The Museum of the Web

A quantitative study into the Cultural User Experience of Digital Storytelling practices in Virtual Museums

Student name: Josephine Timmers
Student number: 585411

Supervisor: dr. Trilce Navarrete Hernandez
Second Reader: dr. Hans J. Roscam Abbing

Erasmus School of History, Culture and Communication

Master Thesis
20-06-2021

Abstract

Not only the Covid-19 pandemic, but also developments in virtual tourism and climate change emphasize the importance of museums changing their business models. Developing virtual museum services is currently one of the most important of these changes, especially since remote cultural consumption has severely increased during the past year.

The development of virtual museums - interactive virtual spaces that provide information and exhibit cultural objects in digital format - has rapidly increased since the notion was first introduced in the 1960's. Simultaneously, a visitor-centred approach emerged, giving rise to a shift from the modernist museum to the post-museum. Virtual museums fall in line with this approach, as they allow for new types of interaction with online visitors. Storytelling is an important practice that allows visitors to engage in their own story. The application of digital storytelling practices in virtual museums creates an opportunity to not only provide a solution for the current restrictions, but to change the museum business model accordingly with a changing society.

This study shows the importance of digital storytelling for virtual museums by conducting a user-centred research, focusing on Cultural User Experience. Cultural User Experience is measured for three virtual museum services of the British Museum, all practicing a different approach to Digital Storytelling. An in-between-subject showed the story is the most important, as no significant difference between digital storytelling and regular storytelling was found in any of the constructs. What the research did find, is that a service that incorporates digital storytelling practices brings about a stronger emotional response and is perceived higher in hedonic qualities than a service that is immersive but offers no explicit storytelling. The study also showed that the application of storytelling for the British Museum services was not enough, as the digital storytelling practices applied did not significantly differ from the regular storytelling practices in perceived user experience or future behaviour. In order for museums to change their business models, virtual museums need to become even more interactive, offering communities to engage and actively share their story.

The findings of this research prove the importance of digital storytelling for virtual museums, but show that in order for visitors to really connect with the virtual museum, museums need further develop their virtual services. This research provides insides the museum sector could use in the development in new services and sheds a new light on Cultural User Experience.

Keywords: *Virtual Museum, Cultural User Experience, , (Digital) Storytelling ,Visitor-Centred Approach, the British Museum*

Table of Contents

List of tables and figures

1. Introduction

In this chapter, the central topic of this thesis is introduced. First, a short overview of recent events and current development in the tourism and museum industry is provided, as well as current academic challenges. Then, the aim of the research question is elaborated on. Finally, the structure of the thesis is explained.

1.1. Covid-19's impact on the museum sector

Even though tourism has faced crises before, the impact of the Covid-19 crisis has, from an economic point of view, been more devastating than any other crisis in recent history (UNWTO, 2021). Due to restrictions caused by the Covid-19 crisis, many public spaces including museums were forced to close their doors to visitors. Whilst in 2019 the Dutch museum sector was growing, welcoming 34 million visitors and generating 17% more revenue than in 2015 (CBS, 2020), in 2020 visitor amounts are estimated to have decreased with almost 75% to 8.7 million visitors (Museum Vereniging, 2019). This was a hard blow for not only the cultural sector, but for the national economy as well. In the last decades, the cultural sector contributed about 2.3% to the Dutch GDP (Minsiterie van OCW, 2018). When applied to 2019, this accounted for 15,6 billion euros (Van der Veen, 2020).

The cultural sector not only impacts the economy with direct contributions to the GDP, it also creates employment opportunities, contributes positively to the social and business climate of a region and is important for the image of a country (Van der Veen, 2020). Furthermore, the creative industries are the breeding ground for ideas, and are regarded a catalyst for innovation in other sectors (Van der Veen, 2020). It is therefore vital that the institutions within the creative industries are maintained. Since the introduction of the restrictions, many museums have launched digital initiatives in order to still be able to welcome visitors, albeit online. These online initiatives might be temporary until museums are allowed to welcome visitors again, however they could very well be here to stay. Even if the services are offered for free and thus will not directly result in economic profit, it is important that these services exist, and that these services are studied. In the next section, this importance is further discussed.

1.2. Technological solutions

According to Gretzel et al. (2020), technology plays an important role in finding solutions and answers to questions about the evolution of travel and the tourism industry. For example, Travel Live Streaming (TLS) is gaining attention of tourist destinations, online travel agencies and social media platforms, as they are attempting to keep travellers engaged

during times of remote contact (Deng et al., 2021). Information & Communication Technology (ICT) services are already intertwined with travel and tourism. Since the beginning of the pandemic, these technologies have been widely adapted to address pressing problems in people's daily lives, including work, leisure time, and travel (Gretzel et al., 2020).

Museums are a core fragment of the tourism and culture industry and attract a large amount of visitors with various ages, financial and cultural backgrounds, and physical abilities (Doukianou et al., 2020). Even though many museums already implemented digital technologies prior to the introduction of the Covid-19 restrictions, these restrictions have forced visitors to now exclusively experience cultural material through digital mediums (Burke et al., 2020). Gretzel et al. (2020, p. 190) describe how online museums have opened their doors to "bored wannabe tourists stuck in quarantine" that are flocking on online exhibitions and other experiences. Museums have always managed access and use of their online resources, but this 'digital revolution' is changing cultural consumption patterns, forcing museums to re-think their relationship with audiences and users of cultural content (Bertacchini & Morando, 2013). This post Covid-19 technology is reported to facilitate shifts in consumer behaviour (Gretzel et al., 2020).

In the current neo-liberal economy, museums have focused on monetising in-person experiences through tickets sales, museum cafés, museum retails, site rentals and other special events (Larkin & Burtenshaw, 2021). However, since the introduction of Covid-19 restrictions, these methods have mostly lost their value. The fact that it was still unclear when and how museums were able to open their doors again in combination with other societal challenges as for example climate change and mass tourism, highlights the importance of ongoing innovation and diversification of the museum business model (Larkin & Burtenshaw, 2021). To illustrate, the city of Venice has recently banned cruise ships from their ports in order to save cultural heritage and the environment (Robbins, 2021). According to Larkin & Burtenshaw (2021), these challenges mean that museums have to develop methods to create experiences and products that can be offered directly to the public, rather than luring visitors to a physical site. The developing digital economy and altering modes of cultural consumption allow opportunities to create captivating new forms of engagement (Larkin & Burtenshaw, 2021).

1.3. Virtual museum research

Little to no research has been conducted about the reaction of visitors to the online initiatives of museums. The studies that have been conducted, mainly cover the digital initiatives museums launched since the beginning of the Covid-19 crisis and primarily focus on the variety of digital responses to the pandemic (Burke et al., 2020; Agostino et al., 2020; Zbuchea, et al., 2020). Equally little research focused on the analysis of how users could be more satisfied and engaged with digital outlets (Calvo-Porral et al., 2016). This lack of empirical support is a serious concern for museums. Not understanding online visitors' needs causes museums to not have the necessary insights to fully provide online services that lead to satisfaction (Hertzum, 1998, as cited in Marty, 2008). The understanding of how museum visitors use these online initiatives in their daily lives and how they experience them is thus critical for the success of museums in the information age.

1.4. Current challenges

According to Larking and Burtenshaw (2021) two challenges have emerged in regard to museums shifting to online environments. The first challenge is the need to shift from digital storytelling techniques that replicate in-person experiences, like online catalogues and virtual exhibitions, to an increasingly dynamic experience that visitors would be willing to pay for. The second challenge is to then find suitable methods to commercialise these types of content (Larking & Burtenshaw, 2021). Next to these (more recent) challenges regarding online museum environments, other challenges have emerged as museums have had to rethink their purpose in society during the last decades (Nielsen, 2017). One emerging practice is that museums are adopting a participatory and engaging approach in order to improve communication and interaction with their audience (Brown & Mairesse, 2018). A museum can no longer expect that a single approach, label or type of experience will satisfy everyone (Falk & Dierking, 2016, p. 298). Creating museum experiences that build meaningful bridges between museum's needs and agendas and the public's needs and agenda's, is something that museums ought to begin with (Falk & Dierking, 2016). The ideal strategy for realizing such an environment, in which visitors of all ages and backgrounds are encouraged to create their own meaning and find the intersection between the familiar and the unknown, is storytelling (Hein, 1998, as cited in Bedford, 2001). As Wyman et al. (2011, p. 463) have stated, the question is not whether people are interested in stories, it is: "How can museums best frame content to make it desirable?".

The emergence of these recent challenges regarding online environments in combination with the fact that museums are increasingly trying to adopt participatory and engaging approaches, has led to the focus of this thesis: The implementation of digital storytelling practices by virtual museums and the perception of these technologies by the public. In this thesis, different opportunities for interaction and engagement as facilitated by digital storytelling practices are elaborated on by creating an experimental setting. Through an in-between-subject experiment, multiple Virtual Museum services and their storytelling practices are evaluated. By conducting this research, more insights into the appreciation of different types of virtual museum and corresponding differences in virtual storytelling are generated. The results of this research contribute to practice in the sense that museum professionals gain insight into which types of virtual museum services are perceived as a better experience than others. Furthermore, academic insight is provided by shining more light on the cultural user experience and the appreciation of online cultural services.

1.5. Thesis structure

This thesis is structured as follows. In the literature review, several topics are discussed and the central research question of this thesis is introduced. In order to gain insight into the economic positions of museums and to understand the need to shift approaches, the (virtual) museum is assessed from an economic and cultural perspective. Secondly, changing user needs and digital consumption are looked at, since virtual museums operate in online environments. Thirdly, digital storytelling practices are introduced as to understand the potential of these practices. Then, a conceptual framework is developed in order to create a concrete and coherent model that can be tested. Hypotheses are subsequently formulated, derived from the theories applied in this research. For this research, a self-administered survey was developed in which participants were, through an experimental setting, asked about their experience in a virtual museum. In the methodological section, the research process is elaborated on. Additionally, the three virtual museum services that are looked at in this thesis are introduced and discussed. In the last part of the methodology, the measurements are operationalised and first indications of reliability are provided. In the result section, general information about the sample is discussed, empirical findings are presented, and the hypotheses as drafted in the theoretical framework are either accepted or rejected. In the conclusion, an overview of the research findings is presented, and the conceptual model as displayed in the theoretical framework is adapted to show the accepted and rejected hypotheses. In the discussion, implications of the research findings are discussed and an

explanation for the rejected hypotheses is given. Finally, current research limitations and future research suggestions are discussed.

2. Theoretical Framework

This chapter consists of a literature review, followed by the operationalization of the conceptual framework. The review consists of three parts and covers several topics. The first section contains theory on the (virtual) museum as a societal and economic institution, and discusses the role of the museum in a societal and economic context. Then, the application of ICT to museums and economic considerations for these applications are looked at and a definition of the virtual museum is introduced. In the second section, a light is shed on changing consumer needs and how the emergence of ICT can fulfil these. In the third section, (digital) storytelling practices and the role of storytelling in museums are looked at. In the fourth section, the theories and opportunities from the previous sections are materialized into the research question. Additionally, a conceptual framework is operationalised and hypotheses are developed.

2.1. The (virtual) museum as a societal and economic institution

In order to understand why museums might have to innovate and diversify their business model to maintain themselves in the current society, the museum as a societal and economic institution is elucidated. First, the role of the museum in a changing society is discussed. In this section, the definition of a museum is presented, and the emergence of the visitor-centred approach is looked at. Thereafter, the economic models of museums are elaborated on as a means to gain more insight in why museums operate the way that they do, and to understand how virtual museums could fit in this context.

2.1.1. Museums in a changing society

Definitions of a museum are constantly evolving (Brown & Mairesse, 2018). The current definition of a museum, as adopted by the 22nd General Assembly in Vienna, Austria, on 24 August 2007 is as follows (ICOM, 2007):

> "A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment."

Zbuchea et al. (2020) argue that definitions like these are too narrow, considering the evolution that museums have gone through in relation to their audience. It was generally understood that knowledge is the commodity that museums offer (Hooper-Greenhill, 1992).

Museums could function as places where perceptions can be altered, and would therefore contribute to knowledge (Hooper-Greenhill, 1992). There has never been only one form of reality for museums however, as they have had to adapt their practices according to social, economic, and political forces throughout history just as any other social institution (Hooper-Greenhill, 1992). These past recent years, museums had to rethink their function in society and the contexts in which they operate again (Sitzia, 2019).

Before, the educational approach that was adapted by museums was based on a more formal form of didacticism, as placing objects on view was considered enough to facilitate learning (Hooper-Greenhill, 2000). In more recent years, education is increasingly viewed as a process, and experience and visitors' learning needs in combination with their diverse social characteristics and cultural backgrounds are recognized and prioritized (Hooper-Greenhill, 2000). Before, academics, curators and conservators would assign meanings to collections, injecting these collections with a certain flair of superior authority, which is claimed to be reinforced by a perceived safe and neutral environment that museums would provide (Smith, 1989, as cited in Mutibwa, 2020). Museum workers however remained fairly unaware of their practices, and a critical approach had barely been adopted (Hooper-Greenhill, 1992). As a consequence, museums would rarely accommodate, construct, represent and interpret multiple perspectives of a shared past, and the nature of possible connections between collections and the general public were rarely investigated (Mutibwa, 2020). Nowadays, the role of the museum has gradually shifted from an institution that is merely presenting and defending elite culture, to promoting alternative types of content, knowledge transfers and production (Sitzia, 2019). A shift from a modernist museum as a site of authority, to a post-museum as a site of mutuality occurred (Hooper-Greenhill, 2000).

Museums are now expected to move beyond their role as research, exhibition and collection facility into facilitators of engagement and experiential visits (Elgammal et al., 2020). Museums have increasingly turned into 'contact zones' (Clifford, 1999 as cited in Sitzia, 2019), social inclusion tools (Sandell, 2002, as cited in Sitzia, 2019) and constructivist terrains of knowledge production (Falk & Dierking, 2000, as cited in Sitzia, 2019). They are starting to consider themselves, and are increasingly considered, agents of local development. Here, they could have the potential to generate wellbeing (Zbuchea et al., 2020). Furthermore, cultural and educational relevance are still at the core museum activity but are more and more considered in an "interactive and experiential framework", occupying a societal focus (Zbuchea et al, 2020).

2.1.2. Museum economics

Museums are non-profit, permanent institutions that serve society (ICOM, 2007). In economic terms, museums have strong 'public good' characteristics, meaning that they are non-excludable and non-rival (Towse, 2010). As a consequence there is a considerable amount of public intervention in the sector, including public ownership and financial support (Towse, 2010). Furthermore, museums and their physical collections are non-reproducible, meaning that an item's stock of supply in a point in time is fixed or declining. As times continues however, museum collection could also grow as more items are collected over time. On the other hand the 'profusion struggle' is a growing issue, forcing curators to rethink their way of collecting, to reconsider the importance of the already existing abundance of objects and eventually even to consider the disposal of items (Morgan & MacDonald, 2020). For a physical museum, what drives up the price is this fixity of supply in the presence of a growing demand (Towse, 2010). In this section, the economic characteristics of a museum are further discussed. This is done in order to understand the financial structure of a museum better, and to see where the economic challenges and opportunities for virtual museums are located. First, the characteristics are discussed for the physical museum, thereafter the virtual museum is introduced and elaborated on.

2.1.2a Demand.

There are two types of demand for a museum: the first type is private demand, which could be applied to visitors (Frey & Meier, 2006). Generally, this type of demand for physical museums can be defined as "the number of tickets that would be purchased at various entry prices for visitors wishing to view the collection" (Towse, 2010, p. 242). Private demand entails individuals that are interested in exhibitions for leisure or professional purposes such as schools, families, etcetera. (Frey & Meier, 2006). The majority of visitors has leisure related reasons for visiting a museum (Frey & Meier, 2006). There are three major determinants for demand: 1) Admission fees: These often seem to be low in price elasticity, 2) Opportunity cost: These would be expected to be higher for locals and people with a higher income, although there has not been a clear link found between income and attendance. For tourists, accessibility and overall costs are important, as travel costs come with high opportunity costs. 3) Price of alternative activities: museums are competing with other cultural, entertaining and social events. Furthermore, complementary costs have to be strongly taken into account (Frey & Meier, 2006).

Next to these three determinants, there is a high correlation between education and income, meaning that people that have received a higher, more theoretical education have the human capital necessary to benefit more fully from a museum than people that have received a lower, more practical education (e.g. Withers, 1980, as cited in Frey & Meier, 2006). Other determinants are the quality of an exhibition, the attractiveness of the building, the amenities in the building, as well as marketing efforts (Frey & Meier, 2006). As shortly discussed for opportunity costs, ease of access and proximity to transportation hubs are also important. A last important determinant of demand is past visits, as people that have visited museums in the past are more likely to visit museums in the present and future (Frey & Meier, 2006). The second type of demand entails individuals or groups that benefit from a museum: the social demand (Frey & Meier, 2006). Social effects of a museum go beyond that of the visitors, facilitating external effects (Frey & Meier, 2006). There are five non-user benefits that can be distinguished: 1) Option value: people appreciate having the option to possibly visit a museum, 2) Existing value: People appreciate knowing that a museum exists, 3) Bequest or inheritance value: People appreciate the knowledge that members of their community or descendants have the opportunity to visit a museum, 4) Prestige value: People appreciate that individuals outside of their community value the museum, even though they do not have to visit the museum themselves, 5) Education value: People are aware that the presence of a museum contributes to their own and other's sense of culture and value (Frey & Meier, 2006, p. 1022/1023). Next to these positive externalities, some negative externalities could occur, such as congestion or noise related problems for local communities (Frey & Meier, 2006).

2.1.2b Supply.
Museums have different cost structures compared to other service industries. They differ in at least four ways: 1) Museums have high fixed costs: operating costs (costs of the building, staff, insurance, etc.) are generally independent of output, 2) Marginal costs are close to zero: Marginal costs of an extra visitor are close to zero, unless congestion occurs, 3) Dynamic costs: Unlike other cultural organisations museums do not seem to produce constant financial problems, as productivity advances seem possible for museums. By for example introducing online exhibitions or innovating surveillance systems, cost disease could be countered. 4) High opportunity costs: The value of a museum's holding is its greatest asset. However, museums often do not place value on their collections (Frey & Meier, 2006, p. 1025). Museums have many different types of output, as becomes clear from the ICOM definition (2007): museums incorporate conservation, research and exhibition for education

and enjoyment. There is thus not one single cost structure in place.

2.1.2c Pricing.

In terms of pricing, museums differ from each other in the way they set entrance fees (Frey & Meier, 2006). Price discrimination is a common practice, as it benefits both visitors with high and low opportunity cost (Frey & Meier, 2006). Sometimes museum visits are free on certain days at certain times, encouraging individuals with a low willingness to pay or low ability to visit the museum (Towse, 2010). Free entry museums or initiatives are often funded by either foundation grants or governments (Towse, 2010). As stated before, the public good characteristics of museums in combination with importance of free entry result in the necessity of public finances (Towse, 2010).

Comprehending the societal and economic characteristics of museums is important for understanding the application of digital technologies by museums. In the next section, the emergence of the virtual museum and its societal and economic considerations are discussed.

2.1.3. Digital technologies and museums

A virtual museum is defined as: "an interactive virtual space that provides information and exhibits cultural objects in digital format" (Moreno, 2007, para. 3). A variation exists in the degree of 'virtuality', since virtual museums might show physical art online but could also showcase art that solely exists online (Moreno, 2007). The focus of this thesis is on virtual museums that are developed by existing, physical museums as an extension of their services.

The emergence of digital technologies expands creative ways for museums to engage with their visitors, by facilitating new types of interaction (Falk & Dierking, 2016). Museums are increasingly implementing digital technologies to support their services and to redefine what it means to be a museum (Falk & Dierking, 2016). The digitisation of museum services has caused a shift in the traditional museum model, which was based on the physical collection of a museum in a publicly funded a publicly accessible building (Bertacchini & Morando, 2013). The application of digital technologies to museum services has been practiced for a long time, as the emergence of the virtual museum dates back to the last half of the 20th century, the same time computers were developed (Moreno, 2007). Since then, hundreds of virtual museums in a variety of disciplines have emerged (Moreno, 2007).

