eric T. Meyer, Grace de la Flor, Melissa Terras, Sally Wyatt, Marina Jirotka, Katherine Eccles and Christine Madsen, 'Reinventing Research? Information Practices in the Humanities', *SSRN Electronic Journal* (2011)

training more resources are lost on outside maintenance, audiences cannot be instructed or helped and the museum staff will not understand their own work.

In a (museum) professional judgement the quality of a visit is based on the uniqueness of collections and site, their conservation and protection, the authenticity and integrity of the presentation, dynamic programming, and opportunities offered for visitor engagement.[91] As it is part of the site, VR does add to the uniqueness and novelty of a museum, it can be related to the conservation or protection of the collections (e.g. with displaying fragile artefacts that cannot be physically placed in an exhibition space), it is an example of dynamic programming and offers a different option for visitor engagement. When it comes to authenticity and integrity of the presentation, it opens up a whole discussion as to can VR be authentic and what exactly integrity is. But all in all, VR seems to add positively to the quality of visit when looked at from the viewpoint of a museum professional. It should also be noted that all of the examples of the use of VR in museums in Chapter II received positive feedback from audiences and positive media coverage, indicating that the exhibitions have been effective, even when they have not been perfect. They have provided learning, entertainment, new experiences, and a whole new virtual world.

3.3. Effectiveness - audiences' reception

The audiences' expectations for museum visits have changed drastically in the past decade(s) and it feel as if a lot more is expected of museums nowadays. People want their museum visit to be interesting but also enjoyable and fun, family friendly so that there is something for everybody no matter their age, ability or degree of knowledge. People are not content with looking or reading but want things that they can do together, things they can learn and expand their knowledge on, not to forget additional facilities on site such as a museum shop and a restaurant or café. What attracts audiences to a museum is temporary exhibits, family experiences or days out, receiving good customer service and also new facilities.[92] If one applies this to VR, it ticks the boxes for enjoyable, fun and interesting, and family friendly in most cases. It is something one can ldo and learn from, but not necessarily together. VR may

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<https://www.researchgate.net/publication/228295635_Reinventing_Research_Information_Practices_in_the_Humanities> [accessed 7 May 2018], p. 8.

[91] Black, p. 102.

[92] Black, pp. 24-6.

be in the form of a new exhibit and can be a good family experience, meaning all in all VR does fit audience expectations quite well.

User satisfaction is an individual experience, and without interviewing or surveying each individual museum visitor, it is difficult to know how they have experienced a museum and its exhibits and how effectively the meanings and ideas that the museum has wanted to convey have been received. Visitors' expectations will change over time - individually and collectively - and each visit is conditional to the personal context a visitor brings with them, their motivation for visiting, their mood, their interactions with museum personnel and whoever they are visiting the museum with, their level of interest in the subject matter on offer, what they participate in or see on that particular day and so forth - aspects that could influence a visit are endless.[93] The museum is only responsible for the aspects it has control over, but, for example, a visitor's mood and motivation are entirely out of the museum's hands.

The sociability of VR experiences has been an aspect that is not entirely straightforward. When wearing a headset and when inside a virtual environment, the visitor usually has no connection to others and the sociability and communality of museums is lost. Prior evidence and that surveyed for this thesis suggest that most people visit museums in groups; 76,9% said they were usually not alone when visiting a museum.[94] It is advised that "exhibitions must also be designed to recognise that most visitors come in groups, and seek social interaction with each other and other visitors, rather than using contents as individuals" which leads VR in its current use in an uncomfortable spot.[95] The comments criticising these VR experiences have almost exclusively been either about technological issues or the lack of sociability. VR is still evolving and does already include more social examples where multiple visitors can access the same virtual world at the same time. The "Turku goes 1812" VR experience is an example of VR in which the environment offers a mix of research and experience that "felt like [one] was there as a group".[96] In AR applications it was noted that visitors would engage "in fewer discussions and interactions about the historical sites with their companions."[97] This could mean they were so immersed in the technology and content

[93] Black, pp. 103-8.
[94] Black, p. 27; Appendix A.
[95] Black, p. 159.
[96] Turun Museokeskus.
[97] Chang, p. 175.

they did not have time for anything else, or that the technology disrupted social activity that would have normally been there. This is not wanted on part of the museum or on part of the audiences, leaving this as one of the issues VR and other new media still have to solve.

IV The potential of VR in museums

Based on the evaluation of the effectiveness above, this next chapter attempts to further debate on the potential VR has in museums: has it reached it now, will it do so in the near future, what does the ideal of VR in museums look like as it seems to gain more popularity and become more accessible and desirable to the masses, will it become a staple in museums. Most if not all studies, books and articles on the subject talk about the potential of VR and new media in general and how as an emergent technology it has only begun its journey. But what exactly is this potential and what would it entail once it has been reached? What could VR in museums actually be at its best and are we on our way there yet? These are all questions that are difficult to answer but I have tried my best.

VR and other new media technology are changing the way we consume and experience entertainment and information, but by changing the way we interact with content it also has the potential to change how we learn, connect and share in today's world.[98] With a still emerging medium, the potential truly seems endless. But for the purpose of this thesis we can forget about future images of projected holograms, laser-plasma virtual displays, autostereo screens, and interactive AI avatars.[99] From the point of view of museums VR itself can provide multisensory reconstructions or experiences that can bring the past as close to back to life as possible, introduce and visualise complex ideas and help in re-establishing the museum image.

The last two decades have been about perfecting the (digital) tools, now it should be about perfecting methods and presentation to match the technology. Although VR and AR are still not cheap, the price of 3D scanning and VR technology has decreased noticeably in recent years, giving more potential to adapt them in museums. Because we have seen successful adaptations of VR from pioneering museums already, it is more than likely to see more museums participating in the trend, encouraged by these examples even if they were intimidated or did not have the means to try VR before. VR in a museum setting creates a chance to play and experience at a museum.[100] Once mainstream museums (such as the National Museum and the V&A, for example) incorporate something into their programmes and museum spaces, early adopters and more experimental museums have already been

[98] Ashby.
[99] Sanders.
[100] Itäpiiri.

experimenting with said thing - in this case VR - for some time. With institutions that are seen as more “established” using VR and VR increasing museums’ media coverage and visibility, it is more than likely that an increasing number of museums show interest in and add VR to their exhibitions as well. With prices coming down, the audiences’ skills and knowledge in new media are also increasing and expectations for museums having VR and the VR’s quality are growing. Usually museums will have better quality technical equipment for a VR experience than what people have at home, inviting visitors with a promise of an enhanced experience.[101]

4.1. Different uses

As it has always been, museums’ role is “to seek contemporary ways to engage audiences with their collections”.[102] This does not mean changing everything, but encourages museums to incorporate new methods that have been proven through research. VR is a contemporary and to an extent proven method that more museums should give a chance to. In 2014 VR was and it still is under-explored in the context of archaeology, history, museums. The past happened in 3D, so the best way to visualise it should be in the same way, aiming for more accuracy than previously: ”What better way to study the past, than to virtually experience it?” [103] VR can provide a platform for the coexistence of an informative experience and experiential information. Information and matter are the strengths of museums, so a VR experience should be complementing and serving the dissemination of this information and matter.[104] Information does not need to be written and matter does not need to be everything the museum has in its collections. The increasing technology diversifies but also complicates interactivity, resulting in museums having to remind themselves that the use of a medium has to serve a purpose and has to serve the content in order to enable new things. The effectiveness and potential of VR has already been acknowledged and championed by major news outlets, showing a clear interest by the media, as well as the public responding to it, in

[101] Itäpiiri.
[102] Black, p. 267.
[103] Sanders.
[104] Viinikkala.

the not-so-new medium.[105] It is only right the museum sector strives to fulfill this potential and seeks to utilise these new ways of applying VR.

VR and other new media technologies and the representation they can present allow experts to picture and figure out new ways of interpretation, to learn new things.[106] With the aid of VR researchers can create alternative narratives, competing interpretations or new contradicting evidence that museums can then present to their audiences.[107] Stories are a fundamental way humans learn; with a beginning, middle and end they teach without preaching and encourage reflection and discussion.[108] VR lends itself to the narrative approaches to learning, contributing to the idea that humans have naturally been storytellers since the beginning of time. Narrative can be seen as "a powerful way that cultural and social history museums, in particular, engaged visitors", even the "real work" of museums.[109] Through stories told in VR, VR too can help define the values and beliefs of society, let the visitor project and reflect on their thoughts, feelings and memories within the VR story and make connections between their lived experience and the museum's subject matter. VR adds an interactive dimension to storytelling and changes the narrative in the virtual world. "The narrative experience is no longer limited to imagining the life of other people, recipients can be active agents whose decisions play a decisive role in determining what happens in the storyworld."[110] "Narrative enables people to imagine themselves in an unfamiliar world.": even more so with VR where you do not necessarily even have to imagine as the medium illuminates the story for the visitor.[111] Often VR is a part of school visits in a museum, blending the elements of education and entertainment, thus giving it the moniker of 'edutainment'; perhaps for this reason a number of studies have found that VR is the most popular form of media as a learning environment.[112]

What once could only be mentally reconstructed by archaeologists, anyone can now explore via VR. "Its main technological contribution is that it recreates and reveals spaces that

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[105] John Pickavance, 'Virtual Reality has the potential to transform teaching and improve learning', *Independent* <https://www.independent.co.uk/news/science/virtual-reality-transforming-teaching-improving-learning-a8913591.html> [accessed 13 November 2021].
[106] Itäpiiri.
[107] Kalay, p. 5.
[108] Leslie Bedford, 'Storytelling: The Real Work of Museums', *Curator* 44:1 (2001), 27-34 (p. 33).
[109] Cameron and Kelly, pp. 201-2.
[110] Marie-Laure Ryan, *Narrating space / spatializing narrative : where narrative theory and geography meet* (Columbus : The Ohio State University Press, 2016), p. 103.
[111] Bedford, p. 31.
[112] Kalay, pp. 243-6.

no longer physically exist. This may appear magical, but nothing has been invented: it is all based upon well-documented information."[113] This kind of collaboration with researchers and museums is a desired direction for historical research. VR can be used for so much more than re-creation and representation of the physical world. "It has the capacity to become a tool to capture both the tangible and intangible essence of both the cultural heritage and the society that created the sites."[114] This could even be their full potential for the future. VR can go further than creating realistic representations of the past or beautiful images for the audience to look at. To fully utilise the hardware and software that is available at the moment and to reach its full potential, the interpretative uses and the flexible and dynamic devices, as well as the simulations that can provide new ways to think about and approach the past should be realised. The production of VR images and experiences should aim "to extract new information to contribute to the understanding of cultural expression and historical phenomena."[115] Objects in museums are usually removed from their original domains and wider contexts, but VR can add this context.[116] Not entirely since objects and places have their own auras, but VR can add more than is usually offered.