Towse (2010, p. 239) describes the digitisation of heritage as an "almost revolutionary change to heritage". This is not in the least because of the economic implications of a virtual museum. Digital collections have specific economic properties that differ from physical collections, as they are related to information goods and their markets (Shapiro & Varian,

1999, as cited in Bertacchini & Morando, 2013). Digitization of physical museum objects thus has implications for the supply and demand side of the virtual museum.

2.1.3.a Supply.

In terms of production, digitalising an analogue collection comes with a lot of fixed and sunk costs, as the process is rather expensive. As computers have become accessible technology, a relative reduction in the cost of technology has caused an increase in the supply of digital heritage (Navarrete, 2013a). However, costs of distributing digital images are close to zero (Bertacchini & Morando, 2013). Furthermore, operating costs of a website are probably lower than that of a monumental building. Virtual museums have, similar to their physical counterparts, public good characteristics (Bertacchini & Morando, 2013). The non-excludability of a virtual museum is higher, as congestion will most likely occur less in virtual museums. The life cycle of digital content is elaborate, and ranges from the preparation of the physical object to the preservation of the digital content, with phases such as identification of digitized material and presentation in between (Navarrete, 2013a). These stages are interrelated, and decisions have influence in the later stages (Navarrete, 2013a).

There is a number of ways in which virtual museums can solve current issues regarding supply that musems are facing. First of all, digitization gives museums the opportunity to showcase their full collections, as there is no physical boundary for museums to adhere to (Navarrete, 2013b). Supply of virtual museums can additionally increase as the costs of production are reduced by optimizing technology (Navarrete, 2013a). Finally, digitization has led to the exploration of new products to best represent cultural heritage (Navarrete, 2013a). Digitization of cultural heritage can support standard museum operations (preservation, use and development of collections), as resources can be allocated differently.

2.1.3b Demand.

Additionally, digitization of museums might increase access, representing a wider market (Johnson and Thomas, 1998, p.80, as cited in Navarrete, 2013b). The complementary costs of a virtual museum might for example be less, as most people are in the possession of a mobile device or laptop for other purposes. If this is not the case however, complementary costs are higher. Even though virtual museums have high fixed and sunk costs, a digital environment affords the empowerment of users to produce their own digital content, as digital images are fairly easy to duplicate, and distribute (Bertacchini & Morando, 2013).

Furthermore, museum visitors evaluate their visit without holding into account the full range of services that museums provide. Visitors are for example not aware of 'backroom' activities, such as research and preservation services (Towse, 2010). Even though online museum visitors often do not pay for museum services, interest can still increase (Towse, 2010). Additionally, virtual museums provide the opportunity to increase accessibility, as digital technologies provide both a more effective and quick method to process information. Moreover, they attract a larger, more universal public than physical museums (Moreno, 2007). Through this, the externalities of the physical museum could be internalized by a public that does not visit the physical, but would visit a virtual museum. In the case of online cultural heritage, it is not the digitized object that makes visitors want to visit a virtual museum, it is the 'authoritative metadata' (the data describing the object and its context) that is significant (Besser & Yamashita, 1989, as cited in Navarrete, 2013a). The demand for cultural content can thus increase if the way the content is presented adds value (Navarrete, 2013a).

Museums generally tell stories through the display of artefacts in combination with explanatory visuals and narratives (Perry, Roussou, Economou, Young & Pujol, 2017). This is thus one of the ways in which value is added to the mere object. Up till recently, museums have largely been following the tendency to use narrative narrowly by communicating information and findings from the experts to the public. Virtual museums have adopted these same practices (Perry et al., 2017). The digitisation of museum services affords the possibility of creating virtual doppelgangers of the physical museum, which has been the most popular approach (Sylaiou & Dafiotis, 2020). As was stated in the introduction however, a diversification of the museum business model is vital, and replicating in-person experiences online, (such as developing a virtual exhibition that closely resembles the physical one) is probably not enough (Larkin & Burtenshaw, 2021). A new and dynamic form of digital creation might be necessary if museums want visitors to come back repeatedly and perhaps even pay for their online services (Larkin & Burtenshaw, 2021). The next section explains why due to changing visitor needs, virtual museums have to go beyond simply turning the physical into digital.

2.2. Changing visitor needs

Previously, ways in which museum visitors engaged with the museums could be reduced to volunteering, donating or visiting (Hill, 2011, p. 220, as cited in Sitzia, 2019, p. 190). However, through the emergence participatory practices, a part of the authority has

shifted from the institution to the public (Sitzia, 2019). Digital technologies have the power to enhanced these participatory practices and increase the agency of the museum public.

This century, digital technologies have emerged as an important new industry (Calvo-Porral et al., 2016). Users are consuming digital technologies on a growing number of digital devices for both entertainment and information-seeking activities (Calvo-Porral et al., 2016). Bertacchini and Morando (2013, p.4) furthermore argue that the digitization of collections in combination with increased storage capabilities and access to digital information by visitors is causing a "rapid change in the traditional models of using, managing and accessing knowledge and information related to cultural heritage and artworks".

Navarrete (2019, p. 202) defines the digital heritage tourist as a visitor who "exists independently of the physical location and explicitly and voluntarily comes in contact with the museum's goods and services online, not necessarily involving direct payment." Digital cultural consumption calls for a new set of principles, shifting from cultural and economic value to informational value (Navarrete, 2019). Next to these information values, digital consumers are expected to have an active stand, participating as part of the museum experience (Navarrete, 2019). So, not only is the focus of the museums shifting from the collection to the visitor, it has shifted again to the digital user (Frasca et al., 2014).

Traditionally, museums are custodians of culture, providing information and research opportunity (Radder & Han, 2015). Visitors are however increasingly demanding products and services that provide a sense of learning, feeling, being and doing (Mehmetoglu & Engen, 2011, as cited in Radder & Han, 2015). Moreover, virtual visitors reportedly expect museum websites to be functional, easily navigable, visually pleasing and enjoyable (e.g. Tractinsky et al., 2000; Zhang & Li, 2005; Lin et al., 2012; Van Dijk et al., 2012, as cited in Lopatovska, 2015). Museums thus have to go beyond giving the visitor a sense of 'being there' (Radder & Han, 2015) and have to be concerned with offering 'learning, participating and experiencing' services and products (Trinh & Ryan, 2013, p. 214, as cited in Radder & Han, 2015). Bakshi and Throsy (2011, p. 4, as cited in Navarrete, 2013b) state that digitization in the museum context allows museums to reach a larger share of the population and to intensify engagement of audiences through interactivity, deepening the audience.

Lark & Burtenshaw (2021) argue for a shift to digital storytelling techniques in order to achieve this increased engagement. Storytelling practices provide the opportunity for visitors to claim ownership over their own experience, and allows them to interact with the digital content museums provide. In the next section, digital storytelling in museums is further elaborated on.

2.3. (Digital) storytelling in museums

The trend of improving visitor experience has taken a great leap forward (Frasca et al., 2014). Technologies for immersive, interactive experiences become increasingly sophisticated and widespread (Frasca et al., 2014). Technology is increasingly adopted to achieve the following objectives (Frasca et al., 2014, p. 203):

- enhance visitor engagement and interaction
- give visitors an active role to play, part visitor – part actor: a "visit-actor"
- define the goal of an "immersive museum", in which the visit-actor is absorbed into the storyline

Digital storytelling could have a positive effect on these three objectives. In the next section, (digital) storytelling is further elaborated on. First, storytelling in the museum context in general is discussed. Then, digital storytelling and its opportunities for virtual museums are looked at.

2.3.1. Storytelling

Storytelling has been a vital part of human communication since the beginning of mankind (Rizvić et al., 2020). Nielsen (2017, p. 445) defines storytelling as the creation of "a narrative that creates engagement". A narrative in this sense is "a structure that can be based on emotional, learning, educational, interactive, individual or social, imaginative, fictive or non-fictive, digital or non-digital, subjective or objective engagements" (Nielsen, 2017, p. 445). Museums have realised that brand and brand name are no longer enough to attract and satisfy visitors, as "cultural consumers want stories" (Sylaiou & Dafiotis, 2020, p. 370). Generally, the objective of storytelling is to increase the attractiveness of cultural content and consequently make the learning process easier (Pietroni & Adami, 2014). Bedford (2001) describes two ways in which storytelling relates directly to museums. Firstly, storytelling has been practiced by humanity since the dawn of day. People make sense of the world around them through narrative. Storytelling skills ensure an individual's place within society, and storytelling skills imply that information that is not structured as a narrative will more likely be forgotten (Bruner, 1990, as cited in Bedford, 2001) Secondly, stories are always written from a certain point of view (Bedford, 2001). In this way, stories can be seen as part of the canon, or as the exceptions of the canon (Bruner, 1990, as cited in Bedford, 2001).

According to Wong (2015) storytelling is a powerful way for museums to communicate inclusive and nuanced histories, to make big ideas more approachable and concrete, and to encourage deep satisfying engagement for visitors and online users by

creating frames of experience. Storytelling can thus be one of the most important tools for creating meaning and ensuring visitor engagement (Nielsen, 2017).

The narratives and stories of museum artworks are relatively open to audience contribution, as meanings are 'impossibly unstable' (Ferguson, 1996, as cited in Sitzia, 2019). Perry et al. (2017) believe that the only way that museum visitor's experiences can contribute to 21st century cultural affairs, is if the emotional aspects of their visit are taken into account.

2.3.2. Digital storytelling

Digital storytelling emerged in the nineties when computers provided new opportunities, combining storytelling practices with digital multimedia. Digital storytelling can be defined as "the use of digital media platforms and interactivity for narrative purposes, either fictional or for non-fictional stories" (Handler-Miller, 2014, as cited in Rizvić et al., 2020, p. 348).

Even though storytelling is at the heart of each museum, digital technology has the potential to go further, as it is adaptive to the individual user and has much more opportunity for interaction (Carlsson, 2020). Technology could in this context be applied to "help visitors find personal meaning in art" (Czajkowski, in Carlsson, 2020). Increasingly, museums are adopting digital technologies to transform the visitor experience. Digital storytelling in virtual museums is able to describe relationships between different exhibits and contribute to visitor engagement (Sylaiou & Dafiotis, 2020). Furthermore, the information that is delivered is personalized, as the visitors are able to select which part of the story they want to follow (Sylaiou & Dafiotis, 2020).

Interactive digital storytelling (IDS) goes even further than this, enabling the user to influence the flow and sometimes even the content of the story (Rizvić et al., 2020). IDS is becoming increasingly popular in the development of museum XR (Extended Reality) experiences, as it appears that conveying information through these technologies is more effective when storytelling practices are applied (Rizvić, 2017).

As became clear from the previous section regarding changing visitor needs, the visitors' attention span is shortening and people increasingly choose to consume audiovisual content as opposed to reading (Rizvić et al., 2020). At the same time however, people lack time to consume, so content might have to be short and informative. Rizvić et al., (2020) propose that the only way to structure an extensive amount of information is through hypertextualisation. Hypertextualisation refers to the incorporation of networked information in content, which is exactly what the internet consists of.

Caspani et al. (2017) report that the main purpose for investing in virtual museums is the opportunity to increase the accessibility and comprehension of tangled relations that otherwise might be too difficult to be understood or appreciated by the general public. Through digital technologies, diverse content is made available, in diverse ways (Wong, 2015). Digital technologies have the ability to offer numerous ways to frame story experiences, while at the same time proposing what lies outside of the frame (Wong, 2015). The application of storytelling in virtual museums and XR museums has been widely researched before, and generally storytelling was found to have a very positive effect on visitor experience (e.g. Roussou & Katifori, 2018; Pietroni, Pagano & Rufa, 2013). However, most of the technologies applied in these museum environments were only partly digital, as they were mostly used as an additional service inside the physical museum. Moreover, quantitative research on Cultural User Experience in museums has not been widely practiced. In this thesis, this kind of research is attempted.

2.4. Cultural User Experience

As discussed, an experience economy has emerged. This implies that consumers desire experiences and an increasing amount of businesses is responding to these requests (Pine and Gilmore, 1998). Before the introduction of the experience economy, value was added in the economic advancement from commodities to products, from products to services and from services to experience. This development can be illustrated by following the example of a birthday cake (Pine & Gillmore, 1998) or a coffee bean (Radder & Han, 2015): an unprocessed bean (commodity) has less value than a pack of roasted beans (product). Value is further progressed when a fresh cup of coffee is made for you in a coffee shop, and this means even more if the coffee shop is located at the Piazza Navona in Rome.

The emergence of the experience economy has led to cultural institutions increasingly adopting the notion of user experience as they are trying to broaden their audience and are competing with other (entertainment) venues for recreational time (Roussou & Katifori, 2018). Additionally, researchers in Cultural Heritage studies have increasingly focused on describing and understanding GLAM (Galleries, Libraries, Archives & Museums) visitors' experiences (Konstantakis & Caridakis, 2020). This is important, as a positive user experience could, according to Konstantakis and Caridakis (2020), contribute to an encouraging experience when interacting with a service or product. User eXperience (UX) has no set definition, but can be described as "a multidimensional concept that covers all the research on studying, designing and evaluating the events that characterise user's behaviour during his

interaction with a service, a product or a system" (Konstantakis et al., 2018, p.1). UX consists of several elements: a user's internal state, the characteristics of the designed system or product, and the context in which the interaction takes place (Konstantakis et al., 2018).

UX for cultural heritage institutions is vital, and in recent years, the notion of Cultural User eXperience (CUX) has gained momentum (Konstantakis & Caridakis, 2020). It is important for cultural institutions to realise their visitors have diverse backgrounds, and have different demands and expectations when visiting for example museums. Furthermore, engagement with exhibits and museum technologies might vary as well (Konstantakis & Caridakis, 2020). CUX consists of two vital gists. The first is the understanding of cultural heritage needs, and consequently meeting those (Konstantakis & Caridakis, 2020). Second is the fact that CUX leads to the simplicity and refined attributes of a cultural service that creates a positive experience, for example joy of ownership and usability (Zahidi, 2013, as cited in Konstantakis & Caridakis, 2020).

Cultural organisations such as museums are, as stated before, adapting to the trends of the new era by utilizing the possibilities offered to them (Konstantakis & Caridakis, 2020). These possibilities include the integration of new technologies into the production of goods in order to not only preserve their cultural attainments, but to ensure their viability by fulfilling their role (Konstantakis & Caridakis, 2020). Integrating UX in cultural heritage digitisation such as virtual museums is essential, as it focusses on ensuring that end-users (the virtual museum visitors) might have positive experiences when they are interacting with digital collections or other digital services (Konstantakis & Caridakis, 2020).

2.5. Research Question, Conceptual Framework & Hypotheses

In the context of CUX, digital storytelling has been identified as a powerful method to increase visitor engagement (Puyol 2012; Pietroni 2013; Liestol 2014, as cited in Konstantakis & Caridakis, 2020). Konstantakis and Caridakis (2020) report how cultural spaces such as museums are nowadays competing with the entertainment industry, therefore having the need to make their products more appealing and attractive for a wide-ranging audiences. At the same time, museums have to attach additional attributes to their services to ensure the educational and entertaining aspects, something that digital storytelling has the potential to do (Konstantakis & Caridakis, 2020).

The emerging digital services that museums provide and the shift of their focus towards visitors, in combination with the opportunities that digital storytelling brings have led to the following research question: *To what extent does the application of interactive digital*

storytelling practices enhance the experience of virtual museum visitors? In the next section, the conceptual framework is further explained. Additionally, hypotheses are derived from the literature.

2.5.1. Conceptual framework
2.5.2a Usability and User Experience.
Nowadays, usability is no longer considered a sufficient measure of quality (Minge & Thüring, 2018). CUX goes beyond simply the usability of a cultural product, as it includes both pragmatic (function) and hedonic (motivation and feelings) factors (Konstantakis & Caridakis, 2020). CUX furthermore emphasizes positive human factors as an outcome of interaction with the cultural service (Hassezahl & Konstantakis, 2006, as cited in Konstantakis et al., 2018). The difference between usability and user experience is visualized by Konstantakis et al. (2018, figure 1). They state that user experience entails a more holistic approach that stresses the importance of subjectivity, as it is explicitly interested in the way people experience and judge products, instead of focussing on objective measurement methods (Konstantakis et al., 2018). The fact that usability and user experience are different phenomena does not mean that usability is not important. Konstantakis et al. (2018) report that usability is still a subset of user experience, as it could function as measure, part or complement of user experience. In the next section, the CUX model is further explained.

2.5.2b CUX model.
The development of a CUX scale for (online) exhibits in museums seems useful and meaningful for academics and practitioners in the museum field (Konstantakis & Caridakis, 2020). A detailed grid of indicators for a CUX evaluation has reportedly been hard to find, as many different dimensions that can be considered (Konstantakis & Caridakis, 2020). UX consists of different dimensions can be separately focused on, or focused on as a whole. These dimensions are: User's Needs Dimension, Brand Aspect Dimension, Technology Aspects Dimension and Context of Use dimension (Zarour & Alharbi, 2017a, as cited in Zarour & Alharbi, 2017b). In this thesis, the focus lies on the User's Needs Dimension. This is done, because, as stated before, museums are increasingly focussing on the needs of their visitors and are trying to adapt themselves to these needs. A visitor-centred approach is therefore adopted in this research as well. The conceptual framework presented in this research (figure 1) is an adaptation from the CUE-model (Components of User Experience) as seen in Minge et al. (2016), and Minge and Thüring (2018). The model was originally

developed by Thüring & Mahlke (2007). In this model, central issues of different analytic theories are integrated, and a comprehensive framework for empirical studies is presented (Mahlke, 2008; Thüring & Mahlke, 2007, as cited in Minge & Thüring, 2018).

Figure 1

Conceptual research framework
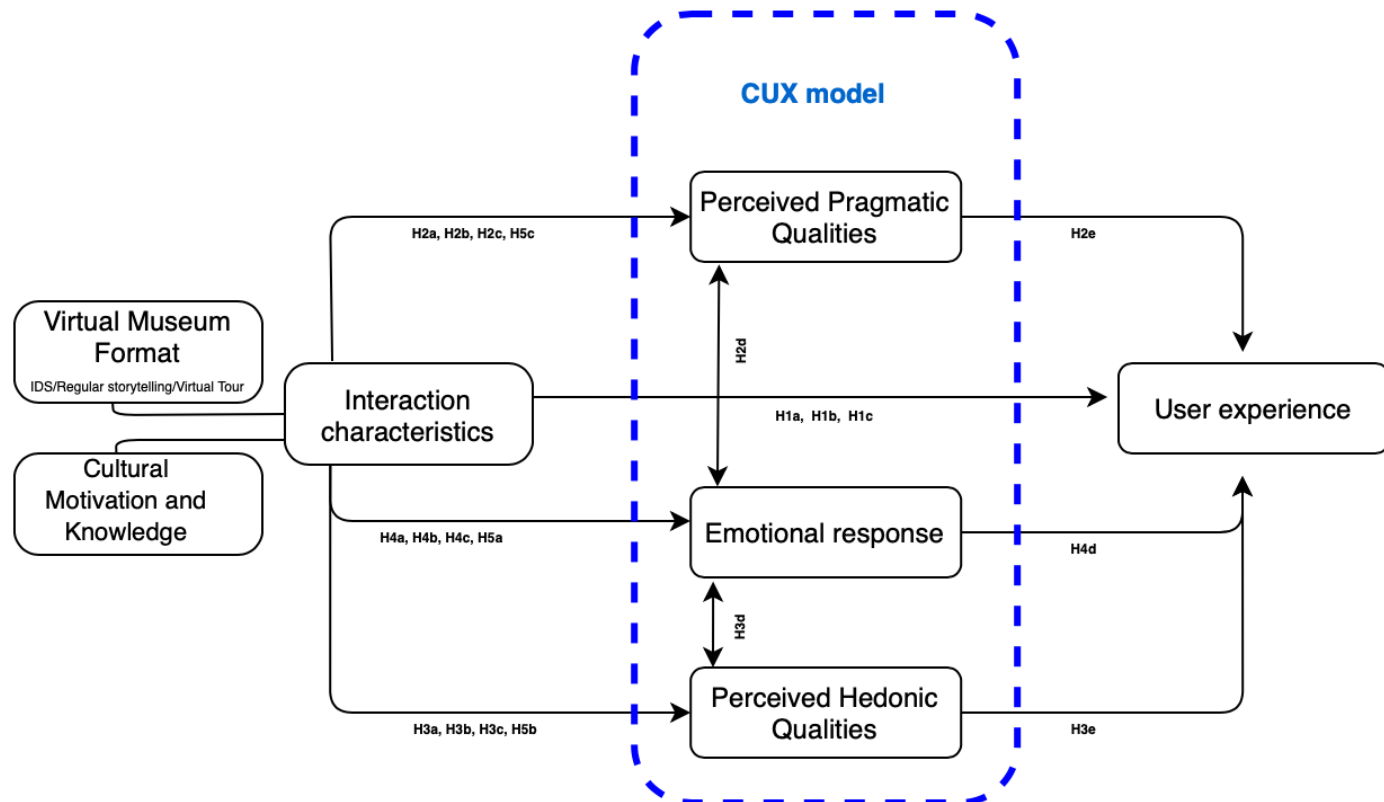
Note. Adapted from the Components Model of User Experience, Minge et al. (2016).

Within the user's needs aspects, the User Experience can be divided into two categories: pragmatic and hedonic qualities (Väätäjä, Koponen, & Roto, 2009; Sproll, Peissner, & Sturm, 2010, as cited in Zarour & Alharbi, 2017b). Other studies define this division as instrumental and non-instrumental qualities (Minge & Thüring, 2018). The pragmatic factors focus on the function and features of the service, and the hedonic factors focus on user expectation, motivation and feelings (Konstantakis & Caridakis, 2020). The perception of both pragmatic and hedonic qualities of the user experience are capable of triggering positive and negative emotional responses (Minge & Thüring, 2018). Emotions in their turn have the ability to impact perception, decision-making and attention (e.g., Isen,

2000; Brosch et al., 2013; as cited in Minge & Thüring, 2018). A bi-directional relation thus exists between perceived service quality and emotions. Together, these pragmatic, hedonic and emotional qualities determine the appraisal of a system (Minge & Thüring, 2018).

Cultural institutions such as museums are increasingly designing experiences for their visitors that are holistic, meaningful and personally encountered stories (Roussou & Katifori, 2018). When used effectively, storytelling techniques can communicate value and enhance the (virtual museum) experience by stimulating emotional resonance and empathy and trigger visitor's meaning-making and attention (Roussou & Katifori, 2018). This knowledge leads to the following hypotheses.

H1a: Participants who have been exposed to an interactive, digital form of storytelling in a Virtual Museum (VM) report higher perceived user experience than participants who have been exposed to the exact virtual copy of a museum that does not contain storytelling elements.

H1b: Participants who have been exposed to a 'regular' storytelling mode of a VM report higher perceived user experience than participants who have been exposed to the exact virtual copy of a museum that does not contain storytelling elements.

H1c: Participants who have been exposed to an interactive, digital form of storytelling in a VM report higher perceived user experience than participants who have been exposed to a 'regular' storytelling mode of a VM.

2.5.2c Perception of pragmatic qualities.

As stated before, the pragmatic qualities of the User Experience model refer to the instrumental qualities, related to technical aspects of a service (Minge & Thüring, 2018). These qualities cover the experienced amount of technical support, learnability and the ease of the service's use (Mahlke & Thüring, 2007). For instance, previous studies have found that a high degree of perceived usability has a positive effect on user experience (Kujala, 2011, as cited in Konstantakis & Caridakis, 2020). Pietroni et al. (2013) found that utility of digital storytelling in virtual museum application was positive. However, the learnability of the application was reported a bit lower as a small percentage reported the service took some time to understand. Furthermore, the perceived efficiency of the service was relatively high, with 79% of participants rating the time to reach their goal as adequate (Pietroni et al., 2013). People are more incited to continue the interaction with a service when the combination of elements and contents continuously change in unpredictable ways (Pietroni & Adami, 2014).

Hypertextualisation is an example of this, and is reported a useful way to structure a lot of information. Interactive digital storytelling is reported to enhance the quality of the user experience, as a lot of information is conveyed through these practices (Rizvić et al., 2020). Additionally, Minge and Thüring (2018) found that 'flawed' interfaces were rated less usable than flawless interfaces. In regards to emotions, Minge and Thüring found that interacting with a more usable service led to more positive emotions. In sum, the following hypotheses are formulated:

> H2a: Participants who have been exposed to an interactive, digital form of storytelling in a VM report higher perceived pragmatic qualities than participants who have been exposed to the exact virtual copy of a museum that does not contain storytelling elements.

> H2b: Participants who have been exposed to a 'regular' storytelling mode of a VM report higher perceived pragmatic qualities than participants who have been exposed to the exact virtual copy of a museum that does not contain storytelling elements.

> H2c: Participants who have been exposed an interactive, digital form of storytelling in a VM report higher perceived pragmatic qualities than participants who have been exposed to a 'regular' storytelling mode of a VM.

> H2d: Pragmatic qualities and emotional response are bi-directionally related.

> H2e: Perception of pragmatic qualities are positively related to perceived user experience.

2.5.2d Perception of hedonic qualities.
The second component of cultural user experience is hedonic qualities of the VM service. The hedonic qualities of a system refer to the look and feel of the system (Mahlke & Thüring, 2007). These hedonic qualities are derived from the appeal and attractiveness of a system (Malke & Thüring). Entertainment is one of the most popular and focussed on hedonic qualities. Dal Falco and Vassos (2017) report how visitors critique museums that do not allow interaction between the object, as the visit is limited solely to object observation. In this way, the regular museum experience is not experienced as entertaining and fun as it could potentially be (Dal Falco & Vassos, 2017). Rizvić et al. (2020) found that the adoption of digital storytelling practices in VR museums increased the edutainment (educational and entertaining) value of the museum as these museums presented novel and entertaining ways

of content presentation. Hedonic quality was found to significantly contribute to intention to use, as well as visual attractiveness (Mahlke, 2005). Furthermore, more aesthetic devices are found to be more attractive then less aesthetic devices (Minge & Thüring, 2018). This knowledge leads to the following hypotheses.

H3a: Participants who have been exposed to an interactive, digital form of storytelling in a VM report higher perceived hedonic qualities than participants who have been exposed to the exact virtual copy of a museum that does not contain storytelling elements.

H3b: Participants who have been exposed to the 'regular' storytelling mode of a VM report higher perceived hedonic qualities than participants who have been exposed to the exact virtual copy of a museum that does not contain storytelling elements.

H3c: Participants who have been exposed to an interactive, digital form of storytelling in a VM report higher perceived hedonic qualities than participants who have been exposed to the 'regular' storytelling mode of a VM.

H3d: Hedonic qualities and emotional response are bi-directionally related.

H3e: Perception of hedonic qualities are positively related to perceived user experience.

2.5.2e Emotional response.
First of all, it has become clear from the literature that storytelling practices have a positive effect on the emotions of the user (Perry et al., 2017). According to previous research, emotions are also a key word when it comes to Interactive Digital Storytelling (Rizvić et al., 2017). Other research showed that students who interacted with interactive digital storytelling devices reported a higher degree of positive emotions than students who interacted with a regular storytelling medium (Chen Hsieh, 2021). Scherer (2004, as cited in Mahlke, 2005) also assumed a relation between the perceived quality of an interactive system, and emotional consequences. In addition to that, other hedonic qualities are connected to emotion, such as trustworthiness and fun. Emotions in themselves have been found to influence the perception and judgement of both usability and aesthetics (Minge, et al., 2016). This knowledge leads to the following hypotheses:

H4a: Participants who have been exposed to an interactive, digital form of storytelling in a VM report higher emotional engagement than participants who have been exposed to the exact virtual copy of a museum that does not contain storytelling elements.

H4b: Participants who have been exposed to the 'regular' storytelling mode of a VM report higher emotional engagement than participants who have been exposed to the exact virtual copy of a museum that does not contain storytelling elements.

H4c: Participants who have been exposed to an interactive, digital form of storytelling in a VM report higher emotional engagement than participants who have been exposed to the 'regular' storytelling mode of a VM.

H4d: Positive emotional responses are positively related to perceived user experience.

2.5.2.f Culture as a context.

As stated before, UX consists of several elements: a user's internal state, the characteristics of the designed system or product, and the context in which the interaction takes place (Konstantakis, et al., 2018). Zarour and Alrhabi (2017b) have found that the user's needs dimension of the CUX ought to be placed in a cultural context. This means that the pragmatic and hedonic qualities of the experience depend on the cultural background of the user. However, I argue that the cultural dimensions that are proposed by Lee, Kim & Han (2008, as cited in Zarour & Alharbi, 2017b) and the method they applied are not appropriate for this study, as culture is not always nationally determined.

Radder and Han (2015) argue that personal and trip-related characteristics have an effect on touristic experiences. It is important to take these (cultural) characteristics into account, as museums are increasingly adopting their services to their visitors, and understanding visitor's backgrounds and characteristics might lead to increased accessibility and engagement (Konstantakis & Caridakis, 2020). In this thesis, not culture, but cultural motivation and knowledge are taken as contextual setting. As stated in the section on cultural demand earlier in the theoretical framework, people with a higher education and people who have visited museums before, are abler to benefit from their museum visit, and are more likely to visit museums in the present and future. In terms of usability however, this will probably not be the case. Minge and Thüring (2018) found a main effect of experience and usability, stating that participants with prior experience regarded the usability of the devices they used in their study significantly lower. This leads to the following hypotheses:

H5a: Participants with a higher level of cultural motivation and knowledge report higher emotional responses than participants with a lower level of cultural motivation and knowledge.

H5b: Participants with a higher level of cultural motivation and knowledge report higher perceived hedonic qualities than participants with a lower level of cultural motivation and knowledge.

H5c: Participants with prior experience in VM services report lower perceived pragmatic qualities.

3. Methodology

This chapter discusses the methodology that was applied in order to provide an answer to the research question. The first section of this chapter focusses on the justification of the chosen research method: an in-between-subject experiment. Then, the implementation of the research design is elaborated on. Thereafter, the different conditions are introduced and explained, focussing on the different degrees of storytelling they contain. The sampling method and further procedure are subsequently looked at. In the final section, the measurements that were used (e.g. hedonic, pragmatic & emotional qualities) are further elaborated on and the corresponding items used in the survey are discussed. Finally, first insights into the data are provided.

3.1. Research design

In order to provide an answer to the research question and validate the hypotheses, an experimental research design was applied. The approach to this question was quantitative, meaning that this study emphasized on the quantification in the collection and analysis of data (Bryman, 2012). Furthermore, quantitative research entails a mostly deductive approach to the relationship between theory and the actual research, which means that the accent is placed on testing theories (Bryman, 2012). The reason behind this quantitative approach was twofold: Firstly, the majority of research covering virtual museum initiatives has been qualitative, (Burke et al., 2020; Agostino et al., 2020; Zbuchea, Romanelli & Bira, 2020) and a call for quantitative studies regarding these virtual museums has been pressing. There is, however, a lack for evaluation tools to quantitatively research user experience has been lacking (Rizvić et al., 2020). This study therefore contributes to the development and validation of such a framework. Secondly, a quantitative approach is deemed more appropriate for this research, as the application of this design allows for a statistical assessment of the relevant theory. An experimental design is particularly relevant, as its artificial nature provides an opportunity to test different conditions.

Charness et al. (2012) state that a fundamental attribute of experimental approaches to economic studies is the researcher's ability to control behaviour in an abstract environment. In this way, the study allows for an artificial differentiation between museum website services. In this study an in-between-subject experiment was conducted. This means that every participant experiences only one condition, and differences between the responses to these conditions are analysed. This experimental approach is particularly useful for this study, for several reasons. Firstly, in within-subject-designs (where participants experience all conditions), potential sources of bias are introduced, as participants might learn from the

conditions they've already been in contact with (Charness et al., 2012). Secondly, between-subject-design is regarded as more 'conservative' way of testing, which could offer more external validity when participants are faced with a single decision.

This is however only the case when a considerate amount of responses is recorded (Charness et al., 2012). Finally, an in-between-subject design was most practical in this context: participants were already asked to perform an additional act by visiting an external museum website. By asking participants to visit not one but three external services, the experiment would have become too complicated and too long.

For this thesis, participants were exposed to one of three conditions, instead of three different websites to reduce complexity of the survey process. The first condition was a virtual interactive timeline that contained immersion as well as digital storytelling aspects. The second condition was a virtual google maps-like tour that contained immersive technologies, but no digital or regular storytelling aspects. Third condition was the regular museum website with text and pictures that did not contain immersive technology, but did contain regular storytelling aspects. The conditions are further elaborated on later in this chapter. Each participant was randomly assigned to a condition, as to assure that baseline participant characteristics were the same for each group. In this way, it is possible to compare the behaviour of participants from one setting to the behaviour of participants in another (Charness et al., 2012). In order to conduct the research, a survey was developed. In the next section, the three conditions of the are experiment are looked at.

3.2. Conditions

In order to prevent bias towards the type of museum the participants visited, all participants were exposed to services provided by the same museum, selected because of the high development of interactivity and storytelling in presenting collections: The British Museum. The first subsection discusses The British Museum as a cultural institution and the justification behind the choice for this institution. Additionally, the three different conditions are elaborated on and their characteristics are connected to the literature.

3.2.1. The British Museum

The groups were all exposed to content from the same organisation in order to avoid biased opinions towards different cultural institutions. The British Museum is the first national public museum of the world and opened its doors in 1759 (Nelson, n.d.). The museum is an exempt charity and is regulated and sponsored by the Department for Digital, Culture, Media

& Sport (Hire, n.d.). At the moment, the entry to the main collection of the museum as well as exhibitions that normally have to be paid for, is free (Neal, n.d.). The museum's aim is to "hold for the benefit and education of humanity a collection representative of world cultures ('the collection'), and ensure that the collection is housed in safety, conserved, curated, researched and exhibited." (Hire, n.d.). The British Museum offers several services that are available online: They published a blog, produced a podcast, and have the audio tour highlights posted on their website. The British Museum was particularly selected, because the museum offers a wide variety of different conditions, all available for free. Furthermore, the British Museum is fairly known to many people and has an incredibly large collection. The practical considerations were however leading in this choice.

Furthermore, the British Museum offered one condition in particular that was the most in line with digital storytelling practices, as well as two other conditions that both had different aspects of storytelling practices. Now, the three conditions are elaborately described. Additionally, the storytelling segments for each of the conditions are highlighted.

3.2.2. Condition 1

The first condition that was adopted in this study is the Museum of the World (Figure 2). This Virtual Museum is an "interactive experience through time, continents and cultures", and features objects from the British Museum (Google Cultural Institute & The British Museum, n.d.).

The objects are placed in a timeline that starts 2000AD and continues back in time to roughly 100.000 BC. The dots on the timeline are categorized into different continents, and on the right side of the website, several themes are presented (Arts & Design, Living & Dying, etc.). When a theme is selected, only the dots that belong to that particular theme are shown. Every dot placed on the timeline represents an item from the British Museum's collection. The environment is immersive, as the visitor is surrounded by the 3D environment. When the cursor is moved to corners of the screen, the screen moves accordingly. When someone would go over the dot with their mouse, a tingly sound can be heard. Once clicked, a preview of the item selected is presented. Additionally, connections with other object in the collections are shown through connecting lines (Figure 3).

Figure 2

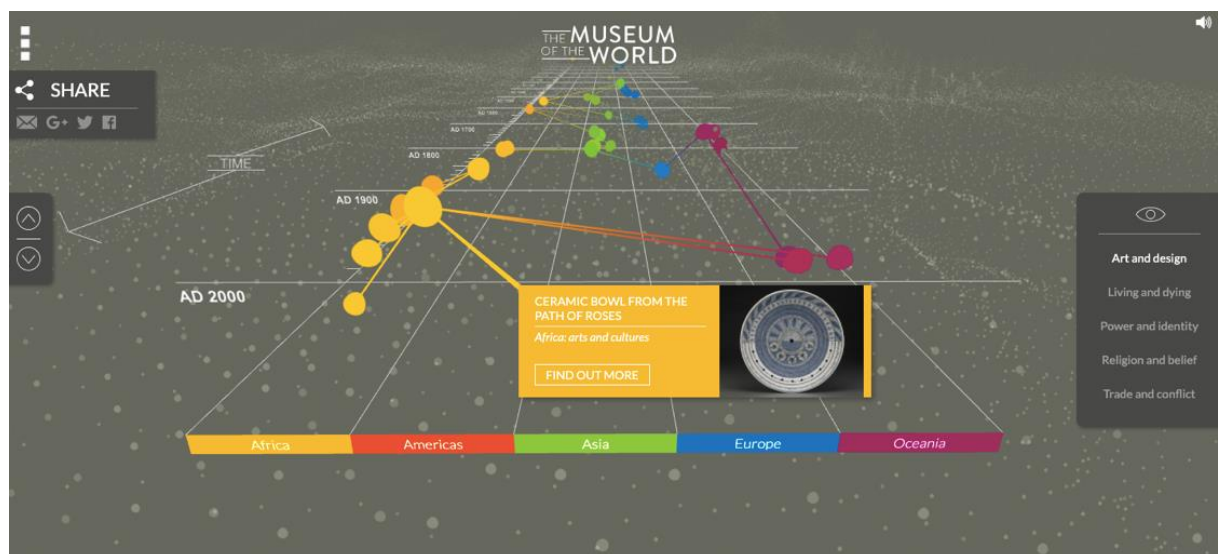*Condition 1 - Interactive Virtual Timeline*

Note. Screenshot taken from the Museum of the World website.

https://britishmuseum.withgoogle.com/
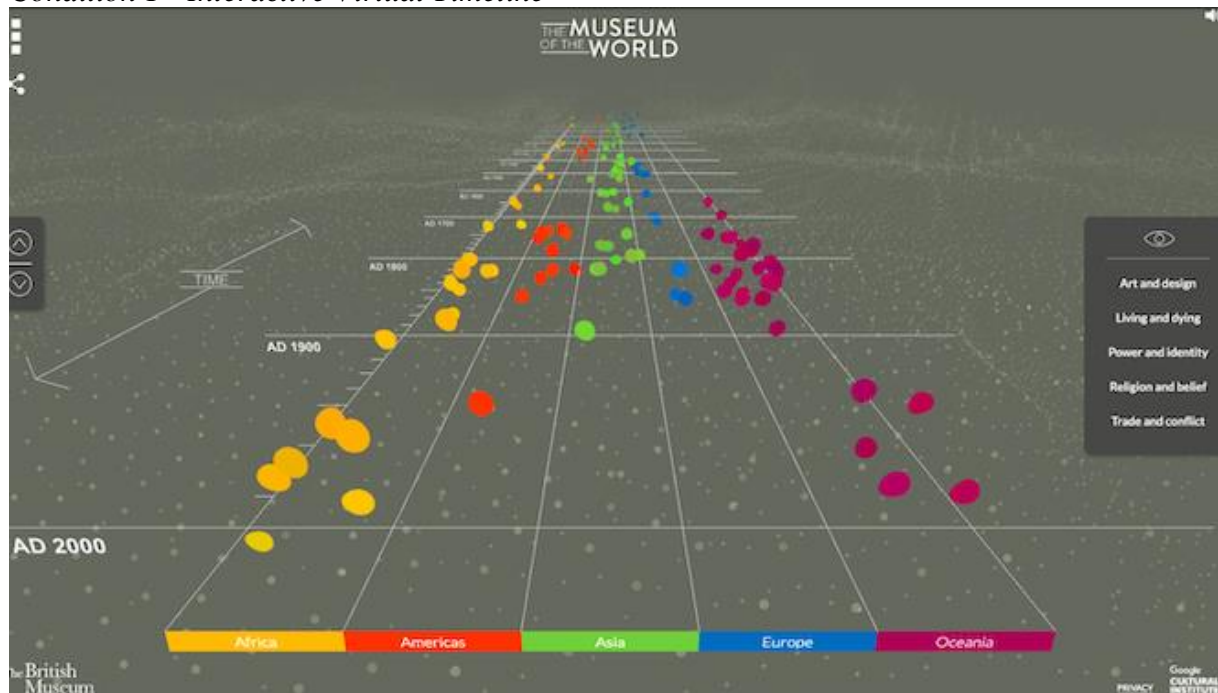
Figure 3

Item once selected

Note. Screenshot taken from the Museum of the World website.

https://britishmuseum.withgoogle.com/

Thereafter, once the visitor clicks on 'Find out more', the item is displayed in a bigger frame. A quite elaborate written description of the object is presented. Each collection item has its own audio fragment, in which curators tell the story of the object, and the object as linked to a Google Maps fragment which displays where in the world the item comes from (Figure 4). Lastly, related objects are displayed, and opportunities to share the object to social media or email are presented in the top right corner.