Virtual reconstructions and databases of cultural heritage sites and artefacts that have been lost, are threatened or living ones often fail in their attempts to capture the complexity of tangible and intangible cultural heritage and the related social, political and economic issues surrounding the sites or artifacts. With VR these sites and artefacts that are threatened by the impact of tourism, urbanisation, development, conflict and neglect, can be brought to life and given their wider contexts.[117] VR can represent the past that does not exist anymore in a realistic way, protect endangered sites and objects, and illuminate hard-to-grasp concepts and give access to places and things that would otherwise be impossible or difficult. People think VR should be taken advantage of more widely in museums - as long as it adds to the exhibit or subject. It was especially seen as a good medium for things that do not exist anymore (like the example of the Rhomaleosaurus presented in a previous chapter or the Modigliani exhibition at Tate Modern that recreated the artist's atelier that does not exist anymore as it

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[113] Maurizio Forte and Alberto Siliotti, ed., *Virtual archaeology : great discoveries brought to life through virtual reality* (London : Thames and Hudson, 1997), p. 32.
[114] Kalay, p. xv.
[115] Barcelo, pp. 60-87.
[116] Denice Blair Leach, 'Dynamic Museum Place: Exploring the Multi-Dimensional Museum Environment', *The Journal of Museum Education*, 32:3 (2007), 199-209 (p. 201).
[117] Kalay, p. xv.

was in the past based on photos[118]) or that are hard or impossible to experience or present (such as space or bacteria). A space exhibit is already in existence at the Science Museum in London where one could experience the Space Descent with Tim Peake VR experience that was advertised and received as realistic, impressive, and something that works as conveying the wanted information.[119] One of the greatest advantages of VR is how it contributes to the understanding of abstract ideas by visualising them. VR is a visual communication tool that stores, recollects and represents information virtually.[120] Virtual reconstructions could also be one kind of a solution to removals - and the museum sector's reluctance to remove from its collections - in museums: the object would not physically exist in the museum space anymore but its removal would feel less final and absolute as at least a digital copy would survive.

4.2. Multisensory and sociable

VR's strong points are that it is immersive and interactive. The audiences' opinion is that it should be made even more realistic, more fun, more interactive, and add the possibility of a multiplayer option that would increase sociability and connectedness. For increased immersion a more multisensory approach in VR would be needed. Most VR experiences are audio-visual but what about the other senses and incorporating them. A full Matrix pod is possibly not the ideal realisation of VR's potential, but a scent receptor is already in development and solutions (other than wireless headsets that came in 2019) to increase mobility are being thought about as well.[121] The Saatchi Gallery even had a VR exhibition in 2018 that monitored one's breathing and heartbeat to impact the art work they were seeing.[122] Clearly adaptation of multisensory additions is plausible. But even the audio-visuals are not always up to date with glitches and low resolution. The sound field in VR is also often simplified to only include light, ambient sounds.[123] It is impossible to experience them in the

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[118] Tate, 'Modigliani' <https://www.tate.org.uk/whats-on/tate-modern/exhibition/modigliani> [accessed 13 November 2021].
[119] Science Museum, 'Space Descent 360° with Tim Peake' <https://www.sciencemuseum.org.uk/see-and-do/space-descent-360-tim-peake> [accessed 13 November 2021]; Matt Burgess, 'Plummet from space with this Tim Peake VR experience', *Wired* <https://www.wired.co.uk/article/tim-peake-vr-science-museum> [accessed 13 November 2021]; Viinikkala.
[120] Kalay, p. 252.
[121] Viinikkala.
[122] Georgie Hoole, 'This Incredible VR Installation Will Use Your Heartbeat To Create Stunning Visuals', *Secret London* <https://secretldn.com/virtual-reality-experience-saatchi-gallery/> [accessed 13 November 2021].
[123] Barcelo, p. 105.

same way as they were in their time, but the recreation of sensory experiences is possible.[124] To reach its full potential, VR should utilise all of the senses available in the most appropriate manner, and the addition of more senses in the future would truly make VR a means for sensory history.

As demonstrated by some of the examples provided in previous chapters, despite its inherent interactivity, VR struggles to provide meaningful interactive experiences and often the developers have to settle for presenting an illusion of interaction - even in successful VR experiences.[125] Interactivity in museums reflects the shift from more collection-centered towards more embracement of audiences and participation. This is even more so with VR where visitors are more clearly written into the exhibitions and encouraged to interact with the exhibit.[126] The lack of sociability is a recurring theme as well. VR is made for single users which is why AR and MR have this advantage over VR: their closer link to the physical, or "real" environment creates less obstruction to sociability.[127] In museums "Visitors temporarily enter a world in which they intimately interact with objects."[128] Having a one-on-one experience is the opposite of sociability, but it is a unique characteristic of VR that makes this experience even more intimate and personal. But multiplayer VR games are increasing and the example of Turku goes 1812 demonstrates that we are moving in the right direction on this matter. Once the immersion and sociability aspects of VR are resolved, the possibilities are endless, and that truly seems like a potential worth reaching for.

4.3. Accessibility

VR provides accessibility in multiple ways. It makes content more accessible if it is online, it makes sites and objects more accessible, it is accessible for a wide audience and does not necessarily require a museum visit. VR has the power to appeal to several age groups "from primary schools to universities".[129] It was said data is missing on older adults but the retired age group's response to the National Museum of Finland's VR exhibition would support the idea that VR is appealing to older adults as well - thus covering practically every age group.

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[124] Mark M. Smith, 'Producing Sense, Consuming Sense, Making Sense: Perils and Prospects for Sensory History', *Journal of Social History* 40:4 (2007), 841-858 (pp. 846).
[125] Kalay, pp. 236-7.
[126] Cameron and Kelly, p. 134.
[127] Kalay, pp. 243-4.
[128] Leach, p. 205.
[129] Kalay, p. 250.

The pandemic also showed an advantage of VR. Virtual tours and other aspects that museums could offer online were in demand as people were staying home. Articles introducing virtual museums and collections to audiences were not uncommon.[130] These are useful for the future, too, and as more museums invested in better online or virtual representation, this material can be utilised and is of use to anyone who, for whatever reason, is unable to visit in person.

4.4. Museum image

VR adds the wow-factor to a museum: it is still easy to approach, something one might have never seen before, something to be seen on location, creates a need to tell others about it, speaks to different audiences, and pulls in people who would not otherwise perhaps visit a museum.[131] This wow-factor of VR can also attract visitors with no prior knowledge of the subject matter or the museum in general who are interested in the medium.[132] These visitors may end up enjoying the content just as much as the media, but are likely to end up not increasing their understanding of what they experienced and learned.

Centering audiences rather than collections is a still growing trend and VR is an example of something museums do with the audiences in mind rather than for themselves - even if they have an interest in new approaches and new media technology. In a way not unsimilar to social media, VR gives people a more central position - this time in a museum. VR also encourages a participatory culture where, in Henry Jenkins' words, "not every member must contribute, but all must believe they are free to contribute when ready and that what they contribute will be appropriately valued".[133]

From a museum representative's point of view the ideal for VR in museums would include true immersion, work environment or spaces, interaction, collaboration and stimulating discussion within VR spaces and outside of them as well, personal but not isolating experiences. VR could be used to present the creation of exhibitions or contemporary issues (at the time of this discussion: refugee journeys) as it has the power to put the viewer in this different space realistically and to thus create more empathy.[134] But for

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[130] Andrea Romano, 'Stuck at Home? These 12 Famous Museums Offer Virtual Tours You Can Take on Your Couch', *Southern Living* <https://www.southernliving.com/syndication/museums-with-virtual-tours?fbclid=IwAR2nCFfBtrs58WarJATD4sMNZmil2rKxqK-ppk1KtF6IPeYoCKMkB6miMrA> [accessed 13 November 2021].
[131] Hujala.
[132] Kalay, p. 247.
[133] Giaccardi, pp. 3-5.
[134] A V&A representative.

this VR still needs more development. In 2016 the industry still needed to grow and get it right in order for museums to be able to implement VR more widely. As we can see, from 2016 to this day, the number of VR applications in museums has increased, indicating that the industry has continued to grow and become more suitable for museums, too.

Although not its main attribute or function, VR can be used by museums to challenge existing opinions on them and to update their image. VR covers all of these museum needs: the preservation and documentation of cultural sites, buildings and artefacts, easy dissemination and presentation of these cultural resources all over the world, the educational potential of VR and 3D graphics in general, and it is an attractive and attention-grabbing medium for presentation to the public.[135]

4.5. Financing

The prices have decreased, but VR is still expensive, and whether a museum receives mostly government funding or has their own means and methods for acquiring revenue they have to decide whether or not VR is something they want to, should or are able to invest in. The cost of an object in a museum includes its purchase, conservation, storage, shipping, installation, and display - and what a lot of people do not realise is that the same goes for digital work.[136]

The attraction of VR and other new media technology and multimedia as an engaging way of representing collections and information comes with a sustainability challenge. One has to keep up with the updates and technology that change rapidly. If a museum's VR exhibit is created with project funding, it is important to take note of who by and how will updates and maintenance be done. Updating technological aspects can become a full-time job and museums do not always have a designated person for this task. One cannot simply push a button or quickly change something, to seamlessly integrate technology into museums, every change to a piece of text or even an object at the museum shop creates more work: updating data and metadata, making changes to computer programmes, film or other audio-visual material, and so on.[137]

The length of touring exhibitions is approximately 3-6 months in comparison to whole galleries and permanent exhibitions that have 5-20 year rotation cycles - creating a 10-40

[135] Baltsavias, pp. 431-2.
[136] Marstine, p. 92.
[137] Marstine, p. 142.

times faster turnover for temporary exhibitions.[138] This allows experimentation and flexibility with new methods such as VR. Creating temporary VR exhibitions, especially if a museum plans to do this multiple times, will take extra financing, which could be one reason as to why in Finland the VR experiences have predominantly been permanent fixtures and in the UK there is more experimentation with temporary experiences and events. Funding for VR is still in its infancy and, at least in Finland, the field and its use in museums has not grown as much as was predicted some years ago.[139] In general, Finnish museums are not big enough to produce "Blockbuster" exhibitions.[140] One needs to reach their audiences within a particular budget and customise exhibitions to match both the budget and the audience. If comparing VR in a museum setting to the world of gaming the budgets are staggeringly different, which would explain the difference in quality, interactivity and overall experience. Budgets for (VR) games with historical settings can be in the 100-200mil Euros, whereas the highest budgets for museum exhibitions in Finland have been around 100 000 Euros.[141] It is obvious that the results would differ, even if the budget does not always equal the quality. With all of this in mind, the content and information of VR projects needs to be relevant and interesting, for when the novelty of the VR technology wears off and the equipment gets outdated, the exhibition still needs to stay operational and enjoyable for the 5 to 20 years it has been planned for. Otherwise the museum would be wasting precious finances, resources, space and workload.