This first condition is a condition that does not copy a physical museum visit and instead offers a new experience through digital storytelling practices. Hypertextuality is an important example in this condition, as multiple sources of information are presented in a networked way (Rizvić et al., 2020). Through this hypertextuality, a multimedia service is presented, inviting the visitor to listen as well as watch and read about the item. The timeline is interactive, as the visitor decides which collections they want to visit and at what point in time they want to start. They then have the autonomy to follow the path laid out for them by clicking connected items, or chose items that are not connected to the previous items. The timeline offers a unique opportunity to untangle complex relations between items in the collection that would probably not have been possible in a physical museum (Caspani et al., 2017). Participants were asked to roam freely through the timeline and were encouraged to engage with all the different services provided.

Figure 4

More information about the item

Note. Screenshot taken from the Museum of the World website.

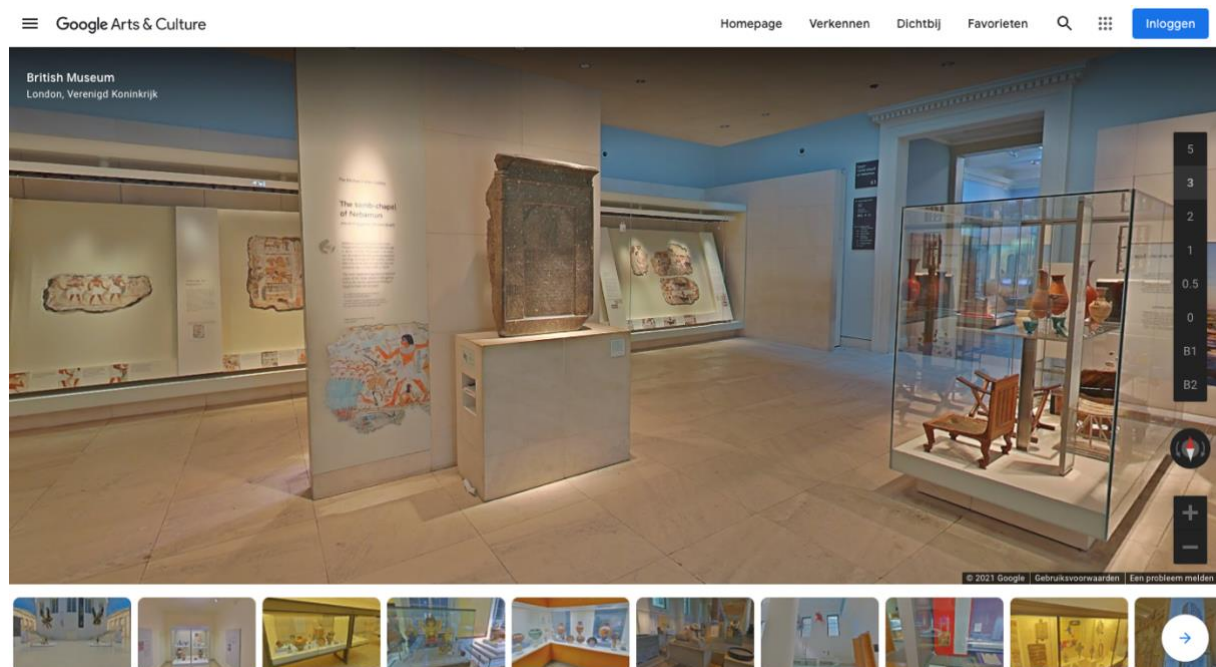https://britishmuseum.withgoogle.com/

3.2.3. Condition 2

The second condition is a virtual visit of the museum through the Google Arts & Culture page of the British Museum. Google Arts & Culture is a non-profit initiative that features content from over two thousand museums. The British Museum has its own page, featuring stories and collections. Additionally, the service offers a google-streetview like tour through the museum (Google Arts & Culture, n.d.). The second condition is this tour, starting in room nr. 61: Nebamun's tomb (Figure 5).

Figure 5

Condition 2 – Virtual Tour (Room 61)

Note. Screenshot taken from the Google Arts & Culture website.
https://artsandculture.google.com/streetview/british-museum/ AwEp68JO4NECkQ?sv_ h= 0&sv_

In this second condition, the visitor is able to be immersed into the museum, being able to move around and explore the physical museum remotely. In this way, the items can be viewed in their 'original' museum context: displayed among related items with informational signs placed next to them. This condition can be considered immersive as the visitor finds themselves inside the actual museum. The visitor is able to look at the item from different directions as well as looking around, with the view corresponding to the visitor's movements.

Digital storytelling however is not applied in this condition, as the only form of interaction is the opportunity to walk around freely. Regular use of storytelling -the stories that are placed next to the object - is also not actively applied as there is no information particularly highlighted in the virtual tour, and most of the signs that are placed next to the items are not legible once a visitor tries to zoom in on an item and its informational sign (As one participant stated: … I could not zoom in without highly blurring the letters on the signs.")

This condition was selected because this is an example of the production of a replica of the physical experience of a museum. Larke and Burtenshaw (2021) are critical of this type of virtual museum. Whether museum visitors would still have a positive museum experience whilst visiting this type of virtual museum will examined in this study.

3.2.4. Condition 3

The third condition is a fragment from the regular British Museum website. On their own website, the British Museum displays their collections as well; providing the visitors with pictures and stories about the different rooms and their items. The participants were asked to take a look at the Egyptian Collection, specifically Room nr. 61: Nebamun's Tomb (Figure 6, The British Museum, n.d.). This condition has the same theme as the room that participants assigned to Condition 2 see in their immersive environment.

Figure 6

Condition 3 – British Museum website (Room 61)

Note. Screenshot taken from the British Museum website.

https://www.britishmuseum.org/collection/galleries/egyptian-life-and-death

This condition refers back to the original, 'regular' form of storytelling as applied by museums: having the story and history of the tomb told in a primarily textual manner, accompanied by highlighted pictures. The narrative presented on the website has an educational nature (Nielsen, 2017), referring to Egyptian rituals regarding life and death, and the conservation of the chapel. This environment is however not immersive, as there is no environment that appears to surround the visitor. The website further offers no real interactive services, as visitors are solely able to navigate between pre-existing web pages.

Within condition 3, the website allows participants to visit the virtual tour (condition 2). However, participants in condition 3 were explicitly instructed not to visit the tour, as this was not the essence of their condition. They were asked to stay within their respective environment of the British Museum website. On the bottom of the page, visitors had the opportunity to click on other 'rooms'. When they clicked on those, they would be led to other website pages with the same layout as room nr. 61 (Figure 7).

Figure 7

Other options to visit

Note. Screenshot taken from the British Museum website.

https://www.britishmuseum.org/collection/galleries/egyptian-life-and-death
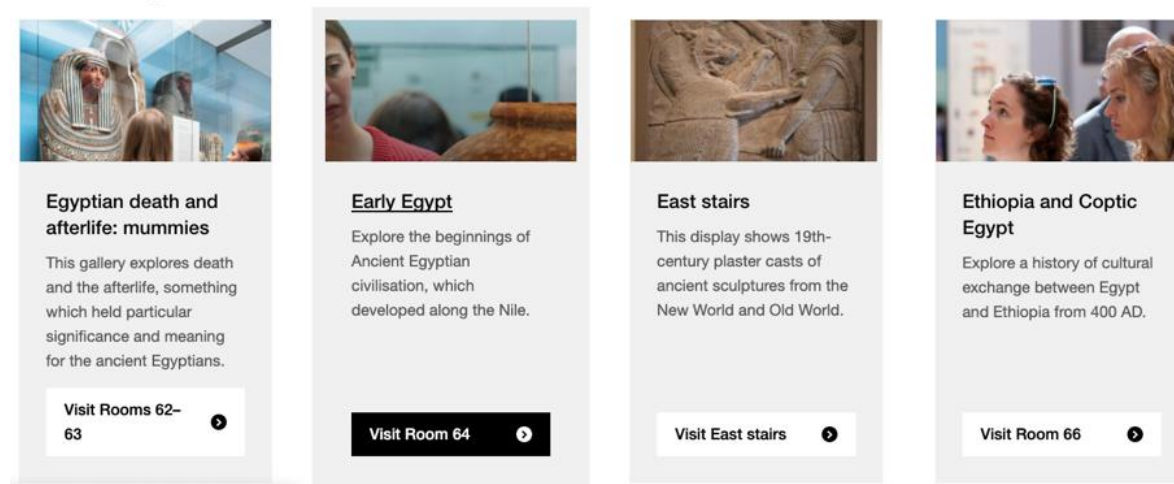
3.3. Procedure

3.3.1. Survey development and distributions

In order to conduct the experiment, a self-administered survey (Appendix A) was developed and distributed. This was done with the survey tool Qualtrics. The survey was set

up in the English language. The reason for this choice of language was twofold. Firstly, by distributing the survey in English, a larger, more international group of participants could be reached. This research is not particularly about Dutch museums, so it is interesting to see how people from other countries think about these virtual museum experiences. In order to reach these people, English would be the most appropriate language. Secondly, the British Museum website and other services are all originally produced in the English language. In order for participants to fully understand the information provided by the museums, comprehension of the English language is necessary in the first place. Therefore, the survey being written in English would not be a source of extra concern. In the introduction of the survey it is stated that the survey is completely in English. Individuals that did not feel comfortable with this, had the opportunity to terminate their participation.

The survey consisted of a total of 24 questions: one open question, and 23 multiple choice questions. The actual number of questions participants were asked to answer varied according to their experience with virtual museums. If they stated they visited a virtual museum before, they were asked to answer three additional questions. The survey consisted of several parts.

On the first page, participants were introduced to the study. On this page, the topic of the study (virtual museum experience) was introduced. Additionally, a reassurance about anonymity, confidentiality and where to reach the Principal Investigator was put in place. In the first section, general demographic questions were presented, as well as questions about prior museum-going behaviour and attitudes towards museum visits. At the end of this part, participants were asked about their opinion towards history and the British Museum. Whereas the more general demographic questions were multiple choice question, the questions about history and the questions about the virtual museum experience were formatted into 5-point Likert scale questions ranging from 'strongly disagree' to 'strongly agree'.

The second part focussed on virtual museum visits and was, as stated before, only presented to participants who stated to have visited a virtual museum before. Questions were both formulated in a multiple choice format, where participants had the opportunity to state how many virtual museums they had visited, as well as in open question format, in which people were asked to describe in keywords what they particularly liked about virtual museums.

In the third section, participants were presented their assigned condition. On this page in the survey, the participants were thanked for their participation up to that point. They were then introduced to the condition by explaining they were going to experience a virtual

museum service of the British Museum. The randomly assigned conditions were presented as a link that had to be copied and pasted into a new tab on the participants' computer or laptop. The participants were encouraged to explore every aspect of their environment, but it was kindly requested to stay inside the assigned environment. After two minutes, the participants were able to go back to the survey and click on the 'continue' button. Thereafter, questions about their experience were presented. First, a manipulation check was executed: a control question was implemented to check which condition the participants had visited. Participants were then presented with statements regarding their experience and were asked to indicate how they felt about this statement by selecting an option in a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. In order to test whether participants were paying attention, some of the questions were stated positively, and others more negatively, as to validate the responses.

3.3.2. Distribution

Before distributing on a wider scale, the survey was first send to a group of peers for pilot testing. This pilot testing resulted in improvements in the spelling and grammar of the survey. Also, the survey appeared to contain too many questions and therefore, two items were removed from each of the constructs. Furthermore, it became apparent that the control question was not stated clearly enough, as people got the impression they were supposed to visit all the environments. The question was therefore adapted as to make sure people were reassured that their visit to one environment was enough. After the pilot testing phase, the survey was widely distributed through a combination of snowball sampling, as well as purposive sampling. The target sample of this research was anyone that had access to a computer or laptop. Participants of all ages and with all kinds of attitudes towards museums were invited, as it was interesting to examine how individuals who had never visited museums experienced the online services. In snowball sampling, the researcher makes contact with a small group of participants relevant to the research, who then distribute the survey even further (Bryman, 2012). In this research everyone could practically participate in the research, therefore, the initial sampling group was quite large. Participants who filled in the survey were then asked to share the survey with others, causing a rippling effect. Purposive sampling was also applied. Purposive sampling is a non-probability form of sampling that focusses on sampling participants that are relevant to the study (Bryman, 2012). Generally, everyone would be able to participate, although a distinction will be made between frequent museum visitors and non-frequent museum visitors. The survey was posted in a Virtual Museum

Facebook group with 124.000 members. The title of the group suggested that members were at least interested in virtual museums. Additionally, the survey was posted in a reaction to a Facebook post by the British Museum, to draw people that would visit their Facebook page as well. In the next section, the measurements used in the survey are further elaborated on. Thereafter, research considerations are discussed.

3.4. Measurements

In this section, the measurements used to measure three qualities (pragmatic, hedonic and emotional response) and overall experience of the virtual museum conditions are explained. Also, a light is shed on the operationalisation of these measurements in the survey. The questions regarding user experience are largely derived from the CUE-model presented by Minge and Thüring (2018). How the questions are used is explained in the subsections of the corresponding qualities.

3.4.1. Pragmatic qualities

To measure the pragmatic qualities of user experience, Zarour and Alharbi (2017b) have identified the following aspects: functionality, usability and usefulness. Functionality covers how functional a product or service is and can be used to measure in what degree the goals of the service are met (Mcnamara & Kirakowski, 2006). Additionally, functionality covers questions such as: "what does the product or service do?". Functionality can be measured through the evaluation of the device performance, reliability and durability (Mcnamara & Kirakowski, 2006). Usability refers to characteristics of an interaction between the user and the service (Mcnamara & Kirakowski, 2006). Furthermore, usability is about learnability and how easy it is to use a service (Mahlke, 2005, as cited in Zarour & Alharbi, 2017b). How usability is measured should be based on the *quality in use* (Mcnamara & Kirakowski, 2006). This means that it encompasses the "extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction [in as specified context of use]" (ISO, 1998, as cited in Mcnamara & Kirakowski, 2006). Usefulness refers to how useful a service or product is in order to reach a certain goal. So, where usability focusses more on the effectiveness of a system, usefulness focusses on a system's appropriateness (MacDonald & Atwood, 2014). In this survey, these pragmatic qualities were condensed into four statements. These statements were derived from research regarding usefulness and usability (Tandon et al., 2016). The statements were: 1) The website is easy to use. 2) I quickly understood how to use the website. 3) It is difficult to understand

how the website operates. 4) With the help of this website I will achieve my goals as a museum visitor. For the items that were negatively formulated, the scores were reversed. In order to measure the items' correlation degree, a Principal Component Analysis (PCA) was conducted (Table 1). The four items, which were Likert-scale based, were entered into factor analysis using Principal Components extraction with Varimax rotation based on Eigenvalues, KMO = .68, $\chi 2$ (N = 109, 6) = 99.85, p < .001. The resultant model explained 54.5% of the variance in pragmatic qualities. A reliability analysis showed a Cronbach's alpha score of .70, meaning it was a reliable measurement, but barely so since it was rounded up. To improve the reliability, the third item was removed. Leaving out this item contributed to a higher Cronbach's alpha score of .71 As a result of this reliability, a new variable was created using the average scores on the three items, which was used for further analysis of the hypotheses. The scores of these items ranged from 1.00 to 5.00 (M = 3.74, SD = 0.85).

3.4.2. Hedonic qualities

In order to measure hedonic factors, Zarour and Alharbi (2017b) consider the following factors: Emotional aspects Hedonic aspects, Trustworthiness, Aesthetics, Fun, Privacy and Sensual aspects (Zarour & Alharbi, 2017b). Emotional aspects refer to emotions that are experienced during the use of the service or product (Mercuri, 2005, as cited in Zarour & Alharbi, 2017b). In this thesis, emotional aspects are a separate quality and these qualities will be elaborated on in the next subsection. The qualities as presented by Zarour and Alharbi (2017b) were cross-referenced with the aspects mentioned by Thüring and Minge (2018). The following aspects where thereafter operationalised: Trustworthiness, Aesthetics and Fun. Trustworthiness refers to the trust between the user and the organisation that provides the service (Mahlke, 2005, as cited in Zarour & Alharbi, 2017b). Aesthetics refers to the sense of beauty the user experiences when using the service. 'Fun' aspects refer to the enjoyment of the service, and just as trustworthiness, are related to emotions (Mahlke, 2005, as cited in Zarour & Alharbi, 2017b). In this survey, these hedonic qualities were condensed into five statements. These statements were derived from research regarding trustworthiness (Büttner & Goritz, 2008), from the original CUE-model items regarding aesthetics (Minge et al., 2016) and from research regarding fun (Tasci & Ko, 2016). The statements were: 1) The way the information was presented is interesting. 2) The way the information is presented was fun. 3). The way the information is presented looks unattractive. 4). The way the information presented was enjoyable. 5) The British museum is competent. For the items that were negatively formulated, the scores were reversed. A PCA was conducted for these items as

well (Table 1), with Varimax rotation based on Eigenvalues, KMO = .83, $\chi 2$ (N = 109, 10) = 284.16, $p < .001$. The resultant model explained 67.1% of the variance in pragmatic qualities. A reliability analysis showed a Cronbach's alpha score of .88, meaning it was a reliable measurement. As a result of this high reliability, a new variable was created using the average scores on the five items. This new variable was used for further analysis of the hypotheses. The scores of these items ranged from 1.00 to 5.00 (M = 3.54, SD = 0.92).

3.4.3. Emotional response

The last set of qualities to be discussed is the emotional qualities. As stated before, emotions are influenced by the pragmatic and the hedonic qualities of a service (Minge et al., 2016). In their turn, emotions have the ability to influence the perception of these qualities (Minge et al., 2016). Emotions are in this research regarded as the "physiological activation, motor ex- pressions, and subjective feelings" (Russell, 1980, as cited in Thüring & Minge, 2018, p. 14). In the CUE-model, negative as well as positive emotions are featured (Minge et al., 2016) Therefore, statements about both negative and positive emotions were asked about in the survey. The statement regarding emotions were: 1) The way the information is presented excites me. 2) The way the information is presented annoys me. 3) The way the information is presented relaxes me. 4) When visiting the website, I feel exhausted. 5) The way the information is presented makes me feel happy. 6) The way the information is presented angers me. The items with negative emotions were reversed. A PCA was then applied to these items as well (Table 1), with Varimax rotation based on Eigenvalues, KMO = .81, $\chi 2$ (N = 109, 15) = 333.51, $p < .001$. The resultant model explained 60.0% of the variance in pragmatic qualities. A reliability analysis showed a Cronbach's alpha score of .86, meaning it was a reliable measurement. As a result of this high reliability, a new variable was created using the average scores on the six items, which was used for further analysis of the hypotheses. The scores of these items ranged from 1.00 to 5.00 (M = 3.46, SD = 0.93).

3.4.4. Perceived experience

The perceived experience was measured using a 1-item, 10-point scale. This scale measures the participant's overall experience of the virtual museum on a scale ranging from 1 to 10. The item was formulated as followed 1) "What final mark would you give the overall virtual museum experience?". As this construct consisted of only one item, the individual question was used as the final construct. The scores for this item ranged from 1.00 to 10.00 (M = 6.38, SD = 1.98).

3.4.5. Cultural motivation and knowledge

Cultural motivation and knowledge was measured using a 2-item, 5-point Likert scale. This scale measures participants' motivation for going to museums and in what degree they like to visit museums, ranging from 1 to 5. The items were formulated as followed 1) How frequently did you physically visit a museum before march 2020? 2) To what extent do you like to visit a physical museum? Regarding the first statement, participants had to indicate whether the statement applied to their own experience on a scale ranging from one 'once a year or less' to 5 'more than once a week'. Regarding the second statement, participants had to indicate whether the statement applied to their own experience on a scale ranging from 1 'Dislike a great deal' to 5 'Like a great deal'. For the two items, a reliability analysis showed a Chronbach's alpha score of .67, meaning that it was not a reliable measurement. To improve reliability, question 1) How frequently did you physically visit a museum before march 2020? was removed. The scores of the item left ranged from 1.00 to 6.00 (M=3.06, SD=.81).

Table 1

Results from PCA of the pragmatic, hedonic & emotional quality items (N=109)

Item	Factor Loading		
	Pragmatic	Hedonic	Emotional
Pragmatic Qualities			
The website is easy to use	**.874**	-	-
I quickly understood how to use the website	**.824**	-	-
It is difficult to understand how the website operates (R)	.594	-	-
With the help of this website I will achieve my goals as a museum visitor.	**.623**	-	-
Hedonic Qualities			
The way the information was presented is interesting	-	**.881**	-
The way the information was presented is fun	-	**.862**	-
The way the information is presented looks unattractive (R)	-	**.813**	-
The way the information was presented is enjoyable	-	**.862**	-
The British Museum is competent	-	**.658**	-
Emotional Response			
The way the information was presented excites me	-	-	**.808**
The way the information was presented annoys me (R)	-	-	**.826**
The way the information was presented relaxes me	-	-	**.787**
When visiting the website I feel exhausted (R)	-	-	**.629**
The way the information was presented makes me feel happy	-	-	**.852**
The way the information was presented angers me (R)	-	-	**.724**

Extraction Method: Principal Component Analysis

Rotation Method: Varimax with Kaiser Normalization

Note: Reverse-scored items are denoted with an (R). Bold items were selected to form a construct.

3.4.6. Future behaviour

Future behaviour was measured using a 2-item, 5-point Likert scale. This scale measures to what extent participants' future behaviour regarding the virtual museum service is dependent on the condition they were assigned to. The two items that future behaviour is comprised of are as followed: (1) "I would recommend this virtual museum service to others" and (2) "I would like to visit this virtual museum service again". Participants had to indicate whether the statements applied to their own experience on a Likert scale ranging from 1 "Strongly disagree" to 5 "Strongly agree". For the two items, which were Likert-scale based, a reliability analysis showed a Cronbach's alpha score of .92, meaning it was a reliable measurement. As a result of this high reliability, the future behaviour variable was created, with scores ranging from 1.00 to 5.00 ($M = 3.07$, $SD = 1.26$).

3.5. Ethical Research Considerations

In every type of research, ethical considerations have to be taken into account in order to assure the integrity of the research and the disciplines that are involved (Bryman, 2012). According to Diener and Grandall (1978 as cited in Bryman, 2012), four major concerns that have to be taken account are: whether participants are harmed, whether there is a lack of informed consent, whether there is an invasion of privacy, and whether deception is involved. In this study, these considerations have been strongly taken into account. At the beginning of the survey, an informed consent was provided, stating that participation was voluntary, and that participants could terminate the survey process at any time. Furthermore, it was stated that the data used in the survey was completely anonymous and confidential. Participant with ages 17 and lower were redirected to a page stating they were too young to participate, whereafter the survey was terminated. Furthermore, participants were able to leave a comment on the last page of the survey, in order to make sure they could anonymously state any concerns they had regarding the survey. However, some critical notes can be made. The survey was distributed online and could only be filled in on a laptop or desktop computer, since some of the conditions were only accessible through these types of technology. Participants were thus not able to fill in the survey on their mobile phones, which required a potential extra effort in order to switch from phone to computer. However, a benefit to this prerequisite was that the device that was used to fill in the survey did not have to be taken into account, as this was the same for all participants. A factor that could be considered to be harmful is the controversy surrounding the British Museum, as human rights lawyers have claimed that the items displayed in the museum are "treasures taken from "subjugated peoples" by "conquerors or colonial masters" (Alberge, 2019). In order to control for these

types of opinions, participants' perception of the British Museum was measured. Participants appeared to be rather positive, as in regards to the statement 'I like the British Museum', no participant strongly disagreed, and only 5 participants disagreed or somewhat disagreed. Also, keeping in mind the participants had the opportunity to share their opinions at the end of the survey, no comments were made about the controversy surrounding the British Museum. Nevertheless, it could still be a possibility people felt uncomfortable being exposed to the items of the museum, but felt reluctant to speak up.

4. Results

In this section, relationships between the different constructs are identified. First, some general information regarding the sample is looked at. Then, a report of the analysis of the different constructs of interest is provided.

4.1. Sample

A total of 178 participants were reached. Of these 178 however, only 132 completely filled in the survey. After the participants were asked to explore their allocated environment, they were asked a control question asking which environment they had found themselves in. 109 participants of the 132 gave the correct answer. The final sample thus existed of 109 participants. The conditions were randomly allocated, resulting in the following division: condition 1: 39 participants, condition 2: 37 participants, condition 3: 33 participants.

The overall sample consisted of 40 participants identifying as male, 68 identifying as female, and 1 participants identifying as non-binary/third gender. The youngest participant was 18 years of age, the oldest participant was 74 years of age, with an average age of 34 years of age. Of the 109 participants, 5 had never visited a physical museum prior to participating in this research, 87 stated they visited a physical museum once or a few times per year, 12 stated that they visited a physical museum once per month, and 5 participants stated that they had visited a physical museum once a week or more before participating. Of the 109 participants, 65 had never visited a virtual museum prior to participating in this research, 28 stated they visited a virtual museum once or a few times per year, 10 stated that they visited a virtual museum once per month, and 6 participants stated that they had visited a virtual museum once a week or more before participating. Lastly, 17 participants indicated they had finished high school or less, 2 participants had an MBO degree (post-secondary vocational education), 19 people had an HBO degree (School of applied sciences), 33 people had a Bachelor's degree at university, and 38 people had a master's degree or higher. The majority of the participants thus received higher, theoretical education. Frequencies of the sample are summarized in Table 2.

Table 2

Respondent Characteristics (n=109)

Respondent Characteristic	N	%
Gender		
Male	40	36.7
Female	68	62.4
Non- binary/third gender	1	.9
Museum visit behaviour prior to normal settings		
Less than once a year	5	4.6
A few times per year	12	11.0
Once a month	68	62.2
Once a week	19	17.4
More than once a week	5	4.6
Educational level		
Less than high school	1	.9
High school graduate	16	14.7
MBO degree (Post vocational secondary education)	2	1.8
HBO Bachelor's degree (School of Applied Sciences)	19	17.4
WO Bachelor's degree (University)	33	30.3
	36	33.0
Master's degree	2	1.8
Doctorate		

4.2. Effect of storytelling by virtual museums on perceived experience

The first hypothesis covered the perceived overall experience of the museum service and the extent to which the different conditions directly impact this perception. The perceived experience consists of the overall mark given by the participants at the end of the survey To test the relationship between virtual museum service and the perceived experience, a univariate ANOVA was conducted (Appendix B, Table 3 & Figure 8). In this analysis, the

condition was the independent variable, and the perceived experience was the dependent variable. The ANOVA revealed a marginal significant effect for video format on perceived enjoyment, $F(2, 106) = 3.02$, $p = .053$, partial $\eta^2 = .05$. Bonferroni post-hoc comparisons showed that participants exposed to Condition 1, the condition that contained the digital storytelling ($M = 6.82$, $SD = 1.9$), scored marginally significantly higher on perceived experience than participants exposed to Condition 2, the condition without explicit forms of storytelling, ($M = 5.76$, $SD = 2.12$), with $p = .057$. It however revealed no significant difference between participants allocated to Condition 3, the condition that contained regular storytelling ($M = 6.55$, $SD = 1.71$), and Condition 2 with $p = .280$. Similarly, there was no significant difference between participants allocated to Condition 1 and Condition 3 with $p = 1.00$. These Post-Hoc test results thus indicate that H1a is accepted, and both H1b and H1c are rejected. Even though the majority of the results were not significant, the patterns that appear in the data were in line with the hypotheses: Condition 1 had a better mark on overall experience than Condition 2, Condition 3 had a better mark on overall experience than Condition 2, and Condition 1 had a better mark on overall experience than Condition 3.

4.3. Effect of storytelling practices on pragmatic qualities

The second hypothesis covered the perceived pragmatic qualities of the museum service and the extent to which the different conditions impact this perception, hypotheses H2a, b and c. The pragmatic qualities again refer to the instrumental qualities of the VM service and consist of the three items as reported in the methodology (1)The website was easy to use. 2) I quickly understood how to use the website. 4) With the help of this website, I will achieve my goals as a museum visitor.). As reported, item 3 was removed in order to improve the reliability. To test the relationship between virtual museum service and pragmatic qualities, a univariate ANOVA was conducted (Appendix B, Table 3 & Figure 9). In this analysis, the condition was the independent variable, and pragmatic qualities was the dependent variable. The ANOVA did not reveal a significant effect for condition on pragmatic qualities, $F(2, 106) = 1.98$, $p = .143$, partial $\eta^2 = .04$. Hypotheses H2a, b and c are thus rejected. Even though the results were not significant, most patterns that appear in the data were in line with the hypotheses: Condition 1 ($M = 3.77$, $SD = .88$) had a better mark on overall experience than Condition 2 ($M = 3.53$, $SD = .95$), Condition 3 ($M = 3.93$, $SD = .65$) had a better mark on pragmatic qualities than Condition 2. However, Condition 1 did not have a better mark on pragmatic qualities than Condition 3.

Thereafter, the bi-directional relations between pragmatic qualities and emotional response was analysed. To examine whether pragmatic qualities was a predictor for emotional response, a regression analysis was conducted, with as the criterion emotional response. When pragmatic qualities enjoyment (β = .65, p < .001) was used as a single predictor the model reached significance, R^2 = .42, F (1, 107) = 77.91, p < .001. In this model, pragmatic qualities thus explained 42.1% of the variances in score of emotional response. When reversed, the analysis provided the same result. Therefore, the analysis shows that pragmatic qualities and emotional response are bi-directionally related and H2d is accepted.

The last hypotheses regarding pragmatic qualities regarded pragmatic qualities being positively related to perceived experience (H2e). When pragmatic qualities (β = .65, p < .001) was used as a single predictor the model reached significance, R^2 = .42, F (1, 107) = 77.80, p < .001. In this model, pragmatic qualities explained 42.1% of the variances in score of perceived experience. H2e is thus accepted.

4.4. Effect of storytelling practices on hedonic qualities

The third hypothesis covered the perceived hedonic qualities of the museum service and the extent to which the different conditions impact this perception, hypotheses H3a, b and c. The hedonic qualities again refer to the non-instrumental qualities of the VM service and consist of the five items as reported in the methodology (1) The way the information was presented is interesting. 2) The way the information is presented was fun. 3). The way the information is presented looks unattractive. 4). The way the information presented was enjoyable. 5) The British museum is competent.) . To test the relationship between virtual museum service and hedonic qualities, a univariate ANOVA was conducted (Appendix B, Table 3 & Figure 10). In this analysis, the condition was the independent variable, and hedonic qualities was the dependent variable. The ANOVA revealed a significant effect for condition on hedonic qualities, F (2, 106) = 6.88, p = .002, partial $\eta2$ = .12. Bonferroni post-hoc comparisons showed that participants exposed to Condition 1 (M = 3.88, SD = .89) scored significantly higher on hedonic qualities than participants exposed to Condition 2 (M = 3.14, SD = .89), with p = .001. It furthermore revealed a marginal significant difference between participants allocated to Condition 3 *(M* = 3.59, *SD* = .84*)* and Condition 2, with p = .096. There was no significant difference between participants allocated to Condition 1 and Condition 3 with p = .52. These Post-Hoc test results thus indicate that H3a was accepted, H3b was marginally accepted, and H3c was rejected. Even though not all the results were significant, the patterns that appear in the data were in line with the hypotheses: Condition 1

had a better mark on hedonic qualities than Condition 2, Condition 3 had a better mark on hedonic qualities than Condition 2, and Condition 1 had a better mark on hedonic qualities than Condition 3.

Thereafter, the bi-directional relations between hedonic qualities and emotional response was analysed. To examine whether hedonic qualities was a predictor for emotional response, a regression analysis was conducted, with as the criterion emotional response. When hedonic qualities ($\beta = .84$, p < .001) was used as a single predictor the model reached significance, $R^2 = .70$, $F (1, 107) = 254.44$, $p < .001$. In this model, hedonic qualities explained 70.4% of the variances in score of emotional response. In sum, the analysis shows that hedonic qualities and emotional response are bi-directionally related and H3d is accepted.

The last hypotheses regarding hedonic qualities regarded hedonic qualities being positively related to perceived experience (H3e). When hedonic qualities ($\beta = .836$, $p < .001$) was used as a single predictor the model reached significance, $R^2 = .70$, $F (1, 107) = 247.97$, $p < .001$. In this model, perceived enjoyment explained 69.9% of the variances in score of user satisfaction. In this model, hedonic qualities explained 69.9% of the variances in score of perceived experience. H3e is thus accepted.

4.5. Effect of storytelling practices on emotional response

The fourth hypothesis covered the emotional response of the museum service and the extent to which the different conditions impact this response hypotheses H4a, b and c. The emotional response consists of the six items as reported in the methodology (1) The way the information is presented excites me. 2) The way the information is presented annoys me. 3) The way the information is presented relaxes me. 4) When visiting the website, I feel exhausted. 5) The way the information is presented makes me feel happy. 6) The way the information is presented angers me.). To test the relationship between virtual museum service and emotional response, a univariate ANOVA was conducted (Appendix B, Table 3 & Figure 11). In this analysis, the condition was the independent variable, and emotional response was the dependent variable. The ANOVA did reveal a significant effect for condition on emotional response, $F (2, 106) = 9.14$ with $p = .000$, partial $\eta2 = .15$. Bonferroni post-hoc comparisons showed that participants exposed to Condition 1 ($M = 3.80$, $SD = .88$) scored significantly higher on emotional response than participants exposed to Condition 2 ($M = 2.98$, $SD = .93$), with $p = .000$. It furthermore revealed a significant difference between participants allocated to Condition 3 ($M = 3.58$, $SD = .77$) and Condition 2, with $p = .013$. There was no significant difference between participants allocated to Condition 1 and

Condition 3 with $p = .84$. These Post-Hoc test results thus indicate that H4a and b were accepted, and H4c was rejected. Even though the last result was not significant, the pattern that appears in the data was in line with the hypothesis: Condition 1 had a better mark on emotional response than Condition 3.

The last hypotheses regarding emotional response regarded emotional response positively related to perceived experience (H4d). When emotional response ($\beta = .78$, $p < .001$) was used as a single predictor the model reached significance, $R^2 = .61$, $F (1, 107) = 167.70$, $p < .001$. In this model, emotional response explained 61.0% of the variances in score of perceived experience. What can be derived from this analysis, is that H4d is accepted.

4.6. Effect of cultural motivation and knowledge on emotional response

As it was not possible to create a new construct regarding cultural motivation and knowledge, physical museum going behaviour was used in measuring hypothesis H5a. When museum going behaviour ($\beta = .78$, $p = .42$) was used as a single predictor the model did not reach significance, $R^2 = .006$, $F(1, 107) = .658$, $p = .419$. In this model, museum going behaviour did not explain the variances in score of emotional response. According to this analysis, hypothesis H5a was rejected.

Furthermore, the relationship between physical museum going behaviour and hedonic qualities was analysed, as was reported in H5b. When physical museum going behaviour ($\beta = .000$, $p = 1.00$) was used as a single predictor the model did not reach significance, $R^2 = -0.009$, $F (1, 107) = .000$, $p = 1.00$. In this model, physical virtual museum going behaviour did not explain the variances in score of hedonic qualities. According to this analysis, hypothesis H5b was rejected.

Lastly, the relationship between virtual museum going behaviour and pragmatic qualities was analysed, as was reported in H5c. When museum going behaviour ($\beta = .067$, $p = .67$) was used as a single predictor the model did not reach significance, $R^2 = .004$, $F (1, 42) = .187$, $p = .67$. In this model, virtual museum going behaviour did not explain the variances in score of pragmatic qualities. According to this analysis, hypothesis H5c was rejected. All three hypotheses regarding cultural motivation and knowledge were thus rejected, meaning that in this study, no effect of previous museum going behaviour, virtual or physical, on any of the constructs was found.

4.7. Effect of storytelling practices on future behaviour

Although future behaviour was not a part of the hypotheses, a univariate ANOVA was conducted to analyse to what extent the different conditions influenced future behaviour. To test this relationship, a univariate ANOVA was conducted (Appendix B, Table 3 & Figure 12). In this analysis, the condition was the independent variable, and future behaviour was the dependent variable. The ANOVA revealed a significant effect for condition of future behaviour, $F(2, 106) = 6.15$ with $p = .003$, partial $\eta2 = .10$. Bonferroni Post-Hoc comparisons showed that participants exposed to Condition 1($M = 3.53$, $SD = 1.27$) scored significantly higher on future behaviour than participants exposed to Condition 2 ($M = 2.57$, $SD = 1.15$), with $p = .002$. It however revealed no significant differences between participants exposed to Condition 3 ($M = 3.1$, $SD = 1.18$) and Condition 2, with $p = .219$. Similarly, there was no significant difference between participants allocated to Condition 1 and Condition 3 with $p = .360$. Even though the majority of the results were not significant, the patterns that appear in the data were in line with the hypotheses: Condition 1 had a better mark on future behaviour than Condition 2, Condition 3 had a better mark on future behaviour than Condition 2, and Condition 1 had a better mark on future behaviour than Condition 3.

Lastly, it was analysed whether perceived experience was a predictor for future behaviour. When perceived experience ($\beta = .78$, $p < .001$) was used as a single predictor the model reached significance, $R^2 = .60$, $F(1, 107) = 161.13$, $p < .001$. In this model, perceived experience explained 60.1% of the variances in score of future behaviour, meaning that people enjoyed their experience, the probability of them visiting the service again or recommending the service to others was higher.

5. Discussion and conclusions

In this research, more insight was provided into the application of digital storytelling practices by virtual museums, and the cultural visitor experience of these virtual museums. In this chapter, progress is made towards formulating an answer to the research question by covering the following. First, the research findings are summarized. In this section, the conceptual model of this thesis and the corresponding hypotheses are displayed (Figure 13). Furthermore, additional findings are added to the model. Thereafter, an overall answer to the research question is presented in the conclusion. Next, implications of the research are elaborated on and looked at in light of the existing theory, linking the findings back to the theoretical framework. Lastly, the research is critically assessed and suggestions for future research are looked at.

## 5.1. Summary of research findings

Of a total of 20 hypotheses, 8 were accepted, 2 were marginally accepted, and 10 were rejected. (Table 4, Appendix B). In the model (Figure 13), the hypotheses that were accepted are coloured green, and the hypotheses that were rejected were coloured red. By doing this, a clear overview is provided, indicating which hypotheses are accepted and where these hypotheses fit into the model. It becomes clear that the accepted hypotheses are mostly related to differences between the Interactive Virtual Timeline and the Virtual Tour. Additional analyses where executed, resulting in an extension of the model regarding future behaviour. As there was no hypothesis formulated prior to this analysis, solely an arrow is displayed (Figure 13).

From the results, it can be derived that the Interactive Virtual Timeline was generally regarded as the best in perceived experience, but no significant effect in overall perceived experience was found. The Interactive Virtual Timeline furthermore scored higher in hedonic qualities than the Virtual Tour, but not higher than the British Museum website. Both the Interactive Virtual Timeline and The British Museum website did significantly score higher in emotional response than the Virtual Tour. There was no significant difference between the Interactive Virtual Timeline and the other services in pragmatic qualities, although a general trend was present. It furthermore became clear that participants were most likely to visit the Interactive Virtual Timeline again and recommend it to others, as it scored significantly higher in future behaviour than the Virtual Tour, but not higher than the British Museum website . The Virtual Tour was regarded as the least positive experience, generally scoring

lowest on all constructs. Furthermore, people were less likely to visit the Virtual Tour again or recommend it to others as it scored the lowest in Future Behaviour.