Digital and virtual work also comes with copy and licensing right issues. Without getting into the existing debate too much, museums have often needed to view their objects and collections as something for sale, as commodities, yet "A problem with heritage that is frequently stated is that it does not, in fact, represent any kind of property."[142] This is a limited view of the value of something, but the implication is that even if the rightful owner of this property is unclear, heritage is treated as intellectual property and comes with property and copyright issues. When it comes to VR, for example audio-visual components can come with

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[138] Cameron and Kelly, p. 85.
[139] Jussi Mankkinen, 'Haluaisitko keskustella keisarin kanssa tai testata Artekin kalusteita? Virtuaalitodellisuus mahdollistaa jo sisustuskokeilut ja museoiden aikamatkat', *YLE* <https://yle.fi/uutiset/3-10092582> [accessed 13 November 2021].
[140] Hujala.
[141] Viinikkala.
[142] John Carman, *Against Cultural Property: Archaeology, Heritage and Ownership* (London : Duckworth, 2005), pp. 51-3; 93-5.

licensing fees, making the whole experience even more expensive.[143] Similarly, with street views in virtual museums have copyright issues that can sometimes be circumvented by blurring objects that would create problems.[144]

One approach offering a solution to issues relating to these digital rights is adopting a concept called "copyleft", making heritage and other things free and credited.[145] Protecting a piece of work is reasonable, but strictly restricting or denying access to especially heritage and digital records of it does not seem to serve the purpose of having and creating them. If something is recorded, it can be assumed that sharing it would be beneficial. Then again, intellectual property and copyrights and licensing are ways in which VR can bring in good revenue for the museum.[146] Thus VR impacts the flow of money in museums both ways; it is costly to incorporate but it can also be utilised to generate money (for example, through photos and 3D copies).

[143] Marstine, p. 142.
[144] Proctor, p. 217.
[145] Kalay, p. 36.
[146] A V&A representative.

V The place of VR in museums

This final chapter analyses the role of museums and whether VR fits into this or not. As the nature of museums evolves, what does it really mean for the institution and how is the use of VR reflected in this. If museums are still seen as organisations and institutions conserving and caring for collections and artefacts that in turn can be presented to the public through exhibitions, is the use of VR making an unnecessary spectacle that may undermine what a traditional museum offers or is VR enhancing and progressing all these aspects that museums seek to achieve, letting the role of museums be seen in a completely different light in the society of today.

5.1. The changing museum

The world in which museums exist has changed, so it is and has been time for museums to change as well; not completely, but to match the surrounding world. As the world has changed, people's relationships have as well, including that with museums and their audiences. If one comprehends museums as institutions merely collecting, preserving and presenting objects, VR seems to have no place in them. But this is a very outdated definition and museums do not fit the early modernist model from the 19th century museum, with authoritative narratives.[147] The growing trends in the last decades have added more interactivity, less definite answers, more aspects of community, diversity and digitalisation. The International Council of Museum's (ICOM) old definition of a museum as "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" is currently being updated as well, to include buzzwords such as 'democratising', 'inclusive', 'addressing the conflicts and challenges of the present', 'equal rights and equal access to heritage', 'participatory' and 'planetary wellbeing'.[148] The ICOM definition - that is yet to be approved - and its changes demonstrates the changes going on in the museum world. The changing museum definition tells us of the changing role and activities of museums.

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[147] Cameron and Kelly, pp. 283-4.
[148] Remondino, p. 129; ICOM, 'ICOM announces the alternative museum definition that will be subject to a vote' <https://icom.museum/en/news/icom-announces-the-alternative-museum-definition-that-will-be-subject-to-a-vote/> [accessed 13 November 2021].

Expectations towards museums have changed dramatically in recent years. The audiences' new expectations include high quality as they are more educated and experienced, a participatory role instead of a passive one, representation of minorities and other marginalised groups that have previously possibly felt excluded from museums.[149] With the shift towards a more audience centered approach in museums these expectations and meeting them are important to museums.[150] With these in mind, museums also have competition for the audiences' free time and need to attract these audiences instead of any other place or media, and alternative information sources such as the Internet that are available to the masses compete with museums as well.[151]

The expectations of the museum staff have had to change as well. There is a wider recognition of the audience not being one, but individuals seeking both personal and communal experiences from the same content that museums provide to all. Communality is still a growing trend but coexisting with the demand for "personal" experiences, which means that museums must provide exhibitions that can be approached from differing perspectives.[152] Museums believe history and heritage can improve people's lives, support conservation and share their area of expertise.[153] These changing expectations, perceptions, demands and perspectives give occasion to the incorporation of new ideas and approaches in museums. ICOM's Multimedia Working Group's report stated that "since visiting a museum has long since been a multimedia experience anyway, computerized multimedia should be seen as part of the continuum of a 'tradition of interpretative and explanatory technology and techniques that grows from slide shows, text panels and dioramas'."[154] VR is simply a continuation of this continuum. And it is able to provide experiences that are both the same for everyone but still experienced, interacted and interpreted personally.

Nobody denies that museum collections or their more traditional roles in conservation and research are of importance. "However, if the museum profession is to talk about purpose at the start of the twenty-first century, the focus must be on audiences and on the role of museums in society."[155] Denice Blair Leach argues that museums have always been display

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[149] Black, pp. 1-2.
[150] Cameron and Kelly, p. 176.
[151] Black, pp. 1-2.
[152] Hujala.
[153] Black, pp. 1-2.
[154] Anna Reading, 'Digital interactivity in public memory institutions: the uses of new technologies in Holocaust museums', *Media, Culture & Society*, 25:1 (2003), 67-85 (p. 72).
[155] Black, p. 3.

domains.[156] If this view is applied to VR, it can be seen simply as a new way of displaying the content of museums.

5.2. Disneyfication and spectacle

And argument that is often used against VR or the more entertainment-leaning approach in museums in general is 'Disneyfication' and how a museum is not the place for one to come for entertainment (only?). By Disneyfication we mean seeing the world or the museum as a theme park, prioritising entertainment in culture, heritage and history. This is something that has received criticism and people have been against the commodification of museums even before entertainment or 'edutainment' started appearing in museums more regularly - even the introduction of admission charges was at one point seen as commodification.[157] The fear is that the focus being on entertainment would result in the loss of expertise and research as well as cheapen and simplify what museums have to offer, or even further confuse or destroy our sense of what heritage and therefore what we ourselves are.[158]

These fears were not completely unfounded, as there are examples of museum staff visiting Disneyland to learn techniques that could be applied to museums with educational and researched content.[159] Fully changing museums into theme parks is likely not desired by anyone, but these elements are not inherently bad or malicious to the museum sector. Interactive multimedia and other technology museums have begun to utilise, can enrich, enliven and upgrade the experience of visitors. Truly; "Many of the changes underway in museums involve using a broader range of media to offer a technologically up-to-date and versatile narrative experience. These might have been pioneered in commercial tourist attractions, but that makes them no less valuable to storytelling strategies."[160] It does not have to be "making museums more relevant" or simplifying and cheapening them, or "democracy" or Disneyfication.[161] All can exist at the same time in varying degrees. Not everyone sees Disneyfication as a negative, either. A visitor's comment regarding the VR exhibition at the National Museum of Finland asked "is this a museum or Disneyland?", and both the commenter and the museum representative presenting the comment viewed it in a positive

[156] Leach, p. 204.
[157] MacDonald, p. 3.
[158] MacDonald, p. 40; Kalay, p. 23.
[159] MacDonald, pp. 68-9.
[160] Ryan, p. 183.
[161] MacDonald, p. 69.

light, highlighting the novelty and enjoyment of the experience.[162] In using new media, like VR, it is important to "maintain the integrity of heritage artefacts and sites, that maintain a sense of the distance and difference between the past and the present, between the original and the reconstruction, between the object and its interpretation", but this does not mean they should not be used at all.[163]

Research has shown that many people do not like traditional museums and in fact prefer VR where they are allowed to touch and feel and interact.[164] In experiences such as VR the visitor can have an emotional and sensory experience without having to feel as if one is learning. And this is the type of museum visit some audiences prefer. With the shift in museums from providing knowledge to the visitors towards considering things from the perspective of what the visitors would want has been significant"[165] This shift also now allows different types of audiences to enjoy museums and get what they are looking for in the, - including those not interested in traditional displays. But even if these were the only thing audiences preferred, museums' business model cannot both rely on the supply of these kinds of "blockbuster exhibitions" and sustain itself. They attract interest over a limited time period and may add to the museum's revenue in additional charges, but ultimately it is questionable whether they advance the museum's mission ethically. And this could pose a problem in creating a museum audience that only visits when the museum holds VR events or other big productions.[166]

5.3. Future

VR is in a way a response to the 21st century demands that museums face, and it can be seen as filling the "role for the museum that bridges its aesthetic past with its populist and market-oriented present", as Zaha Hadid said.[167] VR is clearly here to stay, it is only a question of how and how much it will be used in museums. A more interdisciplinary approach is needed as technology is not against history, heritage and culture. In a post-digital museum

[162] Manninen.
[163] Kalay, p. 24.
[164] Black, p. 38.
[165] MacDonald, p. 47.
[166] Cameron and Kelly, p. 82.
[167] Black, pp. 266-7.

the focus should now be on figuring out how to use technology in the most effective way in a museum setting.[168]

Pitting 'virtual' and 'real' against each other is also not a constructive discourse, yet it keeps appearing when it comes to VR. Virtual is not trying to replace anything, nor is it a reproduction of something but an alternative and its own self, with similar and dissimilar qualities.[169] Virtual worlds are both virtual and real - virtual is not the opposite of real, and it is not real but in essence equal to it.[170] When one understands this, one understands that museums and their collections are not in danger and are not about to be replaced by VR. Physical continues to be seen as superior, even if the representation of virtual and digital are rooted in the same, older methods as for documents, texts, and other physical things.[171]

I believe it has been demonstrated that for the most part VR in museum contexts has been effective and that it has potential. It remains to be differentiated whether "having the capacity" to use VR technology will result into it being incorporated even if it is not "absolutely integral to everything" a museum does.[172] VR can be utilised and it is a good medium to have in one's repertoire, but this does not mean it should be used in everything. Museums can still make impressive exhibits with other media, low-technology or no technology. With a little soundscaping and added lights the smoke cottage at the National Museum of Finland created an atmospheric installation, all without disrupting the original too much.[173]

Without diminishing its role, other applications of new media might be more appropriate sometimes. For example AR is more mobile, more linked to the material and less intrusive to the senses, making it more suitable to some exhibits and preferred by some.[174] An advantage of AR is that it can show multiple realities (that have existed), interpretations of the past, different layers of history, parallel to what exists today.[175] The Birger Carlstedt: Le Chat Doré exhibition at Amos Rex was a notable AR application in Helsinki. One could see

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[168] Lissa Holloway-Attaway, A lecture on Designing Digital Heritage Network (DDHN) (2018) (Notes in the possession of the author).
[169] Fiona Cameron and Sarah Kenderdine, *Theorizing digital cultural heritage: a critical discourse* (Cambridge, Massachusetts: The MIT Press, 2007), p. 65.
[170] Ursula Plesner and Louise Phillips, ed,. *Researching virtual worlds: Methodologies for studying emergent practices* (New York : Routledge, 2014), p. 4; Baltsavias, p. 408.
[171] Cameron and Kenderdine, p. 49.
[172] Marstine, p. 142.
[173] The National Museum of Finland.
[174] A V&A representative.
[175] Ahtee, p. 11.

and “walk in” the reconstructed café basement floor, seen through an iPAD, while the first floor was reconstructed in ‘reality’. “Actually” moving in the space to see what it would have looked like provided a different experience to how it works with headsets, and this exhibit could be experienced with other people. Looking at it from the point of view of VR, this means that different media are good for different subject matter and/or that VR has some evolving to do.

From visitor responses, the feelings towards VR in museums was that it a “cool” addition bringing museums to the 21st century and engaging young people. Its possibilities were recognised but it was also recognised that it still has technological limitations that have to be overcome in the future. People were interested to see how it evolves in the future and how it will change different fields including museums.[176]

The role of exhibitions in the future is also likely to change. Museum professionals expect increasing virtuality, multi-sensory, and personalising experiences to fit different audiences, even to be tailored to oneself by the visitor.[177] However exhibitions and museums change, it seems VR has a place in them. As long as the museum presents participatory, good content, the VR experience will be interesting even after the novelty wears off.[178]

[176] Appendix A.
[177] Hujala.
[178] Itäpiiri.

VI Conclusion

With the emerging prominence of VR in today's world as well as attempts to find new ways to reach audiences on part of museums, the potential where these two meet should be utilised. VR is clearly not going anywhere, it is only a question of how and how much it will be used in museums. I would argue that as its potential begins to be more realised, we can expect to see an even increasing amount of VR exhibitions and experiences in the museum and heritage sector.

VR still has issues, especially on the technological side, but once these are resolved, it's potential is nearly unlimited and it can be used in museums to represent a wide variety of subject matter in an engaging, interactive and immersive way. The fact that VR has technological problems but so does all other technology in museums (and elsewhere), renders it an unfair argument against it.[179] It can convey the meanings and information museums want to distribute to the public and it is generally seen as an interesting and enjoyable addition by the visitors. And that is what VR should be: an addition, a medium for the content and never the focal point around which an exhibition or something else is built.

Societal changes lead to museums needing to change as well, but as well as being familiar with their "competition", they should believe and take pride in their own work and the museum sector.[180] The use of VR in museums follows the larger trends in the museum and heritage sector; a participatory model, interactivity, digitalisation, communality and including the audience increasingly. In addition to the focus on the audience and its wishes, the focus has moved from collections to exhibitions and even further to events.[181] This is a current trend and will possibly continue even more so in the future. VR works as exhibitions and events, and incorporates the audience and its wishes, making it plausible that the use of VR would be another growing museum trend.

All of the cases of VR I have looked at in more detail have been in partnership or in collaboration with a technology company, they have been designed for a longer period of time and all of these museums have had mainly positive experiences and feedback, and see the potential of VR, wanting to continue its use or find new ways to incorporate it into their

[179] Manninen.
[180] Hujala.
[181] Hujala.

repertoire. This testifies to the effectiveness and potential of the use of VR in museums and justifies its continued role and place within museums.

The addition of technology in museums is nothing new and neither is the increasing interest in it. More audio-visual and interactive displays were already wanted in the early 2000s, illustrating the audiences' desire for new experiences within the museum environment.[182] Yet, in the questionnaire provided, the one thing that everyone agreed on was that 100% still want to see "real things" in museums.[183] Thus, even though VR and other new media, technology and methods are increasing in museums, it does not mean that they are competition for older, more traditional museum practices. The two can and should coexist and complement each other, providing a whole as a museum experience.

VR is part of the new technology that have "shifted the site of history's making, and have transformed the public from spectators of distant actions to participants in historical dramas".[184] The digital age and VR with it are having a profound impact on our engagement with the past and with museums. One can resist it or embrace it and fully welcome the potential that VR can bring to the museum world - once it is even more developed. "Traveling in time and space represents an old dream, which excited the imagination of numerous writers and artists. Virtual and augmented reality pushes this idea to a new level and enables to achieve the first steps in this direction."[185] I propose we, in turn, enable even more of these steps, and continue to monitor the use, role and effectiveness of VR in museums so that it can reach this potential.

[182] Black, p. 23.
[183] Appendix A.
[184] Weller, pp. 195-204.
[185] Baltsavias, p. 431.

References

Primary sources

A discussion with a representative from the Helsinki City Museum on the use of VR and other new media technology at their museum 03/05/2018 (With Laura Jones, notes in the possession of the author)

A discussion with a representative from The National Museum of Finland on the use of VR and other new media technology at their museum 04/05/2018 (With Laura Jones, notes in the possession of the author)

A discussion with a representative from the Victoria and Albert Museum on the use of VR and other new media technology at their museum 27/01/2017 (With Laura Jones, notes in the possession of the author)

Ahtee, Simo, 'Yhdistetty todellisuus avaa unohtuneita näkökulmia', *Lilja* 3 (2019), 11

Ashby, Jack, 'Museums and Virtual Reality: VR in the Grant Museum', *UCL Culture Blog* (15 February 2017) <https://blogs.ucl.ac.uk/museums/2017/02/15/museums-and-virtual-reality-vr-in-the-grant-museum/> [accessed 13 November 2021]

Burgess, Matt, 'Plummet from space with this Tim Peake VR experience', *Wired* <https://www.wired.co.uk/article/tim-peake-vr-science-museum> [accessed 13 November 2021]

Debenjak-Ijäs, Annukka A lecture called '3D-mallinnus museotyössä' (2020) (Notes in the possession of the author)

Flowers, Alex, 'V&A Samsung Digital Classroom: creative digital design education for young people', *A Flowers Website* <https://aflowers.co.uk/projects/va-samsung-digital-classroom-creative-digital-design-education-for-young-people> [accessed 13 November 2021]

Framestore VR, 'Natural History Museums' <http://framestorevr.com/natural-history-museums/> [accessed 13 November 2021]

Google Arts & Culture <https://artsandculture.google.com/> [accessed 11 November 2021]

Helsinki City Museum, 'Signe's birthday and opening of Time Machine 2.0', <https://www.helsinginkaupunginmuseo.fi/en/events/signes-birthday-and-opening-of-time-machine-2-0/> [accessed 13 November 2021]

Helsinki City Museum, ‘Time Machine’, <https://www.helsinginkaupunginmuseo.fi/en/exhibitions/time-machine/> [accessed 13 November 2021]

Holloway-Attaway, Lissa, A lecture on Designing Digital Heritage Network (DDHN) (2018) (Notes in the possession of the author)

Georgie Hoole, ‘This Incredible VR Installation Will Use Your Heartbeat To Create Stunning Visuals’, *Secret London* <https://secretldn.com/virtual-reality-experience-saatchi-gallery/> [accessed 13 November 2021]

Hujala, Susanna, A lecture called ‘Taidemuseoiden tulevaisuuden näkymät’ (2020) (Notes in the possession of the author)

Itäpiiri, Janne, A lecture from Zoan (2020) (Notes in the possession of the author)

Johnson, Colin, ‘Computer Visualisation of Dudley Castle c1550’, *Extrenda* <http://www.exrenda.com/dudley/dudley.htm> [accessed 11 November 2021]

Kansallismuseo, ‘Aikamatkailu on sittenkin mahdollista. Kansallismuseon uusi virtuaalitodellisuus heittää vuoteen 1863.’ (13/02/2018) <https://www.kansallismuseo.fi/fi/ajankohtaista/aikamatkailu-on-sittenkin-mahdollista-kansallismuseon-uusi-virtuaalitodellisuus-heittaa-vuoteen-1863> [accessed 13 November 2021]

Mankkinen, Jussi, ‘Haluaisitko keskustella keisarin kanssa tai testata Artekin kalusteita? Virtuaalitodellisuus mahdollistaa jo sisustuskokeilut ja museoiden aikamatkat’, *YLE* <https://yle.fi/uutiset/3-10092582> [accessed 13 November 2021]

Manninen, Kadja, A lecture from the National Museum of Finland (2020) (Notes in the possession of the author)

Natural History Museum, ‘Explore the Great Barrier Reef with Sir David Attenborough’ (2015) <http://www.nhm.ac.uk/about-us/news/2015/november/explore-great-barrier-reef-sir-david-attenborough.html> [accessd 17 November 2017]

Natural History Museum, ‘Virtual reality partnership launches with mantis vision experience’, <https://www.nhm.ac.uk/discover/news/2016/june/virtual-reality-partnership-launches-with-mantis-vision-experience.html> [accessed 13 November 2021]

Norman, Jeremy, ‘The First Use of Virtual Reality in a Museum or Archaeological Context’, *Jeremy Norman's HistoryofInformation.com: Exploring the History of Information and Media*

through Timelines <https://www.historyofinformation.com/detail.php?id=4082> [accessed 11 November 2021]