Figure 13

Conceptual Model with accepted and rejected hypotheses & additions
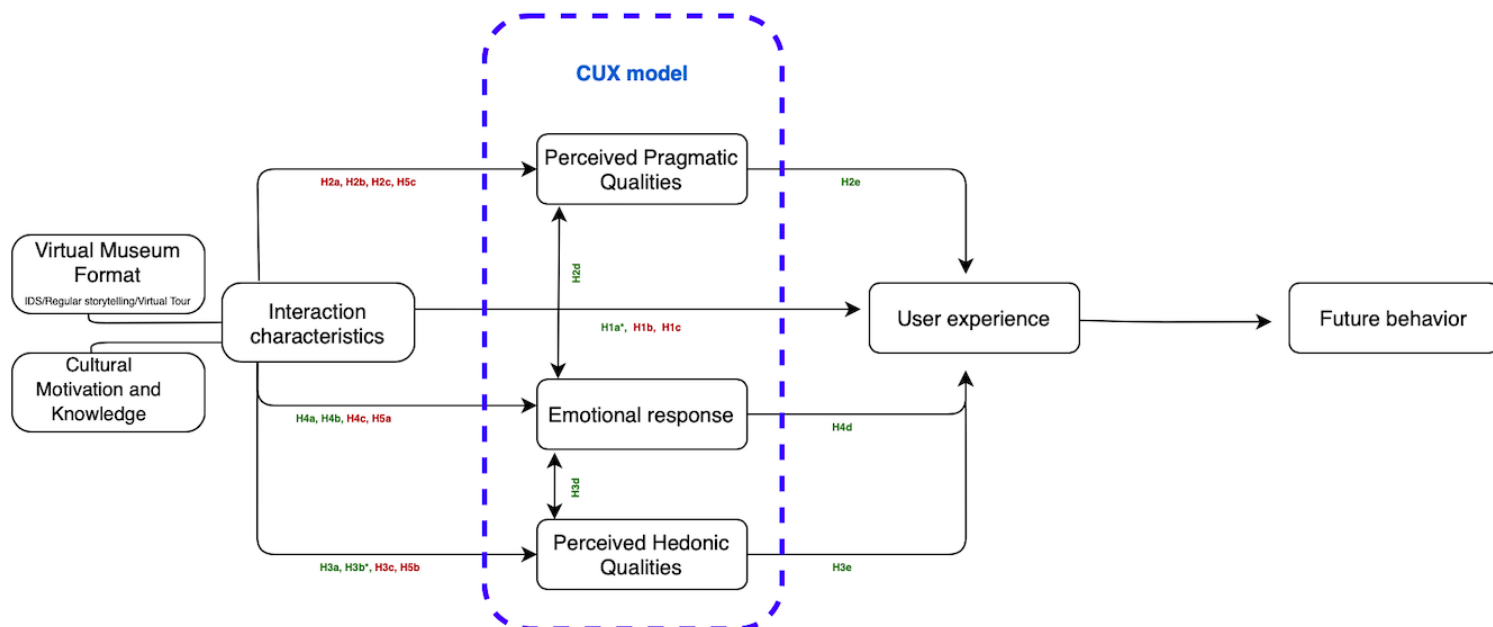
Note. Adapted from the Components Model of User Experience, Minge et al. (2016).
* marginally significant

As becomes apparent, there is no significant difference the Interactive Virtual Timeline and the British Museum website in any of the constructs. In pragmatic qualities, the British Museum website scored even higher, although not significantly. Other than these pragmatic qualities however, a general trend is visible: participants give better marks to the Interactive Virtual Timeline in hedonic and emotional qualities, as well as in future behaviour, although again not significantly.

The three constructs functioned as a predictor for perceived experience. The bi-directional relationships between emotional response and hedonic and pragmatic practices were also confirmed. Furthermore, the analysis showed that an enhanced overall experience in its turn functioned as a predictor for future behaviour. In the next section, the implications of the findings mentioned above are presented and are linked back to the theoretical framework.

5.2. Discussion of research findings

This section covers the implications of the research findings, linking them back to the theoretical framework. Additionally, the findings are compared to previous studies and the

economic implications of the findings are discussed. By doing this, the research is placed in the respective academic and societal contexts.

5.2.1. Main effects

The experimental results indicate that the perceived pragmatic qualities (functionality, usability & usefulness) are not influenced by digital storytelling practices (H2). The hedonic qualities (fun, aesthetics & trustworthiness, H3) and emotional response (H4) are however substantially influenced by the presence of (digital) storytelling practices. A significant main effect shows that only the Interactive Virtual Timeline was higher perceived than the Virtual Tour in terms of hedonic qualities (H3a). Another significant main effect shows that both the Interactive Virtual Timeline, as well as the British Museum website caused a significantly greater emotional response than the Virtual Tour (H4a & H4b).

Surprisingly, there was no main effect found in the application of the digital storytelling practices (H1). In terms of overall perceived experience, the Interactive Virtual Timeline (which thus contains the highest amount of digital storytelling practices), was only marginally better perceived that the Virtual Tour (with no storytelling practices, H1a) and tnot at all better than the British Museum website (which contains regular storytelling practices (H1c). What these results first of all imply, is that the perceived experience is not directly influenced by the applied storytelling practices in a virtual museum, as there is no direct significant effect. These findings confirm the flow and the holistic perspective of the Cultural User Experience, as it shows that perception of product qualities as well as emotions are important when looking at user experience (Minge et al., 2016).

Additionally, the findings showed that the Interactive Virtual Timeline did not cause a significantly greater emotional response (H4c) or was better perceived in hedonic qualities than the British Museum website (H3c). This absence of a significant difference between the two could be explained by the notion of a trade-off.

5.2.2. Trade-off

In her study, Rizvić (2017) came to the conclusion that when it comes to virtual cultural heritage, a trade-off exists between the amount of interaction and the amount of information that is provided. When applied to the current study, this trade-off seems to hold true. When looking at the perception of pragmatic qualities, it becomes clear that there is no difference between the Interactive Virtual Timeline (digital storytelling) and the British Museum website (regular storytelling, H2c). However, a general trend is present, as the British Museum website was better perceived in terms of functionality, usability and

usefulness. This could be explained by the fact that this was a regular website, meaning that participants were probably already familiar with the operations of this service. The Interactive Virtual Timeline however was a completely new environment that was potentially more difficult to initially understand. This is in line with research regarding website familiarity: for example Gefen (2000, as cited by Casaló et al., 2008) argues that familiarity with a certain website reduces uncertainty in relationships. The Interactive Virtual Timeline furthermore has more features and has a high degree of hypertextualisation, making it a more complex service than the regular website. A study done by Tisinger et al. (2005) regarding websites with political content has shown that in terms of usability, interactivity was generally not preferred to simplicity. In this study they found that users preferred a simpler format that presented the information in a simpler way (Tisinger et al., 2005). Moreover, Harrington (2020) concluded that museum visitors desire casual and fun experiences, but not if those experiences stand in the way of learning. It terms of the Interactive Virtual Timeline, it could be the case that the service was too complicated and not casual enough for participants to fully enjoy. Thus, the fact that the pragmatic qualities were better perceived for the British Museum website could counter balance the overall perceived perception of the services, resulting in a non-significant effect. The idea of a trade-off is confirmed by the regression analyses, as the bi-relationship between emotional response and pragmatic qualities was confirmed. Pragmatic qualities did have the lowest explanation for the variances in score of emotional response (40%).

5.2.3. The importance of the story

It became clear that both the Interactive Virtual Timeline, as well as the British Museum website caused a greater emotional response than the Virtual Tour. This is an important finding, as this suggests that storytelling is important for cultural user experience. As seen in the theoretical framework, Perry et al. (2017) stated that storytelling practices indeed have an effect on the user's emotions. The findings are thus in line with the literature. The lack of a significant difference between the Interactive Virtual Timeline and the British Museum website could be further explained by the explicit presence of storytelling in both conditions, meaning that it might be less important that the storytelling is interactive and immersive as long as it is present. Storytelling is a powerful way for museums to communicate nuanced stories and encourage deep satisfying engagement by creating frames of experience (Wong, 2015). Nielsen (2017) stated that storytelling can be one of the most important tools for creating meaning and ensuring visitor engagement and the finding of this research confirms that. Even though many studies have argued for a positive effect of

interactive digital storytelling (e.g. Harrington, 2020; Rizvić, 2017), the results of this study do not match this notion. Next to the 'trade-off' explanation', another explanation might be prevalent. In contrast to the fact that 'only' the story is important, it could be that there were not enough digital storytelling practices incorporated in the service.

According to Sylaiou and Dafiotis (2020, p. 385), a successful application of digital storytelling practices for virtual museums entails the inclusion of polyphony-in-dialogue between the users and the institution. By facilitating this, the fruitful symbiosis and a site of mutuality can emerge. The post-museum can in this way be created virtually. Even though the Interactive Virtual Timeline offers an opportunity to share a certain item in the collection on social media (Figure 4), there is no real opportunity to directly engage in conversation with fellow visitors or the institution itself. Participants thus do not have an explicit opportunity to critically engage with the stories that they encounter.

5.2.4. Increased accessibility

No significant results were found for prior visit to a physical museum and perception of hedonic qualities or emotional response (H5b, H5a). In the theoretical framework, it was stated that people that have visited museums before in the past are more likely to visit museums in the present and future (Frey & Meier, 2006). Combined with the fact that individuals with a higher education might have the human capital necessary to benefit more fully from a museum than people that have received a lower, more practical education has led to these hypotheses. This trend appeared to be not applicable to a virtual museum experience, as these hypotheses were rejected. Different reasons could explain these findings. It could for example imply that virtual museums are more accessible than physical museums, allowing people that have never or less frequently visited museums the opportunity to enjoy them just as much as people who have. One participant in this research even stated: "I do not like museums but I am convinced that virtual museum is better than physical". This participant indicated they had visited one museum in 2019, and zero during the restrictions. Other participants (N=8 out 44) indicated that accessibility was at least one of the affordances of a virtual museum they enjoyed. This is in line with research stating that accessibility is one of the increased values of virtual museums (Bertacchini & Morando, 2013). Johnson and Thomas (1998, as cited in Navarrete, 2013b) also state that the digitization of museums might increase access, representing a wider market.

Results regarding the effect of prior virtual museum visits and perceived pragmatic qualities (H5c) was also rejected, meaning that Minge and Thüring's (2018) main effect of

experience and usability was not supported in this research. A possible explanation could be that over time, the frustration with a service might actually decrease (Mendoza & Novick, 2005, as cited by McLellan et al., 2012). Generally, the services presented in this study appeared to be quite difficult, or that not enough responds were recorded to generate a significant result (*N*=44).

5.2.5. *Future Behaviour*

Economics studies, among other things, rational choice and human behaviour (Robins, 1936, as cited in Chang, 2014). Since this thesis is partly about (virtual) museum economics, it was very interesting to ask questions regarding future behaviour. Minge and Thüring (2018) argued for the effect of pragmatic and hedonic qualities and emotional response on future behaviour and it seems like the current study confirms this. Digital storytelling is important for the indication of future behaviour, as people indicated they would visit the Interactive Visual Timeline again, and recommend it to others. However again, there was no significant difference with the British Museum website.

Multiple studies have shown that visitor experience has a strong effect on visitors behavioural intentions, especially for likelihood to repeat a visit and to recommend the service to others (Radder & Han, 2015; Jung et al., 2016; Jung et al., 2016; as cited in Leopardi et al., 2021). In order to really establish which digital storytelling practices will significantly increase this future behaviour, more research will be necessary.

5.3. Conclusion

This thesis studied the application of digital storytelling practices and its effect on the cultural user experience of virtual museum visitors. This was operationalised by answering the following research question: *To what extent does the application of interactive digital storytelling practices enhance the experience of virtual museum visitors?* To answer this research question, an elaborate theoretical framework was developed, considering theory on virtual museums, cultural experience and storytelling. A plethora of hypotheses was formulated and in order to gain insights, an in-between-subject experiment was developed, measuring the pragmatic (instrumental), hedonic (non-instrumental) and emotional qualities, as well as the direct perceived experience of participants after visiting one of three different formats of (digital) storytelling in a virtual museum service of the British Museum.

In more recent years, the educational purpose of museums is increasingly considered a process that requires the recognition of the experience and visitor's learning needs in

combination with their diverse social and cultural characteristics (Hooper-Greenhill, 2000). Where before curators would assign meaning to collections, a shift to a museum as a site of mutuality occurred (Hooper-Greenhill, 2000). Even though cultural and educational relevance are still considered the core of museum activity, a more interactive and experiential framework is emerging (Zbuchea et al, 2020). Museums are progressively implementing digital technologies in their services in order to enrich the visitor experience and facilitate new types of interaction (Falk & Dierking, 2016). Digital storytelling is in this context increasingly applied by museums, in order to enhance visitor engagement, turn visitors into a visit-actor, and to define the goal of an immersive museum (Frasca et al., 2014, p. 2013).

After careful consideration, two major conclusions can be drawn when looking at the effect of interactive digital storytelling on the experience of the virtual museum visitor. First, for positive emotions as well as enjoyment, trustworthiness and aesthetics, storytelling plays a vital role in the virtual museum experience. People ought to emotionally engage and have fun in order to have a positive experience. The data showed that for emotional response and the hedonic qualities mentioned above, the Interactive Virtual Timeline (containing the digital storytelling aspects) scored best, but for enhanced experience only marginally. Furthermore, through the constructs of the CUX model (pragmatic qualities, hedonic qualities and emotional response) the experience of interactive digital storytelling and regular storytelling was statistically the same. This implies that not the interactivity, but the story is what makes these experience a positive one. These new types of interaction that museums aim to facilitate must incorporate a substantive degree of emotional and personal content, as this would allow the visitor to have fun and engage.

The second conclusion is that the functionality, usability and usefulness of the online services, especially of the Interactive Virtual Timeline, is insufficient and as pragmatic qualities explain over 40% of the variances in perceived experience as well as emotional response, it is an important field for improvement. Where the hypertextuality and interactivity cause positive emotional and hedonic responses, people seem to prefer simplicity when it comes to functionality, usability and usefulness. There was no significant difference in pragmatic qualities between any of the three conditions, although the general trend showed that the British Museum website scored best. These results imply that however innovative a museum service might be, it still needs to be understandable and easy to use. If this is not the case, it might distract visitors from the actual content and hinder the emotional connection that can be formed.

Overall, it becomes clear that the virtual museum experience and its digital storytelling practices as presented in this study, are not enough to significantly enhance the visitor experience. Even though a general trend in both visitor experience and future going behaviour is present, the Interactive Virtual Timeline did not cause a significantly enhanced experience. Even though it scored the highest in perceived experience, it was given an average mark of 6.82, which is fairly low considering the fact that this virtual museum service is one of the most advanced in digital storytelling elements currently available to the public. In order for museums to really offer an enhanced virtual museum experience, digital storytelling practices (including a narrative, interactive features, and opportunities to contribute, which allow visitors to form their own personal experience and form emotional connections to the content on display) need to be further developed. Whilst doing this, museums have to assure that the services stay useful however, approaching hypertextuality in a practical manner.

In terms of economic implications for these findings, it appears that virtual museums, if sufficiently equipped with digital storytelling elements, have the power to increase accessibility as people will be likely to visit the service again and recommend it to others. However, these services are still mostly free nowadays and do generate a high amount of sunk costs. For a considerate amount of museums, digitisation on this level might thus not be possible. In order for museums to monetize from their virtual museum services and change their business model accordingly, major technological and substantive development is necessary. So, even though museums and their virtual services are on the right path, much more research and work is required to make the museums of the web, worth it.

5.4. Economic and social implications of findings

Lastly, when discussing this research, it is vital to discuss the economic and social implications of the research findings. In the theoretical framework, an elaborate overview of physical and virtual museums was provided. In this section, the results of this study are linked to the overview, resulting in recommendations for (virtual) museums.

Lark and Burtenshaw (2021) have called for ongoing innovation and diversification of the museum business model, as current societal challenges challenge the idea of visitors coming to a physical site. For physical museums indeed, income is generally generated from private demand, defined as tickets purchased (Towse, 2010). What became clear from the data, is that the digital storytelling practices incorporated in the Interactive Virtual Timeline are not enough to significantly positively influence the perceived experience and future behaviour compared to the British Museum website. As previously stated this could have

multiple explanations such as the trade-off theory or the lack of interactive technology, limiting visitors to share their own perspectives. Hence, the way that these services currently operate gives little room to the introduction of a new museum business model as proposed by Larkin and Burtenshaw (2021). Nevertheless, there are ways in which this is possible.

Bonacini et al. (2019) researched an online storytelling platform that allows for the creation of audio guides and tours for cities and regions. The platform is based around participatory culture and storytelling and provides digital tools to manage and self-generate content (Bonacini et al., 2019). The digital storytelling practices on this platform provide the opportunity for visitors, communities as well as curators to share their story. The project was deemed a success and has provided insights for policy makers, that are very relevant for this study.

Firstly, an interactive platform like this could reduce costs of implementation and updating (Bonacini et al., 2019). As seen in the theoretical framework of this study, a high amount of sunk costs and operating costs, even though these are still lower than that of a monumental building. Self-managing platforms would reduce external management costs strongly, as tours would be created and updated for free. In case of the Interactive Virtual Timeline, participants could be granted the opportunity to make connections themselves, creating their own timeline.

Secondly, no physical boundary exits for virtual museum collections (Navarrete, 2013b) and the distribution costs of digital images are close to zero (Bertacchini & Morando, 2013), an interactive storytelling platform would allow to duplicate these contents on other applications or websites, in this way ensuring replicability and dissemination of contents (Bonacini et al., 2019). The Interactive Timeline already provides the opportunity to share content on other platforms, yet it might be interesting to increase the visibility of this shared content. Consequently, a network of content might emerge, increasing the visibility of the virtual museum even further.

Thirdly, the application of digital storytelling practices in this manner results in long-term social and economic revenues. On a social level, museums could further realize the current trend of adopting a visitor-centered approach, and turn into real contact zones, social inclusion tools and constructivist terrains of knowledge production (Sitzia, 2019). The digital storytelling elements could achieve this within the interactive and experiential framework as proposed by Zbuchea et al. (2020). Museums could develop creative relationships with their audiences, and within cultural co-production encourage a feeling of participation. Economic revenues are direct as well as indirect, as an applications such as the platform that was

researched (Bonacini et al., 2019) are low in operating costs, but also function as an additional marketing tool: providing people with more insight in the museum and thus increasing interest by showing them the 'backroom activities' (Towse, 2010). Lastly, online platform that engage with digital storytelling practices allows museums to manage their quantitative statistics regarding the online services (Bonacini et al., 2019). Bertacchini and Morando (2013) have stated that virtual museums have the opportunity to track their metadata so that the use and reuse of images can be tracked and insights can be provided.

5.5. Limitations of the study and suggestions for future research.
This section reflects on the research conducted in this thesis. It will cover the chosen methodology, as well as the applicability of the findings. First, the methodology is looked at.

First of all, not all hypotheses were accepted, meaning that not the entire CUE-model as discussed by Minge & Thüring (2018) seemed applicable. However, there were a lot of general trends that were in line with the model, as well as with other theoretical findings. What must be kept in mind, is the limited sample size of the study. With 109 valid responses, it is not possible to state that the findings of this study are universally applicable. Even though a lot of different nationalities filled in the survey and the male/female ratio was not too far off, the survey was mostly filled in by higher, more theoretically educated people. Since the distribution method of the survey was largely snowballing, a vast amount of participants furthermore is from the researcher's network. The creation of a bubble was however countered by the fact that the survey was posted on both the website of the British Museum as well as on a Virtual Museum page. However, these pages also attract a certain type of visitor, meaning that the findings have to be placed in a context.

A couple of limitation can be linked to the survey. The first one is the fact that the survey was self-administered, meaning that there was no supervision during the filling in of the survey. It could thus be possible that during the time participants were supposed to visit the museum service, they were doing something different. To reduce this risk, a timer was installed into the survey, causing a 2-minute delay. Participants were forced to wait two minutes until they could continue the survey, and of course were asked to visit the environment during this time.

Another limitation linked to the survey is the fact that the different conditions had to be incorporated in the survey software. Even though the survey was pilot-tested before distribution, a lot of participants did not seem to understand how to access the virtual museum service, or did not read that they had to stay in their environment. A potential difficulty was taken into account, as a control question was asked before participants could fill in the

questions regarding their experience. As a result, only 109 of 132 responses were taken into account, as 23 participants did not correctly indicate the virtual museum experience they had experienced. The most commonly made mistake occurred amongst participants who were assigned to Condition 3, but allegedly still clicked on the 'Take a Virtual Tour' button, even though they were explicitly asked not to do this. The control question was necessary, but simultaneously caused some confusion, as participants sometimes misinterpreted the question and did not understand they only had to select the environment they had visited. Since participants saw screenshots of all three conditions in the question, some thought they did something wrong, since they only visited one. The data from these participants was not used in the analysis. The three conditions were still visited by over 30 people per condition however, making it still possible to analyse.