Oxford English Dictionary, *Reality* <https://www-oed-com.ezproxy.utu.fi/view/Entry/158934?redirectedFrom=reality#eid> (2013) [accessed 13 November 2021]

Oxford English Dictionary, *Virtual* <https://www-oed-com.ezproxy.utu.fi/view/Entry/223829?redirectedFrom=virtual#eid> (2013) [accessed 13 November 2021]

Oxford English Dictionary, *Virtual Reality* <https://www-oed-com.ezproxy.utu.fi/view/Entry/328583?redirectedFrom=virtual+reality#eid > (2013) [accessed 13 November 2021]

John Pickavance, 'Virtual Reality has the potential to transform teaching and improve learning', *Independent* <https://www.independent.co.uk/news/science/virtual-reality-transforming-teaching-improving-learning-a8913591.html> [accessed 13 November 2021]

Science Museum, 'Space Descent 360° with Tim Peake' <https://www.sciencemuseum.org.uk/see-and-do/space-descent-360-tim-peake> [accessed 13 November 2021]

Tate, 'Modigliani' <https://www.tate.org.uk/whats-on/tate-modern/exhibition/modigliani> [accessed 13 November 2021]

The British Museum website <https://www.britishmuseum.org/> [accessed 11 November 2021]

The British Museum website, 'A 3D interactive animation of the tomb-chapel of Nebamun' <http://www.britishmuseum.org/visiting/galleries/ancient_egypt/room_61_tomb-chapel_nebamun/nebamun_animation.aspx> [accessed 15 November 2017]

The British Museum website, 'Samsung Digital Discovery Centre' <https://www.britishmuseum.org/learn/schools/samsung-digital-discovery-centre> [accessed 13 November 2021]

The National Museum of Finland, New Technology at the National museum tour (2018) (Notes in the possession of the author)

Victoria and Albert Museum website <https://www.vam.ac.uk/> [accessed 11 November 2021]

Turku, ‘Turku goes 1812 vie virtuaaliselle kierrokselle aikaan ennen Turun paloa’, <https://www.turku.fi/uutinen/2019-03-11_turku-goes-1812-vie-virtuaaliselle-kierrokselle-aikaan-ennen-turun-paloa?fbclid=IwAR04UR4toJlgyVEcRxBzSi6qUkgGRS-Zs3jxFepLtkNG7pPGJ_OvZpoXtnM> [accessed 13 November 2021]

Turun Museokeskus, ‘Turku goes 1812 - VR-kokemus’, *Youtube* <https://www.youtube.com/watch?v=E8B8-I5abkw> [accessed 13 November 2021]

Viinikkala, Lauri, A lecture called ‘Museot ja yhdistetty todellisuus’ (2020) (Notes in the possession of the author)

V&A, ‘Composition for Immersive VR’ <https://www.vam.ac.uk/event/8KqLRRAa/composition-for-immersive-vr> [accessed 13 November 2021]

V&A, ‘Opera Weekender: Welsh National Opera presents Magic Butterfly VR Experience’ <https://www.vam.ac.uk/event/xRr3Bq51/welsh-national-opera-presents-magic-butterfly-vr-experience> [accessed 13 November 2021]

Secondary sources

Baltsavias, Emmanuel, et al., ed., *Recording, modeling and visualization of cultural heritage* (Leiden : Taylor & Francis, cop. 2006)

Bandelli, Andrea, ‘Virtual Spaces and Museums’, *The Journal of Museum Education* 24:1-2 (1999), 20-22

Barceló, Juan A., Maurizio Forte and Donald H. Sanders, ed., *Virtual reality in archaeology : Computer Applications and Quantitative Methods in Archaeology (CAA)* (Oxford : Publishers of British Archaeological Reports, 2000)

Bedford, Leslie, ‘Storytelling: The Real Work of Museums’, *Curator* 44:1 (2001), 27-34

Black, Graham, *The Engaging Museum: Developing Museums for Visitor Involvement* (London: Routledge, 2005), pp. 1-24

Blank, Trevor J., *Folk Culture in the Digital Age: The Emergent Dynamics of Human Interaction* (Logan: Utah State University Press, 2012)

Bodenhamer, David J., John Corrigan and Trevor M. Harris, *The spatial humanities : GIS and the future of humanities scholarship* (Bloomington : Indiana University Press, 2010)

Bulger, Monica, Eric T. Meyer, Grace de la Flor, Melissa Terras, Sally Wyatt, Marina Jirotka, Katherine Eccles and Christine Madsen, 'Reinventing Research? Information Practices in the Humanities', *SSRN Electronic Journal* (2011) <https://www.researchgate.net/publication/228295635_Reinventing_Research_Information_Practices_in_the_Humanities> [accessed 7 May 2018]

Cameron, Fiona, and Lynda Kelly, ed,. *Hot Topics, Public Culture, Museums* (Newcastle-upon-Tyne: Cambridge Scholars, 2010)

Cameron, Fiona and Sarah Kenderdine, *Theorizing digital cultural heritage: a critical discourse* (Cambridge, Massachusetts: The MIT Press, 2007)

Carman, John, *Against Cultural Property: Archaeology, Heritage and Ownership* (London : Duckworth, 2005)

Chang, Yu-Lien, Huei-Tse Hou, Chao-Yang Pan, Yao-Ting Sung and Kuo-En Chang, 'Apply an Augmented Reality in a Mobile Guidance to Increase Sense of Place for Heritage Places', *Journal of Educational Technology & Society*, 18:2 (2015), 166-178

Ch'ng, Eugene, Vincent Gaffney and Henry Chapman, *Visual Heritage in the Digital Age* (London: Springer London, 2013)

Forte, Maurizio, and Alberto Siliotti, ed., *Virtual archaeology : great discoveries brought to life through virtual reality* (London : Thames and Hudson, 1997)

Giaccardi, Elisa, *Heritage and social media: understanding heritage in a participatory culture* (Abingdon, Oxon: Routledge, 2012)

Kalay, Yehuda, Thomas Kvan and Janice Affleck, *New heritage: new media and cultural heritage* (London; New York: Routledge, 2008)

Leach, Denice Blair, ‘Dynamic Museum Place: Exploring the Multi-Dimensional Museum Environment’, *The Journal of Museum Education*, 32:3 (2007), 199-209

Marstine, Janet, *New Museum Theory and Practice: An Introduction* (Chichester: John Wiley & Sons, 2005)

MacDonald, Sharon, *Behind the scenes at the Science Museum* (Oxford: Routledge, 2002)*seum Theory and Practice: An Introduction* (Chichester: John Wiley & Sons, 2005)

Moser, Dennis, ‘Understanding the Impact of the New Aesthetics and New Media Works on Future Curatorial Resource Responsibilities for Research Collections’, *Art Documentation: Journal of the Art Libraries Society of North America,* 32:2 (2013), 186-201

Plesner, Ursula, and Louise Phillips, ed,. *Researching virtual worlds: Methodologies for studying emergent practices* (New York : Routledge, 2014)

Proctor, Nancy, ‘The Google Art Project: A New Generation of Museums on the Web?’, *Curator* 54:2 (2011), 215-221

Reading, Anna, ‘Digital interactivity in public memory institutions: the uses of new technologies in Holocaust museums’, *Media, Culture & Society*, 25:1 (2003), 67-85

Remondino, Fabio and Stefano Campana, *3D recording and modelling in archaeology and cultural heritage: theory and best practices* (Oxford: British Archaeological Reports, 2014)

Ryan, Marie-Laure, *Narrating space / spatializing narrative : where narrative theory and geography meet* (Columbus : The Ohio State University Press, 2016)

Sanders, Donald H., ‘Virtual Heritage: Researching and Visualizing the Past in 3D’, *Journal of Eastern Mediterranean archaeology & heritage studies* 2:1 (2014), 30-47

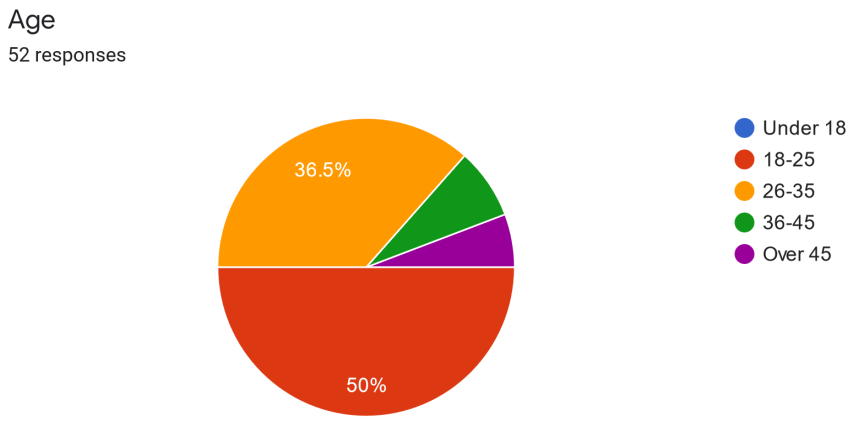
Smith, Mark M., ‘Producing Sense, Consuming Sense, Making Sense: Perils and Prospects for Sensory History’, *Journal of Social History* 40:4 (2007), 841-858

Weller, Toni, *History in the Digital Age* (London;New York: Routledge, 2013)