In terms of the conditions chosen, some limitation occurred as well. The three conditions that were used in this survey do not cover all the type of virtual museums that have been developed by museums. These three were chosen, because they were all developed by the one museum, reducing the risk of bias against a museum. It is however possible that with different services, the outcomes would be different. It is furthermore possible that the theme and subject of the objects displayed contributed to the perception of the virtual museums. For condition 2 and 3, this risk was reduced by letting visitors visit the different services, but within the same theme: The Egyptian part of the museum. However, with condition 1, it was not possible directly steer people in that direction.

The last limitation is about the applicability of the research findings. Ervrard and Krebs (2018) state that due to financial and technical reasons, only large and medium sized museums would have the opportunity to develop completely digital services, as they are the only ones that can afford it. Hopefully as these services become increasingly affordable, more museums will have the opportunity to move beyond exact online copies of their physical sites. One of the strong points of the survey was that it was quite simply, fun. Multiple participants indicated they enjoyed participating in the research, and that they were surprised about the quality of the museum services they encountered. One participant stated: "The website really surprised me! Very interesting survey" , and another stated: "I loved the website and had no idea this existed." And a third participant considered the research 'good and very topical' It seems thus that participants were presented with an opportunity to learn something themselves and enrich themselves in this way. Of course, not every participant was this enthusiastic (especially when they were assigned a condition they did not like) and the majority did not speak out at all, but it is relevant to mention nevertheless.

Another strong point of this research is the fact that this is one of the first ones covering a topic in such a manner: applying the Cultural User Experience quantitatively on remote virtual museum services. Therefore, this study could contribute to the work on virtual museum experience, and the implications of this study could be used by museums, as well as in the academic world.

That being said, some suggestions for further research regarding this topic are made. Even though the current research contained some open question, the case could benefit from a mixed-method approach, combining for example interviews with the survey. By doing this, further insights can be provided into what is exactly is that makes some condition more attractive than others. Furthermore, it would be very interesting to conduct similar research with conditions that are more explicit in their digital storytelling practices, providing for example a clear narrative with significant interactivity. In order to realise this however, a vast budget is necessary as there are currently no (free) services available that are exactly right for this type of research. The researchers might have to develop these services themselves, as was done with for example the CHESS project (Roussou & Katifori, 2018). A third suggestion for further research is the online tracking of the virtual museum visitor, followed by a survey or interview, as more insight can in this way be provided into what it is that people value most in these services and where they seem particularly interested in on the website. Lastly, it would be very interesting to collaborate with existing museums on their virtual counterparts. In line with the visitor-centred approach museums could invite active members to participate and explore the services, indicating what they think is interesting. In this way, the museum truly becomes a site of mutuality whilst contributing to current research in Cultural User Experience.

References

Agostino, D., Arnaboldi, M., & Lampis, A. (2020). Italian state museums during the COVID-19 crisis: from onsite closure to online openness. *Museum Management and Curatorship*, *35*(4), 362–372. https://doi.org/10.1080/09647775.2020.1790029

Alberge, D. (2019, November 4). British Museum is world's largest receiver of stolen goods, says QC. *The Guardian*. https://www.theguardian.com/world/2019/nov/04/british-museum-is-worlds-largest-receiver-of-stolen-goods-says-qc

Bedford, L. (2001). Storytelling: The Real Work of Museums. *Curator: The Museum Journal, 44*(1), 27–34. https://doi.org/10.1111/j.2151-6952.2001.tb00027.x

Bertacchini, E., & Morando, F. (2013). The future of museums in the digital age: new models of access and use of digital collections. *International Journal of Arts Management, 15*(2), 60-72. http://hdl.handle.net/2318/105581

Bonacini, E., Camarda, S., Noto, V., & Sangati, C. (2019). Digital Storytelling and Long-Term Participatory Strategies. *DigitCult*, *4*(2), 1–14. https://doi.org/10.4399/97888255301481

Brown, K., & Mairesse, F. (2018). The definition of the museum through its social role. *Curator: The Museum Journal, 61*(4), 525–539. https://doi.org/10.1111/cura.12276

Bryman, A. (2012). *Social Research Methods* (4th ed.). Oxford University Press.

Burke, V., Jørgensen, D., & Jørgensen, F. A. (2020). Museums at Home: Digital Initiatives in Response to COVID-19. *Norsk Museumstidsskrift*, *6*(02), 117–123. https://doi.org/10.18261/issn.2464-2525-2020-02-05

Büttner, O. B., & Göritz, A. S. (2008). Perceived trustworthiness of online shops. *Journal of Consumer Behaviour, 7*(1), 35–50. https://doi.org/10.1002/cb.235

Calvo-Porral, C., Faíña-Medín, A., & Nieto-Mengotti, M. (2016). Exploring technology satisfaction: An approach through the flow experience. *Computers in Human Behaviour*, *66*, 400–408. https://doi.org/10.1016/j.chb.2016.10.008

Carlsson, R. (2020, March 9). *'Storyteching' – how museums can use technology to tell their stories*. MuseumNext. https://www.museumnext.com/article/storyteching-how-museums-can-use-technology-to-tell-their-stories/

Casaló, L., Flavián, C., & Guinalíu, M. (2008). The role of perceived usability, reputation, satisfaction and consumer familiarity on the website loyalty formation process. *Computers in Human Behaviour*, *24*(2), 325–345. https://doi.org/10.1016/j.chb.2007.01.017

Caspani, S., Brumana, R., Oreni, D., & Previtali, M. (2017). Virtual museums as digital storytellers for dissemination of built environment: possible narratives and outlooks for appealing and rich encounters with the past. *ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, *XLII-2/W5*, 113–119. https://doi.org/10.5194/isprs-archives-xlii-2-w5-113-2017

Central Bureau for Statistics (2020, November 20). *2019 jaar van groei voor musea.* [Data file]. Retrieved from https://www.cbs.nl/nl-nl/nieuws/2020/47/2019-jaar-van-groei-voor-musea

Chang, H. (2014). *Economics: The User's Guide*. Pelican.

Charness, G., Gneezy, U., & Kuhn, M. A. (2012). Experimental methods: Between-subject and within-subject design. *Journal of Economic Behaviour & Organization, 81*(1), 1–8. https://doi.org/10.1016/j.jebo.2011.08.009

Chen Hsieh, J. (2021). Digital Storytelling Outcomes and Emotional Experience among Middle School EFL Learners: Robot-Assisted versus PowerPoint-Assisted Mode. *TESOL Quarterly*, *0*(0), 1–17. https://doi.org/10.1002/tesq.3043

Dal Falco, F., & Vassos, S. (2017). Museum Experience Design: A Modern Storytelling Methodology. *The Design Journal, 20*(1), 3975–3983. https://doi.org/10.1080/14606925.2017.1352900

Deng, Z., Benckendorff, P., & Wang, J. (2021). Travel live streaming: an affordance perspective. *Information Technology & Tourism, 23*, 189-207. https://doi.org/10.1007/s40558-021-00199-1

Doukianou, S., Daylamani-Zad, D., & Paraskevopoulos, I. (2020). Beyond Virtual Museums: Adopting Serious Games and Extended Reality (XR) for User-Centred Cultural Experiences. In F. Liarokapis, A. Voulodimos, N. Doulamis, & A. Doulamis (Eds.), *Visual Computing for Cultural Heritage* (pp. 283–300). Springer.

Egyptian life and death. (n.d.). The British Museum. Retrieved April 24, 2021, from https://www.britishmuseum.org/collection/galleries/egyptian-life-and-death

Elgammal, I., Ferretti, M., Sorrentino, A., & Risitano, M. (2020). Does digital technology improve the visitor experience A comparative study in the museum context. *International Journal of Tourism Policy*, *10*(1), 47-67. https://doi.org/10.1504/ijtp.2020.10029192

Evrard, Y., & Krebs, A. (2018). The authenticity of the museum experience in the digital age: the case of the Louvre. *Journal of Cultural Economics, 42*(3), 353–363. https://doi.org/10.1007/s10824-017-9309-x

Falk, J., & Dierking, L. (2016). The Twenty First Century Museum. In *The Museum Experience Revisited* (pp. 295–317). Routledge.

Frasca, R., Pantile, D., Ventrella, M., Verreschi, G. (2014). Innovative Museum Exhibits: Telling a Story by Means of an Engaging Experience. In Gottlieb, H., & Szeląg, M. (Eds.), *Engaging Spaces Interpretation, Design and Digital Strategies* (pp. 201-207). Nodem.

Frey, B. S., & Meier, S. (2006). The economics of museums. In V. A. Ginsburgh & D. Throsby (Eds.), *Handbook of the Economics of Art and Culture* (Vol. 1, pp. 1018–1047). Elsevier.

Google Arts & Culture. (n.d.). *British Museum.* The British Museum. Retrieved April 24, 2021, from https://artsandculture.google.com/streetview/british-museum/

Google Cultural Institute & The British Museum. (n.d.). *Museum of the World*. Museum of the World. Retrieved April 24, 2021, from https://britishmuseum.withgoogle.com/

Gretzel, U., Fuchs, M., Baggio, R., Hoepken, W., Law, R., Neidhardt, J., Pesonen, J., Zanker, M., & Xiang, Z. (2020). e-Tourism beyond COVID-19: a call for transformative research. *Information Technology & Tourism*, *22*(2), 187–203. https://doi.org/10.1007/s40558-020-00181-3\

Harrington, M. C. R. (2020, June). Connecting User Experience to Learning in an Evaluation of an Immersive, Interactive, Multimodal Augmented Reality Virtual Diorama in a Natural History Museum & the Importance of Story. *2020 6th International Conference of the Immersive Learning Research Network (ILRN)*, 70–78. https://doi.org/10.23919/ilrn47897.2020.9155202

Hire, C. (n.d.). *Governance*. The British Museum. Retrieved May 14, 2021, from https://www.britishmuseum.org/about-us/governance

Hooper-Greenhill, E. (1992). *Museums and the Shaping of Knowledge (Heritage)* (1st ed.). Routledge.

Hooper-Greenhill, E. (2000). *Museums and the Interpretation of Visual Culture (Museum Meanings)* (1st ed.). Routledge.

ICOM. (2007, August 24). *Museum Definition*. https://icom.museum/en/resources/standards-\ guidelines/museum-definition/

Kim, M. J., & Hall, C. M. (2020). What drives visitor economy crowdfunding? The effect of digital storytelling on unified theory of acceptance and use of technology. *Tourism Management Perspectives*, *34*, 100638. https://doi.org/10.1016/j.tmp.2020.100638

Konstantakis, M., Aliprantis, J., Teneketzis, A., & Caridakis, G. (2018, November).

Understanding user experience aspects in cultural heritage interaction. In *Proceedings of the 22nd Pan-Hellenic Conference on Informatics* (pp. 267-271).

Konstantakis, M., & Caridakis, G. (2020). Adding Culture to UX. *Journal on Computing and Cultural Heritage*, *13*(1), 1–17. https://doi.org/10.1145/3354002

Larkin, J., & Burtenshaw, P. (2021, March 31). *ICOM Voices - Museums and New Business Models*. ICOM. https://icom.museum/en/news/museums-new-business-models/

Leopardi, A., Ceccacci, S., Mengoni, M., Naspetti, S., Gambelli, D., Ozturk, E., & Zanoli, R. (2021). X-reality technologies for museums: a comparative evaluation based on presence and visitors experience through user studies. *Journal of Cultural Heritage*, *47*, 188–198. https://doi.org/10.1016/j.culher.2020.10.005

Lopatovska, I. (2015). Museum website features, aesthetics, and visitors' impressions: a case study of four museums. *Museum Management and Curatorship*, *30*(3), 191–207. https://doi.org/10.1080/09647775.2015.1042511

MacDonald, C. M., & Atwood, M. E. (2014). What does it mean for a system to be useful? *Proceedings of the 2014 Conference on Designing Interactive Systems.* https://doi.org/10.1145/2598510.2598600

Mahlke, S. (2005). Understanding users' experience of interaction. In *EACE '05 Proceedings of the 2005 Annual Conference on European Association of Cognitive Ergonomics* (pp. 251–254).

Mahlke, S., & Thüring, M. (2007). Studying antecedents of emotional experiences in interactive contexts. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems - CHI '07*. https://doi.org/10.1145/1240624.1240762

Marty, P. F. (2008). Museum websites and museum visitors: digital museum resources and their use. *Museum Management and Curatorship*, *23*(1), 81–99. https://doi.org/10.1080/09647770701865410

McCarthy, J., & Wright, P. (2004). Technology as experience. *interactions*, *11*(5), 42-43.

McLellan, S., Muddimer, A., & Peres, S. C. (2012). The Effect of Experience on System Usability Scale Ratings. *Journal of Usability Studies*, *7*(2), 56–67. https://uxpajournal.org/wp-content/uploads/sites/7/pdf/JUS_McLellan_February_2012.pdf

McNamara, N., & Kirakowski, J. (2006). Functionality, usability, and user experience. *Interactions*, *13*(6), 26–28. https://doi.org/10.1145/1167948.1167972

Minge, M., Thüring, M., & Wagner, I. (2016). Developing and Validating an English Version

of the meCUE Questionnaire for Measuring User Experience. In *Proceedings of the Human Factors and Ergonomics Society 2016 Annual Meeting, 60*(1). SAGE Publications. https://doi.org/10.1177/1541931213601468

Minge, M., & Thüring, M. (2018). Hedonic and pragmatic halo effects at early stages of User Experience. *International Journal of Human-Computer Studies*, *109*, 13–25. https://doi.org/10.1016/j.ijhcs.2017.07.007

Ministerie van Onderwijs, Cultuur en Wetenschap. (2018, October 8). *Economische waarde cultuur. Cultuur & Media* | OCW in cijfers. https://www.ocwincijfers.nl/cultuur-media/cultuur/cultuur-algemeen/economische-waarde-culturele-sector

Moreno, M. J. (2007). Art Museums and the Internet: The Emergence of the Virtual Museum. *Crossings: EJournal of Art and Technology*, *5*(1), 1. https://crossings.tcd.ie/issues/5.1/Moreno/

Morgan, J., & Macdonald, S. (2020). De-growing museum collections for new heritage futures. *International Journal of Heritage Studies, 26*(1), 56–70. https://doi.org/10.1080/13527258.2018.1530289

Museum Vereniging. (2020). *Museumcijfers 2019*. Retrieved from https://www.museumvereniging.nl/media/publicationpage/publicationFile/museumcijfers2019_def.pdf

Mutibwa, D. H. (2020). Rising beyond museological practice and use: a model for community and museum partnerships working towards modern curatorship in this day and age. In S. Popple, A. Prescott, & D. H. Mutibwa (Eds.), *Communities, Archives and New Collaborative Practices* (pp. 108–122). Policy Press.

Navarrete, T. (2013a). Digital cultural heritage. In I. Rizzo & A. Mignosa (Eds.) *Handbook on the Economics of Cultural Heritage*, (pp. 251–271). Edward Elgar Publishing.

Navarrete, T. (2013b). Museums. In R. Towse & C. Handke (Eds.), *Handbook on the Digital Creative Economy* (pp. 330–343). Edward Elgar Publishing.

Navarrete, T. (2019). Digital heritage tourism: innovations in museums. *World Leisure Journal*, *61*(3), 200–214. https://doi.org/10.1080/16078055.2019.1639920

Neal, K. (n.d.). *Accessibility at the Museum*. The British Museum. Retrieved May 14, 2021, from https://www.britishmuseum.org/visit/accessibility-museum

Nelson, V. (n.d.). *The British Museum Story*. The British Museum. Retrieved May 14, 2021, from https://www.britishmuseum.org/about-us/british-museum-story

Nielsen, J. K. (2017). Museum communication and storytelling: articulating understandings

within the museum structure. *Museum Management and Curatorship*, *32*(5), 440–455. https://doi.org/10.1080/09647775.2017.1284019

Perry, S., Roussou, M., Economou, M., Young, H., and Pujol, L. (2017). Moving Beyond the Virtual Museum: Engaging Visitors Emotionally. 23rd International Conference on Virtual Systems & Multimedia (VSMM), Dublin, 2017, pp. 1-8.

Pietroni, E., & Adami, A. (2014). Interacting with Virtual Reconstructions in Museums. *Journal on Computing and Cultural Heritage*, *7*(2), 1–29. https://doi.org/10.1145/2611375

Pietroni, E., Pagano, A., & Rufa, C. (2013, October). The Etruscanning project: gesture-based interaction and user experience in the virtual reconstruction of the Regolini-Galassi Tomb. *In 2013 digital heritage international congress (DigitalHeritage)*, *2*, 653-660. IEEE.

Pine, B. J., & Gilmore, J. H. (1998). Welcome to the experience economy. *Harvard business review, 76*(4), 97-105. https://hbr.org/1998/07/welcome-to-the-experience-economy

Proctor, N. (2011). The Google Art Project: A New Generation of Museums on the Web? *Curator: The Museum Journal*, *54*(2), 215–221. https://doi.org/10.1111/j.2151-6952.2011.00083.x

Radder, L., & Han, X. (2015). An Examination Of The Museum Experience Based On Pine And Gilmore's Experience Economy Realms. *Journal of Applied Business Research*, *31*(2), 455–470. https://doi.org/10.19030/jabr.v31i2.9129

Rizvić, S. (2017). How to Breathe Life into Cultural Heritage 3D Reconstructions. *European Review, 25*(1), 39–50. https://doi.org/10.1017/s106279871600034x

Rizvić, S., Djapo, N., Alispahic, F., Hadzihalilovic, B., Cengic, F. F., Imamovic, A., Okanovic, V., & Boskovic, D. (2017). Guidelines for interactive digital storytelling presentations of cultural heritage. *2017 9th International Conference on Virtual Worlds and Games for Serious Applications (VS-Games)*. https://doi.org/10.1109/vs-games.2017.8056610

Rizvić, S., Okanovic, V., Boskovic, D. (2020). Digital Storytelling. In F. Liarokapis, A. Voulodimos, N. Doulamis, & A. Doulamis (Eds.), *Visual computing for cultural heritage* (pp. 347–367). Springer.

Robbins, N. E. (2021, April 9). Venice's ban on cruise ships is a vital step towards saving the city from disaster. *The Guardian*. https://www.theguardian.com/commentisfree/2021/apr/08/venice-ban-cruise-ships-step-saving-city-italian-lagoon

Roussou, M., & Katifori, A. (2018). Flow, Staging, Wayfinding, Personalization: Evaluating User Experience with Mobile Museum Narratives. *Multimodal Technologies and Interaction*, *2*(2), 1-32. https://doi.org/10.3390/mti2020032

Sitzia, E. (2019). Public participation and agency in art museums. In B. Eriksson, C. Stage, & B. Valtysson (Eds.), *Cultures of participation* (pp. 185–200). Routledge.

Stickel, C., Ebner, M., & Holzinger, A. (2010, November). The XAOS metric–understanding visual complexity as measure of usability. In *Symposium of the Austrian HCI and Usability Engineering Group* (pp. 278-290). Springer.

Sylaiou, S., P. Dafiotis (2020). Storytelling in Virtual Museums: Engaging A Multitude of Voices. In F. Liarokapis, A. Voulodimos, N. Doulamis, & A. Doulamis (Eds.), *Visual computing for cultural heritage* (pp. 369–388). Springer.

Tandon, U., Kiran, R., & Sah, A. N. (2016). Customer satisfaction using website functionality, perceived usability and perceived usefulness towards online shopping in India. *Information Development, 32*(5), 1657–1673. https://doi.org/10.1177/0266666915621106

Tasci, A. D., & Ko, Y. J. (2016). A FUN-SCALE for Understanding the Hedonic Value of a Product: The Destination Context. *Journal of Travel & Tourism Marketing, 33*(2), 162–183. https://doi.org/10.1080/10548408.2015.1038421

The British Museum. (n.d.). *Egyptian life and death.* The British Museum. Retrieved April 24, 2021, from https://www.britishmuseum.org/collection/galleries/egyptian-life-and-death

Thüring, M., & Mahlke, S. (2007). Usability, aesthetics and emotions in human–technology interaction. *International Journal of Psychology*, 42(4), 253–264. https://doi.org/10.1080/00207590701396674

Tisinger, R., Stroud, N., Meltzer, K., Mueller, B., & Gans, R. (2005). Creating political websites: Balancing complexity & usability. *Knowledge, Technology & Policy*, *18*(2), 41–51. https://doi.org/10.1007/s12130-005-1024-9

Towse, R. (2010). *A Textbook of Cultural Economics*. Cambridge University Press.