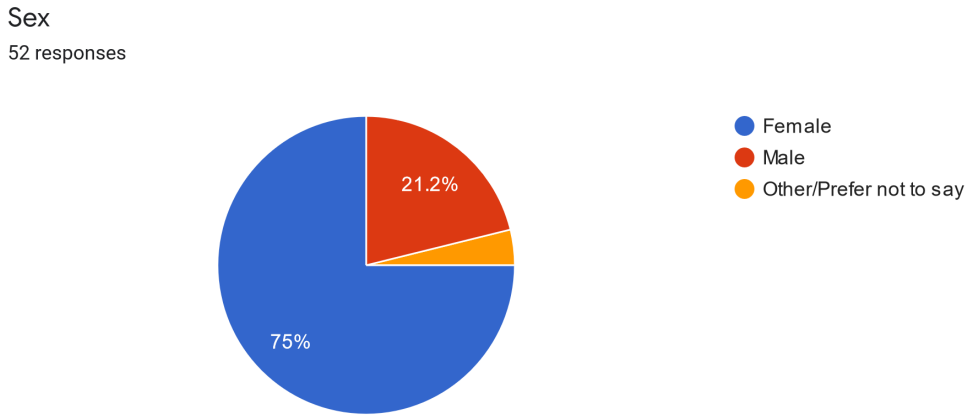
Appendices

Appendix A. Questionnaire - VR, Museums and Visitors - and its answers

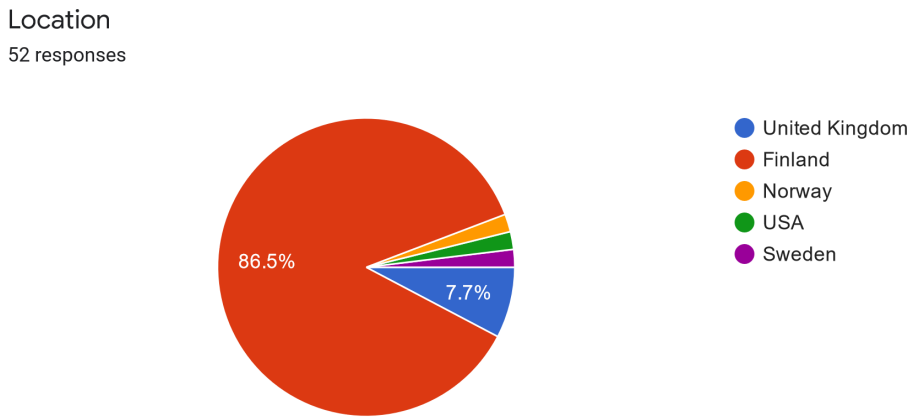
VR, Museums and Visitors



1. Age of respondents: 50% 18-25; 36,5% 26-35; 7,7% 36-45; 5,8% Over 45; 0% under 18

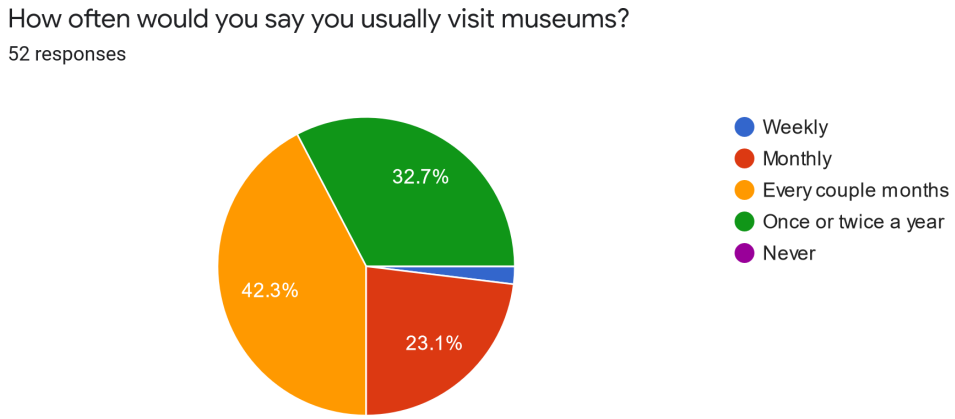


2. Sex of respondents: 75% female, 21,2% male, 3,8% other/prefer not to say



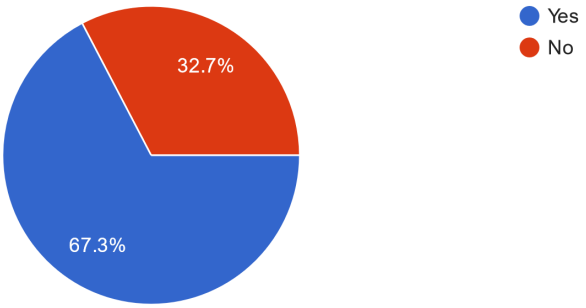
3. Location: 86,5% Finland; 7,7% UK, 1,9% Norway; 1,9% USA; 1,9% Sweden

VR, Museums and Visitors - Museum habits



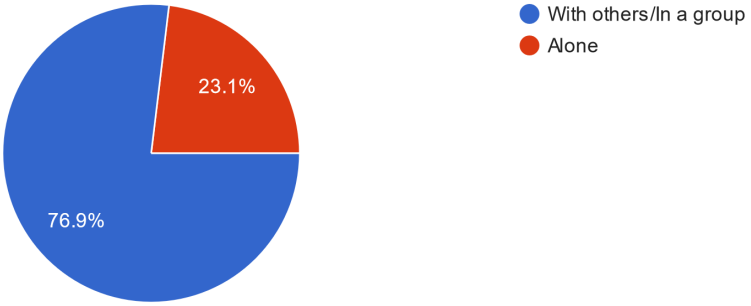
4. How often would you say you usually visit museums?: 42,3% every couple months; 32,7% once or twice a year; 23,1% monthly; 1,9% weekly; 0% never

Do you actively check for exhibitions &c. that might interest you?
52 responses



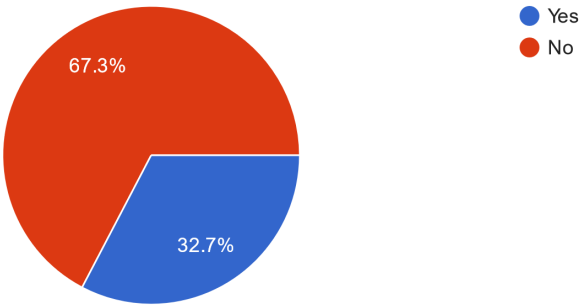
5. Do you actively check for exhibitions etc. that might interest you?: 67,3% yes; 32,7% no

Do you usually visit museums:
52 responses



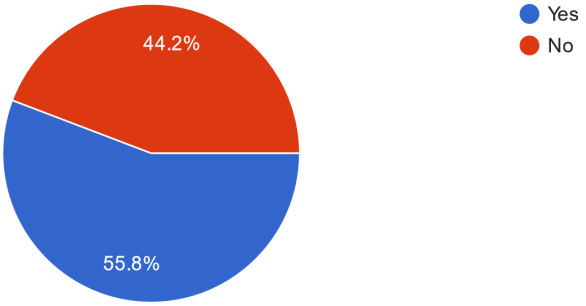
6. Do you usually visit museums: 76,9% with others/in a group; 23,1% alone

Do you mind paying extra for an exhibition in a museum that usually has free entry?
52 responses



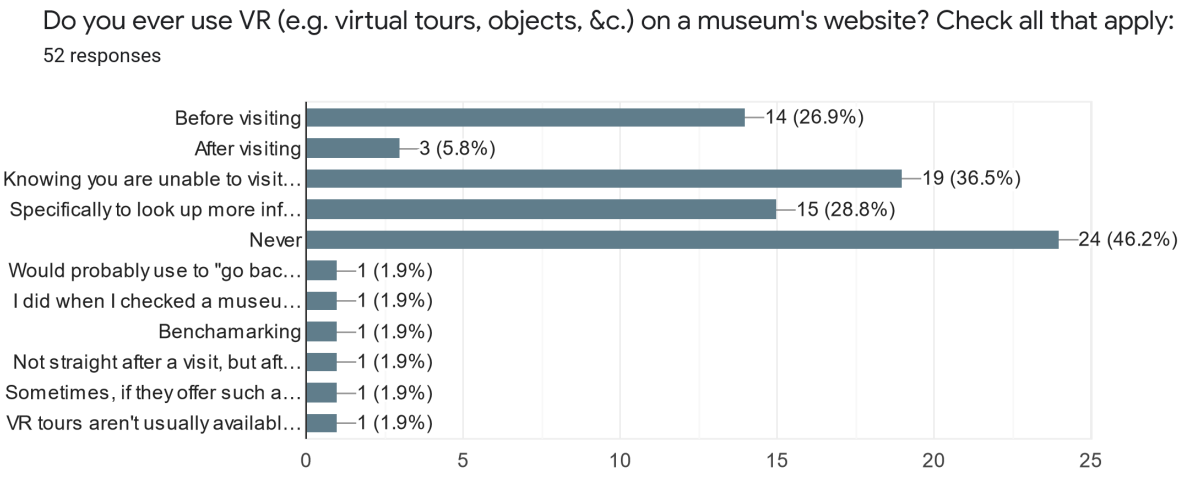
7. Do you mind paying extra for an exhibition in a museum that usually has free entry?: 67,3% no; 32,7% yes

Do you mind paying extra for an exhibition in a museum that usually already has an entrance fee?
52 responses

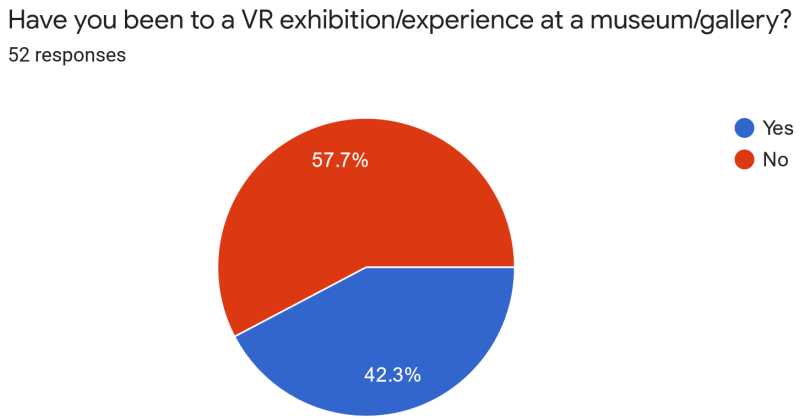


8. Do you mind paying extra for an exhibition in a museum that usually already has an entrance fee?: 55,8% yes; 44,2% no

VR, Museums and Visitors - VR in Museums

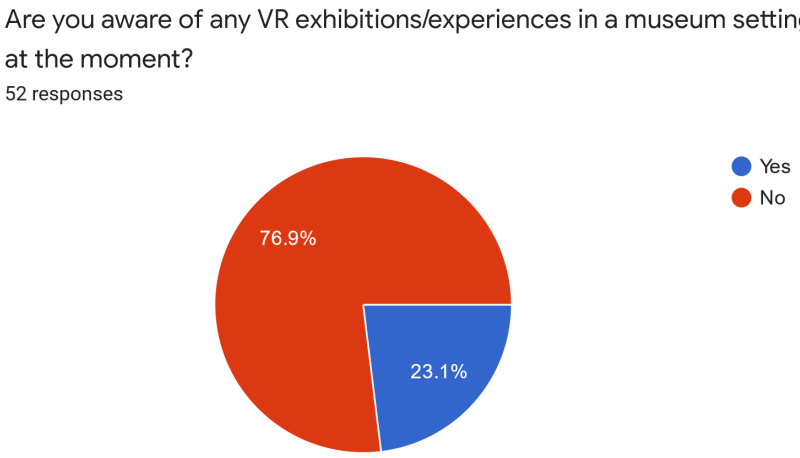


9. Do you ever use VR (e.g. virtual tours, objects, etc.) on a museum’s website? Check all that apply: 46,2% never; 36,5% knowing you are unable to visit the museum "in real life" for whatever reason; 28,8% specifically to look up more information on something that was advertised or something you saw at the museum; 26,9% before visiting; 5,8% after visiting; 1,9% other/”Would probably use to "go back/ revisit" my favourite piece at the museum if was possible”; 1,9% other/”I did when I checked a museum out. But I may not intend to visit it”; 1,9% other/”Benchamarking [sic]”; 1,9% other/”Not straight after a visit, but after years have past to reminisce [sic]”; 1,9% other/”Sometimes, if they offer such a thing and I'm particularly interested in the architecture or art or whatever it is they showcase in the VR application. I mostly do it for novelty purposes, though.”; 1,9% other/”VR tours aren’t usually available in those museums that I usually visit. And I don't own a VR set.”