UNWTO. (2021). *UNWTO World Tourism Barometer* (vol 19). UNWTO, Madrid. https://www.e-unwto.org/toc/wtobarometereng/19/1

Van der Veen, M. (2020, September 21). *Het economische belang van de culturele en creatieve sector.* RaboResearch - Economisch Onderzoek. https://economie.rabobank.com/publicaties/2020/september/het-economische-belang-van-de-culturele-en-creatieve-sector/

Wong, A. (2015). The whole story, and then some: 'digital storytelling' in evolving museum practice. *MW2015: Museums and the Web 2015*, 8-11. Retrieved from https://mw2015.museumsandtheweb.com/paper/the-whole-story-and-then-some-digital-storytelling-in-evolving-museum-practice/

Wyman, B., Smith, S., Meyers, D., & Godfrey, M. (2011). Digital Storytelling in Museums: Observations and Best Practices. *Curator: The Museum Journal*, *54*(4), 461–468. https://doi.org/10.1111/j.2151-6952.2011.00110.x

Zarour, M., & Alharbi, M. (2017a). User experience aspects and dimensions: Systematic literature review. *International Journal of Knowledge Engineering, 3*(2), 52–59. https://doi.org/10.18178/ijke.2017.3.2.087

Zarour, M., & Alharbi, M. (2017b). User experience framework that combines aspects, dimensions, and measurement methods. *Cogent Engineering*, *4*(1), 1-25. https://doi.org/10.1080/23311916.2017.1421006

Zbuchea, A., Romanelli, M., & Bira, M. (2020). Museums in times of the Covid-19 pandemic. [E-book]. In C. Brătianu, A. Zbuchea, F. Anghel, & B. Hrib (Eds.), *Strategica - Preparing for Tomorrow, Today* (pp. 680–705). Tritonic publishing house. http://strategica-conference.ro/previous-editions/2020-edition/

Appendix A - Survey

Thesis VM survey Final

Welcome to the research study!

Thank you for your participation. We are interested in understanding visitor experience in virtual museums. You will be presented with a virtual museum experience, and asked to answer some questions about it. Please be assured that your responses will be kept completely confidential.

 The study should take you around 10 minutes to complete. Your participation in this research is voluntary. The data is collected anonymously and will be used for this study only. There are no wrong answers. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you would like to contact the Principal Investigator in the study to discuss this research or if you are curious about the final results, please e-mail Josephine: 585411jt@student.eur.nl or leave a remark at the end of the survey.

 By clicking the button below, you give consent to and acknowledge that your participation in the study is voluntary, you are 18 years of age or older, the data will be collected anonymously and you are aware that you may choose to terminate your participation in the study at any time and for any reason.

 !! We ask you to please fill in the survey on a **laptop or desktop computer**, as the websites used in this survey do not run smoothly on mobile devices!!

○ I consent, begin the study

1. What is your age in years?

▼ 17 or younger ... 115

2. Which gender do you identify with?

○ Male

○ Female

○ Non-binary / third gender

○ Prefer not to say

3. What is your country of birth?

▼ Afghanistan ... Zimbabwe

4. In which country do you currently reside?

▼ Afghanistan ... Zimbabwe

5. What is your employment status?

○ Employed full time

○ Employed part time

○ Unemployed (looking for work)

○ Not working (not looking for work)

○ Retired

○ Student

○ Prefer not to say

---

6. What is the highest level of education you have completed?

○ Less than high school

○ High school graduate

○ MBO degree - (post secondary vocational education)

○ HBO Bachelor's degree - (School of applied sciences)

○ WO Bachelor's degree (University)

○ Master's degree

○ Doctorate

7. How frequently did you physically visit a museum before march 2020?

○ More than once a week

○ Once a week

○ Once per month

○ A few times per year

○ Once a year

○ Never

---

8. How many different museums have you approximately visited in 2019?

▼ I don't remember ... 50

---

9. How frequently did you physically visit a museum after march 2020, during the restrictions?

○ More than once a week

○ Once a week

○ Once per month

○ A few times per year

○ Once a year

○ Never

10. To what extent do you like to visit a physical museum

    ○ Like a great deal

    ○ Like somewhat

    ○ Neither like nor dislike

    ○ Dislike somewhat

    ○ Dislike a great deal

11. To what extent do you agree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I enjoy history	○	○	○	○	○	○	○
In my free time, I enjoy reading about history	○	○	○	○	○	○	○
I enjoy visiting history museums such as the British Museum	○	○	○	○	○	○	○
I like the British Museum	○	○	○	○	○	○	○

12. A virtual museum can be defined as *"an interactive virtual space that provides information and exhibits cultural objects in digital format"*. Examples are a museum's website, social media page or the museum page on the Google Arts & Culture

website. Considering this definition, how often have you visited a virtual museum since March 2019?

○ More than once a week

○ Once a week

○ Once per month

○ A few times per year

○ Once a year

○ Never

13. How many different virtual museum websites have you visited?

▼ I don't remember ... 50

14. Do you have a favourite virtual museum service? If yes, what is it? (You are welcome to answer this question in Dutch or English)

○ No

○ Yes _____

15. What do you like about this virtual museum service? Please explain in keywords. (You are welcome to answer this question in Dutch or English)

_____

Format 1
Thank you for answering the questions up to this point. Right now, we would like you to visit a virtual museum service of the British Museum through the link below. Please stay on the website for AT LEAST two minutes. After two minutes, you can return to the survey and the continue button will appear. If you want to stay longer, please do so!

You are encouraged to explore all the options the virtual environment you are in has to offer, but **please stay inside the environment**! Do not go to the 'home' page or other pages of the museum website. Also, please turn on your sound.

Please copy the link in a new tab on your computer.
  https://britishmuseum.withgoogle.com

Format 2
Thank you for answering the questions up to this point. Right now, we would like you to visit a virtual museum service of the British Museum through the link below. Please stay on the website for AT LEAST two minutes. After two minutes, you can return to the survey and the continue button will appear. If you want to stay longer, please do so!

You are encouraged to explore all the options the virtual environment you are in has to offer, but **please stay inside the environment**! Do not go to the 'home' page or other pages of the museum website.

Please copy the link in a new tab on your computer.
  https://artsandculture.google.com/streetview/british-museum/AwEp68JO4NECkQ?sv_h=1.3350774539566714&sv_p=-4.148759747651283&sv_pid=H77eIi8MPlIU9dAX9NEnNA&sv_lid=3582009757710443819&sv_lng=-0.1279902004199585&sv_lat=51.51958873462346&sv_z=0.6911292499459274

Format 3
Thank you for answering the questions up to this point. Right now, we would like you to visit a virtual museum service of the British Museum through the link below. Please stay on the website for AT LEAST two minutes. After two minutes, you can return to the survey and the continue button will appear. If you want to stay longer, please do so!

You are encouraged to explore all the options the virtual environment you are in has to offer, but **please stay inside the environment and do not visit the virtual tour**!

16. Did you manage to take a good look around in the environment? You have only visited one of these environments. Please select the environment you visited.

  ○ Screenshot Condition 1

  ○ Screenshot Condition 2

  ○ Screenshot Condition 3

  ○ I did not manage to visit the virtual museum service

We would now like to ask you a couple of questions about your experience with the online museum service you just visited.

Please indicate on what level you agree with the following statements.

17.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
The website is easy to use	○	○	○	○	○
I quickly understood how to use the website	○	○	○	○	○
It is difficult to understand how the website operates	○	○	○	○	○
With the help of this website I will achieve my goals as a museum visitor	○	○	○	○	○

18.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
The way the information was presented is interesting	○	○	○	○	○
The way the information is presented was fun	○	○	○	○	○
The way the information is presented looks unattractive	○	○	○	○	○
The way the information presented was enjoyable	○	○	○	○	○
The British museum is competent	○	○	○	○	○

19.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
The way the information is presented excites me	○	○	○	○	○
The way the information is presented annoys me.	○	○	○	○	○
The way the information is presented relaxes me.	○	○	○	○	○
When visiting the website I feel exhausted	○	○	○	○	○
The way the information is presented makes me feel happy	○	○	○	○	○
The way the information is presented angers me	○	○	○	○	○

20. To what extent do you agree with the following statements?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I would recommend this virtual museum service to others	○	○	○	○	○
I would like to visit this virtual museum service again	○	○	○	○	○

21. Lastly, what final mark would you give the overall virtual museum experience?

0 1 2 3 4 5 6 7 8 9 10

You have now reached the end of the survey. Thank you for your participation, it is highly appreciated! If you have any questions or remarks, you are welcome to send an email to the Principal Investigator of this study, Josephine: 585411jt@student.eur.nl. You can also leave a comment right here.

Please make sure to press the continue button in order to finalize and record your response!

Appendix B – Tables and Figures

Table 3

Analysis of variance for the different constructs per condition

Measure	Condition 1		Condition 2		Condition 3		$F(2, 106)$	η2
	M	*SD*	*M*	*SD*	*M*	*SD*		
Overall Experience	6.82	1.9	5.76	2.12	6.55	1.71	3.02	.05
Pragmatic Qualities	3.77	.88	3.53	.95	3.93	.88	1.98	.04
Hedonic Qualities	3.88	.89	3.14	.89	3.59	.84	6.88**	.12
Emotional Response	3.80	.88	2.98	.93	3.58	.77	9.14***	.15
Future Behaviour	3.53	1.27	2.57	1.15	3.1	1.18	6.15**	.10

**p < .01. ***p < .001*

Table 4

Overview of (marginally) accepted and rejected hypotheses

Hypotheses	Accepted	Rejected
H1a	X*	
H1b		X
H1c		X
H2a		X
H2b		X
H2c		X
H2d	X	
H2e	X	
H3a	X	
H3b	X*	
H3c		X
H3d	X	
H3e	X	
H4a	X	
H4b	X	
H4c		X
H4d	X	
H5a		X
H5b		X
H5c		X

*Note. * marginally accepted*

Figure 8

Difference in Overall Perceived Experience per condition
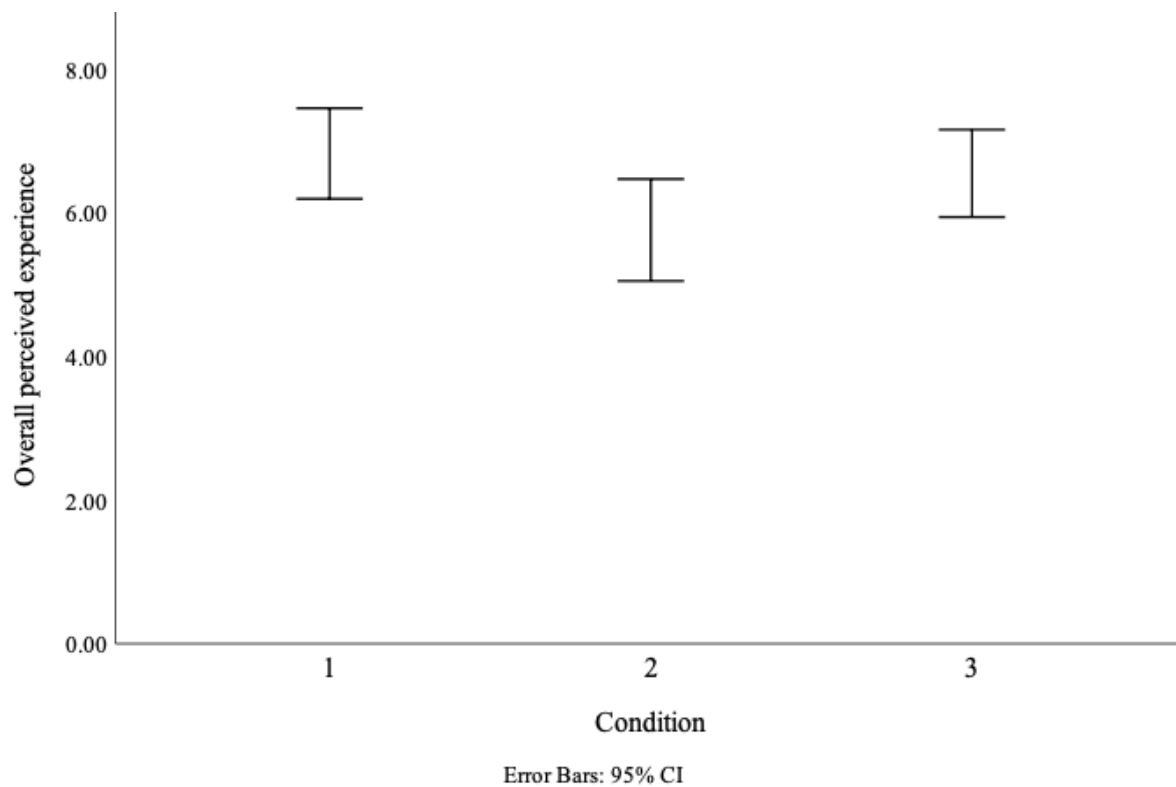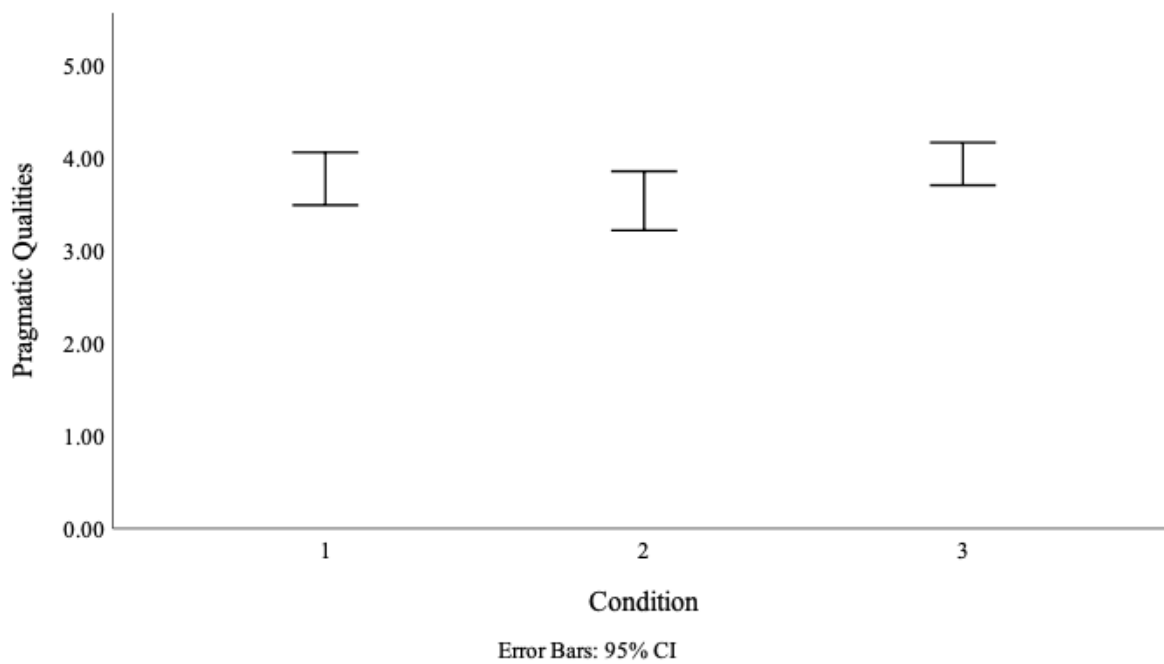

Figure 9

Difference in Pragmatic Qua

lities per condition

Figure 10

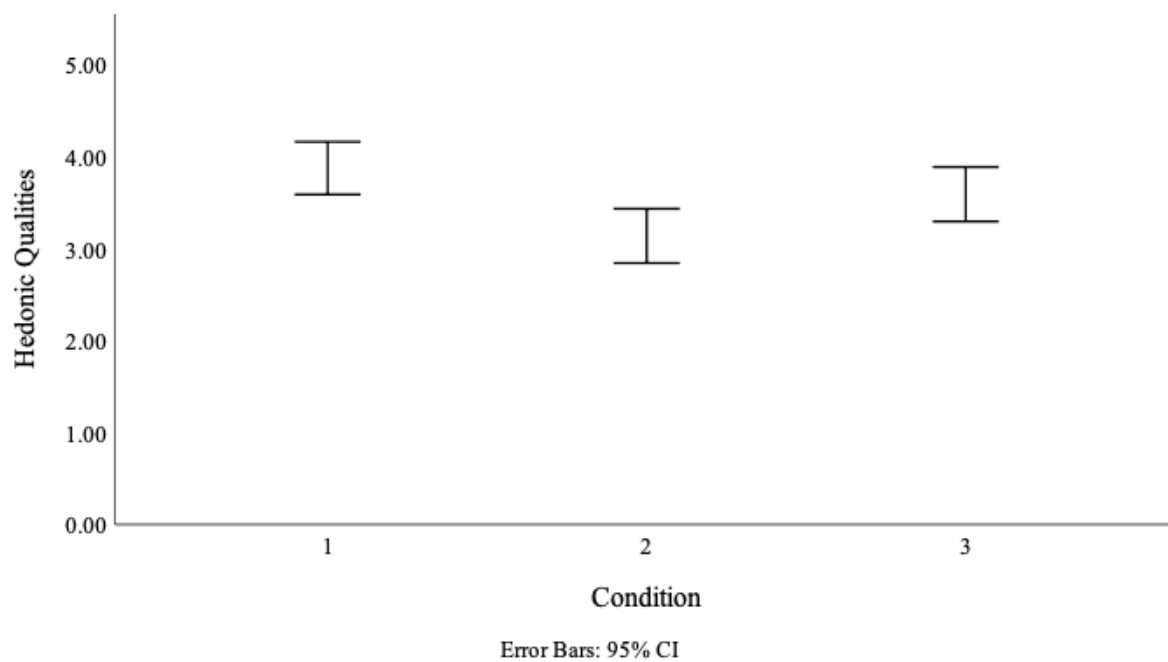*Difference in Hedonic Qualities per condition*

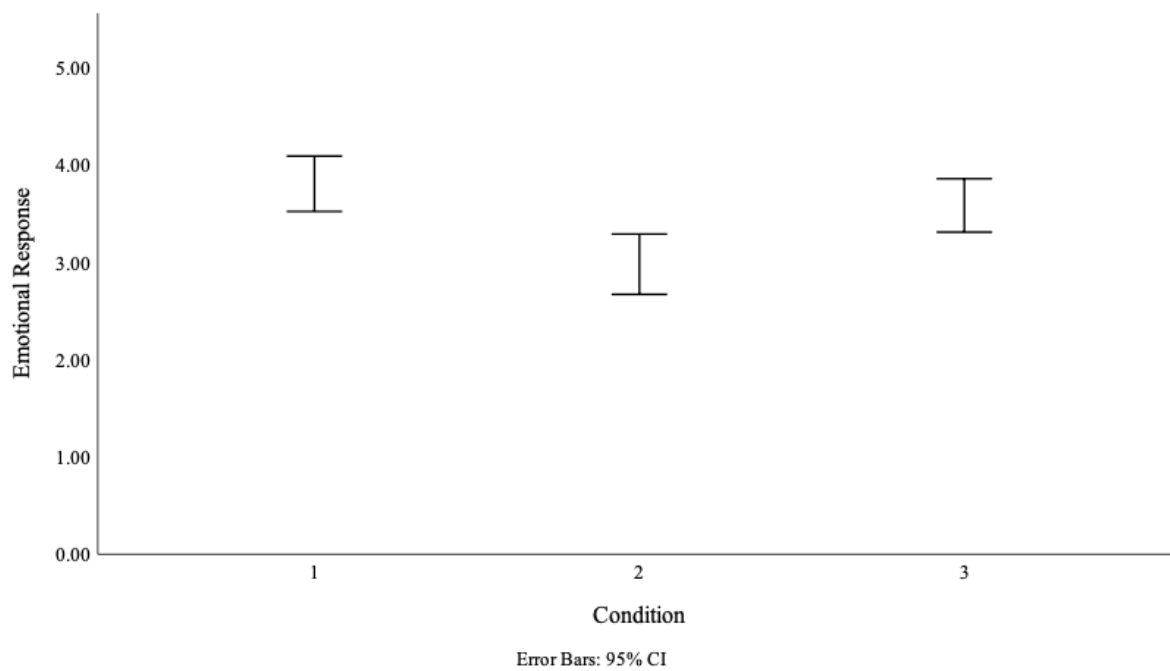**Figure 11**

Difference in Emotional Response per condition

Figure 12

Difference in Future Behaviour per condition

Error Bars: 95% CI