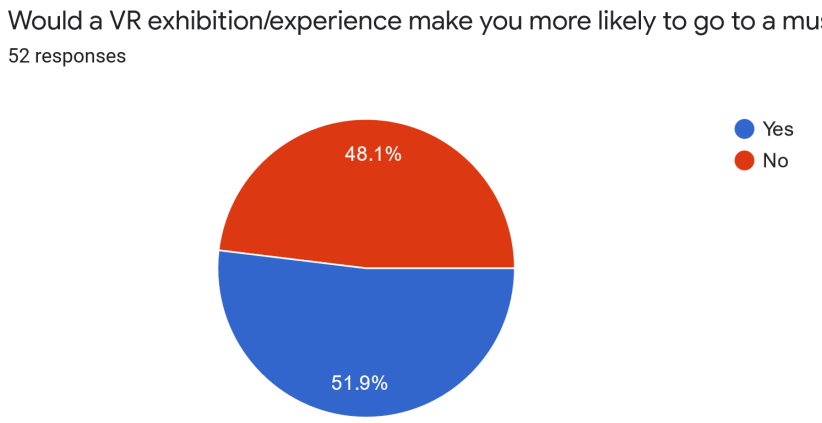
10. Have you been to a VR exhibition/experience at a museum/gallery?: 57,7% no; 42,3% yes
11. If yes, what was it? Describe your experience if you want to.:
    a. “Time Machine @ Helsinki City Museum [sic]”
    b. “It was in the Helsinki City Museum, they have a room for the VR experience. The experience was below what I expected, it basically felt like I was floating in the air. It would have been better if it was filmed more on the ground (from a person who is walking). Also one of the VR "glasses" were broken, which is a side effect of this experience. Sometimes the technology might fail. [sic]”
    c. “It was an exhibition put up by art students. It is one of the installations made by students”
    d. “In Kiasma.”
    e. “Some exhibition about Helsinki's history in Helsinki Museum”
    f. “e.g. "Aikakone", Helsingin kaupunginmuseo”
    g. “Instant migraine”
    h. “Louvre”
    i. “I have a couple of experiences. Sometimes with VR games brought into museums and other times with more traditional media/visual art made for VR. It's been OK, but hasn't felt terribly interesting as art. Rather than be art, it has always been very much about "THIS IS VR ART, WOW": the medium gets most of the artist's as well as the audience's attention, so the art itself is a little half-baked.”

j. “Art piece that was only possible to see and interact with VR headset.”
k. “In Helsinki City Museum (in Aleksanterinkatu). It was about old Helsinki city view. Worked well. [sic]”
l. “In iceland, at a whale museum. There was vr glasses where you could feel you were in the ocean with whales swimming around you. [sic]”
m. “It was at Helsinki City museum. There were VR glasses to show how Helsinki looked like in the past.”
n. “Part of the exhibition, a piece of art”
o. “Turku Art Museum, in the Pimiö right now. I don’t remember the name but it was a virtual art experience about questions of posthumanism and nature.”
p. “I have once tried VR headset in a museum. [sic]”
q. “I was at Turku Cathedral but I´m not sure if that´s considered vr-exchibition. [sic]”
r. “HTC Vive simulation of Apollo 11 mission.”



12. Are you aware of any VR exhibitions/experiences in a museum setting near you or in your country at the moment?: 76,9% no; 23,1% yes
13. If yes, which ones?:
    a. “Time Machine @ Helsinki City Museum [sic]”
    b. “The Helsinki City Museum.”
    c. “At least in Helsinki, yes, not sure about places elsewhere.”

d. “There was an article about a VR experience in Kansallismuseo just about a day ago in Turun Sanomat.”
e. “The National Museum of Finland has VR service that gives you the opportunity to visit Finland's parliament in 1863 and also Helsinki City Museum offers opportunity to step out on early 20th century's street in Helsinki. [sic]”
f. “see previous answer”
g. “National Museum (Kansallismuseo) in Helsinki”
h. “Ateneum (Helsinki)”
i. “E.g. Helsinki city museum has VR glasses and you can look at old photograph from early 20th century [sic]”
j. “Small parts in National Museum and Helsinki City Museum”
k. “Smithsonian, VR exhibits and online virtual tour.”

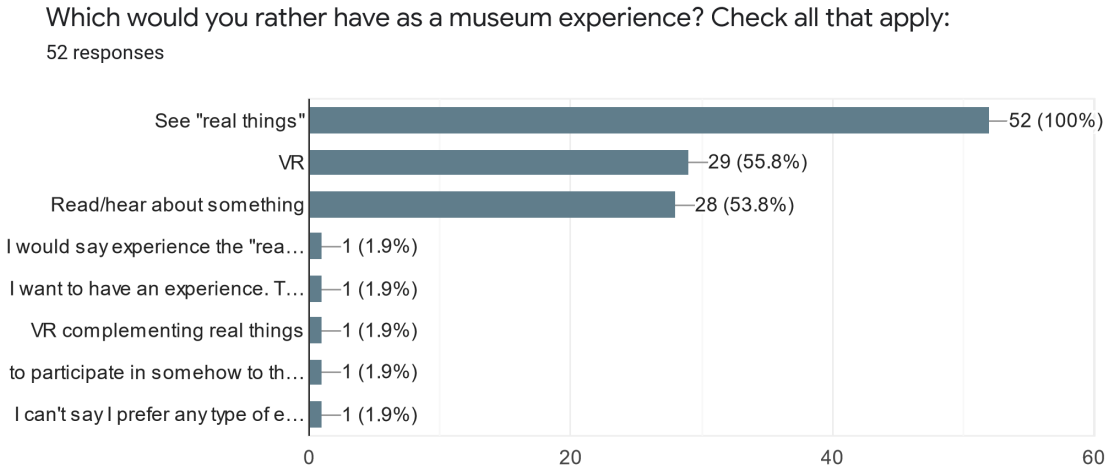


14. Would a VR exhibition/experience make you more likely to go to a museum?: 51,9% yes; 48,1% no
15. Why or why not?:
    a. “Depends, but generally not. More interested in the subject matter than the means of exhibiting them.”
    b. “Its a different experience! [sic]”
    c. “For me it's the experience of going to the museum and seeing the old artefacts that makes me connect more with history. I go to see these objects. If there is a

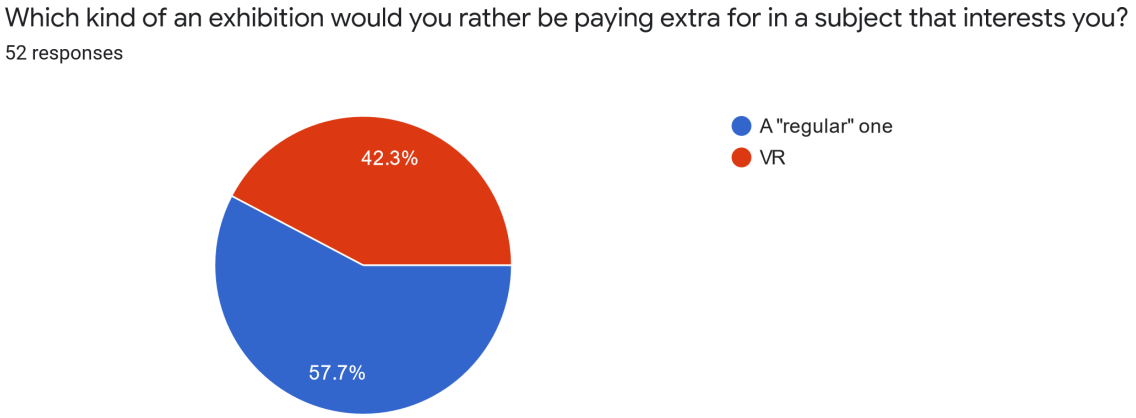
VR experience there I would also be interested in doing that, but it wouldn't be the primary reason I would go."

d. "I maybe wouldn't go to an all VR/ VR obly exhibition, but if it was a part of it then yes it would be interesting. Like seeing an artist's exhibition then being able to expirience their studio/atelier with VR would be awesome [sic]"
e. "It's more interesting and more interactive, VR is a new thing and it could make the experience more "modern" than the typical museum experience."
f. "The VR experience is not that amazing because the image quality is usually bad"
g. "It would be a new way to experience something familiar."
h. "I believe this technology would be perfect for something like a museum. It opens so many new ways of presenting the exhibitions to visitors."
i. "It makes the exhibition a bit more interesting and makes me feel like I'm part of art."
j. "I can see VR being a great tool for younger generations and to get them interested about museums, but I don't feel like VR is for me right now (or yet)"
k. "I choose exhobitions depending on their content. VR itself doesn't interest me, but would be ok as an addition to an interesting exhibition. [sic]"
l. "I go to museums anyways"
m. "I'm very interested in trying it and to see how it looks/feels."
n. "It gives you more intense experience [sic]"
o. "I think it could make my experience more memoriable, that is nice to remember later. [sic]"
p. "I like museums with or without VR. I use my imagination so I don't need VR to enhance the experience. It can be a nice thing but it doesn't significantly increase my interest towards museums."
q. "It is still a gimmick, an instrument. There has to be interesting content, VR is just a way to show it."
r. "Not the VR itself. There would have be something that I want to see on site. [sic]"
s. "It makes the experience more exciting. VR is still something that not every museum has, so at least for me it's something new and therefore thrilling."

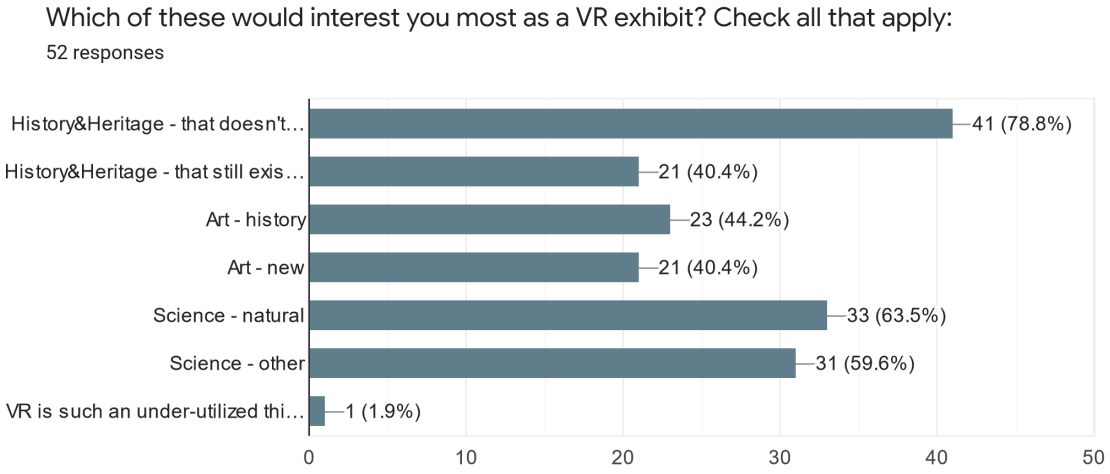
t. “I kind of want to answer "It depends" instead of "Yes" or "No". I would totally go to a VR exhibition if the artists, works, themes, or whatever other contextual details of the exhibition interested me. I mean, it's the same as with non-VR exhibitions: I visit them if I'm interested in them. Them being performance art, media art or classic oil paintings or whatever doesn't really affect the likelihood. There's always something that sparks my interest. And if there isn't, I don't go to the museum. So, can't really give a yes/no answer.”
u. “VR experience is not the thing that makes exhibition interesting as itself, but if it is used in an otherwise interesting piece, I would like to see it.”
v. “It seems fun and different.”
w. “I find it an interesting idea!”
x. “I´m pleased with the exhibitions as they are at the moment. [sic]”
y. “It might be interesting”
z. “Actually it does not really matter if there is a VR experience or not.”
aa. “I visit museums anyway”
bb. “I'm intrigued by new experiences.”
cc. “I have not tried out VR yet.”
dd. “The content of the exhibition it´s more important than VR-experiences [sic]”
ee. “It’s interesting, though not my all time favorite art form. But it does bring up interesting questions about art and the limits of art.”
ff. “It depends on a topic. I didn't feel like it brought much more to the experience when I used the headset. [sic]”
gg. “I`m enough in virtual world in my free time as it is. In museums I`d like to see and experience things without virtual assistence. [sic]”
hh. “Not that interested in VR”
ii. “It would be an interesting experience and I'm sure I would get more out of a museum visit using VR.”
jj. “VR provides an often fun bit of interactive learning.”



16. Which would you rather have as a museum experience? Check all that apply: 100% see “real things”; 55,8% VR; 53,8% read/hear about something; 1,9% other/”I would say experience the "real things" than only see. [sic]”; 1,9% other/”I want to have an experience. The nice thing about art is that "an experience" is pretty much guaranteed, regardless of the details. I go to museums to feel, think, learn, and be social. I want to see art and historical objects and broaden my horizonts. With an approach like that, a preferred museum experience is anathema to what I'm looking for in museums. (For this reason, the next question is impossible for me to answer. I chose 'VR' but please correct the data to reflect that I would just as likely have chosen the other option.) [sic]”; 1,9% other/”VR complementing real things”; 1,9% other/”to participate in somehow to to the pieces [sic]”; 1,9% other/”I can’t say I prefer any type of experience over others. My preference is subject matter dependant."

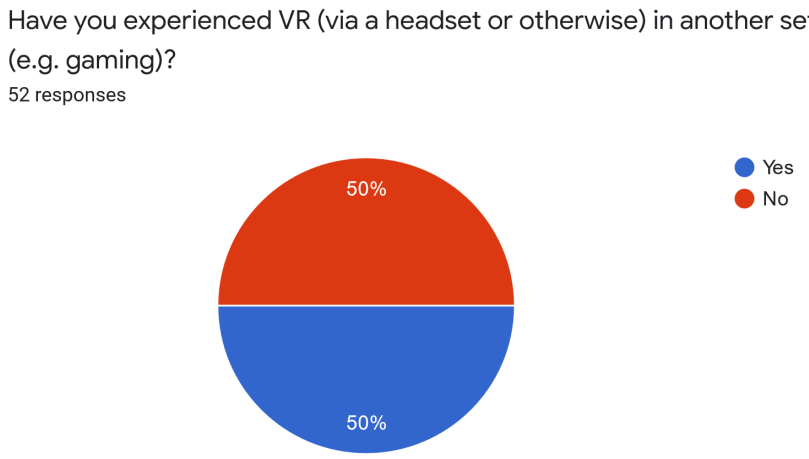


17. Which kind of an exhibition would you rather be paying extra for in a subject that interests you?: 57,7% a “regular” one; 42,3% VR



18. Which of these would interest you most as a VR exhibit? Check all that apply: 78,8% history and heritage - that doesn’t exist anymore; 63,5% science - natural; 59,6% science - other; 44,2% art - history; 40,4% history and heritage - that still exists in full or partially; 40,4% art - new; 1,9% other/”VR is such an under-utilized thing in museums still, I feel, so basically I would like to see more of it. On any themes. And again, it's not so much a specific category or media that interests me but the work itself. Art history VR could be the bee's knees or an absolute bore, depending on how it's made. And the more VR is used, the better the art and practices become, I hope.”

VR, Museums and Visitors - VR



19. Have you experienced VR (via a headset or otherwise) in another setting than a museum/gallery (e.g. gaming)?: 50% yes; 50% no

20. Any comments/how do you feel in regards to VR in museums?
    a. "VR is a really nice concept, but it should be used in specific ways, for e.g. if you don't have the budget to rebuild de room of an artist, you make it VR [sic]"
    b. "It's a cool edition to the normal exhibitions, and could definitely help create a stronger relation and experience of the exhibition. [sic]"
    c. "It could be cool exhibitions, for example they can have a VR experience about some historic event see through first person camera, it ll be like if you time travel [sic]"
    d. "will bring museums into the 21st century and engage young people again"
    e. "I'm very open for it I think it has a lot of possibilities. [sic]"
    f. "I have never seen or heard about VR in museums but it is really a great idea."
    g. "they need to enhance the VR quality."
    h. "Should be used more widely."
    i. "I would like to see it used more and new ideas that could stem from it."
    j. "I wish there would be more"

k. “It's not future, it's present day and museums should take advantage of it more. [sic]”
l. “It would be very interesting and I am looking forward to see what happens in the future! [sic]”
m. “see previous answer”
n. “Content is king, VR is just a way to deliver it.”
o. “a good aid to exhibit something that either doen's exist anymore or is hard to experience otherwise for example due to size (outer space or bacteria) [sic]”
p. “Amazing!”
q. “It's the future of museums.”
r. “I think once VR technology advances further it will become a very imortant method in museums and education in general. The possibilities are endless.. [sic]”
s. “I would want to experience it”
t. “If it really adds something to the exhibition then I'd say it's a handy tool bringing things 'to life'.”
u. “I feel it has incredible potential. Especially in regards to different historical sites, that might otherwise suffer from real life visitors.”
v. “nothing”
w. “I believe it could be an interesting thing once VR advances. Right now VR still feels a little clumsy.”
x. “VR, if implemented correctly, is a great way to resurrect/reimagine the past, present, and future in an interactive and exciting manner. Although there still plenty of technological limitations, the only real limitation to VR in museums is the imagination of the historian. [sic]”

21. Any comments/how do you feel in regards to VR in general?
    a. “They are ok if you need them for an specific reason, but not something you need in general [sic]”
    b. “VR is a very interesting area that I think will keep developing. Just as AR.”
    c. “Good technology and it could change a lot of fields”
    d. “I find it interesting, waiting to experience some very realistic VR”

e. “I played a game once on VR and it is really brilliant”
f. “It can be a future trend, but first the image should be made more realistic and it should be made more fun and interactive. It should also allow multiple users to enjoy it together”
g. “An excellent opportunity that should be explored more and used braver in education and entertainment.”
h. “We have the technology so why wouldn't we use it? VR has endless possibilities.”
i. “A bit reserved, but nothing against it - just doesn’t appeal to me personally. Would be cool to hang out with dinosaurs though!”
j. “Its possibilities to use it are limitless. [sic]”
k. “I think that it will be significant in the future”
l. “I find it entertaining”
m. “still needs work. Still brings me migraine. [sic]”
n. “the sound world of VR is unfortunately underdeveloped, and that affects the whole experience. I am not saying that VR should take all the senses into account. I think we don't have the technology for that yet, but the sound technology is there... well just saying.... [sic]”
o. “Still amazing!”
p. “Ehh. It's cool, I guess? I think we're still ways off from truly interesting VR experiences, but we're certainly getting closer! It's the same as it was with the internet. At first, it was difficult to see much use - artistic or everyday - for it. But fast-forward a few years and all of a sudden a lot of the most interesting discussions, art, and general everyday interaction takes place there. I'll be interested to see where VR goes and how it will mesh with the rest of our mediated technological practices and spaces.”
q. “Good but I don't want it to be a part of everyday life.”
r. “Have you seen/read Ready Player One? The moment a VR world like Oasis becomes available I will not be available irl ever again regardless of the costs (monetary or otherwise)”
s. “I find it interesting overall”

t. “I see the potential. Personally I'm waiting for the technology to go through a few generations, becoming less cumbersome and expensive, before buying into it myself.”
u. “not really interests me; indifferent, does not add value to experiences [sic]”
v. “I'm very interested in VR since I find the advancements in video games astonishing and see VR as a sort of natural next step.”
w. “The high financial barrier to entry for a quality VR experience has stifled consumer adoption; thus the technology's growth has slowed. Hopefully, multimedia megacompanies like Disney can reinvigorate the medium.”