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Dissemination of Archaeological Knowledge through Digital Technologies: The Case of the Multisensory Museum

Georgia-Nikoletta Kakoulidou

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Supervisor: Ing-Marie Back Danielsson
Department of Archaeology and Ancient History
Lund University

Abstract

Nowadays, archaeological museums are open to innovation with an ever-changing character in order to remain relevant to contemporary museology in terms of dissemination of knowledge. In that spirit, digital technologies have been used systematically by museums in an effort to move beyond their ocular-centric nature, resulting in the integration of multisensory practices within the exhibition space. Recently, there has been a rising scholarly interest in the visitor's experience and the influence of digital technologies on it. However, there is a lack of research concerning the incorporation of digital technologies into the exhibition hall from the perspective of the museum professionals, as well as their role within the exhibition's overall sequential flow. The present study aims to address this gap and initiate a dialogue about the importance of adopting a holistic approach concerning the integration of digital technologies in the archaeological museum. To accomplish this, two case studies—the Bryggens Museum in Bergen and the Viking Planet in Oslo—have been utilized. This thesis evaluates digital technologies in museums based on visitor engagement, factors that should be considered when integrating digital technologies in exhibitions, and potential challenges from the perspective of the museum professionals. By using the post-phenomenological framework and by conducting both exhibition analysis and interviews with museum experts, this paper addresses certain areas that have been understudied. The results show the benefits of digital turn employed within a museum setting and the challenges that might arise if such elements are only being used to draw visitors' attention instead of fostering a symbiotic relationship between visitors, artifacts, and devices. Finally, after highlighting potential areas that need further research, this thesis concludes by claiming that the archaeological museum should be receptive to perpetual change, as is the case with the discipline of archaeology itself.

Keywords: archaeological museum, digital media, multisensory learning, postphenomenology, dissemination of knowledge, Norway

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Table of Contents

Chapter 1 Introduction

Museums are dynamic entities that alter and evolve through time as they keep redefining their role in society, their interactions with various stakeholder groups, and other aspects of how they operate (Bernard & Catoni, 2022:113). The origins of the word "museum" can be traced back to the ancient Greek word "*mouseion*" (orig.: μουσεῖον), which meant "the home of the Muses." In its early use, the term had a strong association with philosophical institutions and with places that were dedicated to contemplation and thought (Genoways & Andrei, 2016:35).

Throughout the centuries, the concept of a museum has been subjected to a great deal of evolution and transformation. For instance, the Italian naturalist Ulisse Aldrovandi defined the museum of the sixteenth century as a "collection of knowledge," whether it concerns broad universal descriptions or detailed accounts of phenomena (Folga-Januszewska, 2020:41). George Brown Goode, who wrote two centuries after Aldrovandi, defines the museum as "an institution for the preservation of those objects which best illustrate the phenomena of nature and the works of man, and the utilization of these for the increase of knowledge and for the culture and enlightenment" (Goode, 1895:198).

The International Council of Museums (ICOM) approved the most recent and widely accepted definition of the museum and its function. According to that definition, museums "operate and communicate ethically, professionally, and with the participation of communities, offering varied experiences for education, enjoyment, reflection, and knowledge sharing" (ICOM, 2022). As is becoming apparent from the definitions presented above, regardless of the fact that museums have undergone changes in terms of the primary purpose that they serve and how they operate, one parameter has remained constant over the centuries: the intention to contribute to the dissemination of knowledge.

When it comes to archaeologically based museums, the duty of disseminating specialized knowledge to a wider audience is particularly challenging for the reason that archaeology, like the artifacts on display, is a highly context-dependent discipline. The displays within an archaeological museum are there to serve their primary purpose of educating an audience that may not possess prior knowledge about a topic or concept,

through archaeological finds that are completely detached from their determinate context (Shanks & Tilley, 1992:91). In addition to that, archaeologists and curators, as Fowler describes (1977:136), are "creatures of their time" because their interpretations of the archaeological evidence they uncover or curate are shaped by the prevalent theories and practices of their time. In recent years, the increasing adoption of digital technologies has significantly impacted archaeological museum practices to the extent that the established museum typologies have been rethought (Stobiecka, 2023:106). The digital turn made museums undergo considerable transformations, shifting from the traditional idea of a museum visit to a museum experience that actively, yet interactively, fulfills its task of knowledge-sharing (Drygalska, 2024:2).

1.1 Research Background

In former times, museums solely relied on the display of authentic artifacts to educate the public. However, over the past twenty years, there has been a notable shift towards a visitor-centered approach, prompting museums to integrate Information and Communication Technology (ICT) within their exhibition halls (Wishart & Triggs, 2010:669). In the early phases of the inclusion of digital technology into museum settings, it was employed as a strategy for attracting visitors to the museum while also enriching their learning experiences in a manner that was both educational and enjoyable (Zaharias, Michael & Chrysanthou, 2013:374). As of now, one may argue that today's museums are making use of ICT as an effort to keep up with the times and the changing needs of a more media-literate audience, especially after the COVID-19 era (Black, 2020:40).

The adoption of multisensory practices, which aim to engage visitors through a number of sensory modalities, including sight, sound, touch, smell, and even taste, is one particularly promising avenue in this digital transformation of museums. Recent literature has explored the current museum's sensory approach and how it enhances the overall visitor's experience (Harada et al., 2018; Levent & Pascual, 2014). In addition, adopting practices that expand beyond the realm of visual perception are seen as initiatives that promote accessibility and inclusivity, as they assist in bringing into the museum space a more diverse range of visitors (Zoh, 2023:6).

As a consequence of the aforementioned factors, research in the field of Museum Studies has redirected its focus from objects to visitors and their ensuing experience within the museum. However, the vast body of literature either examines the concept of the visitor's experience from the perspective of the visitor (Kirchberg & Tröndle, 2012) or deals with strategies that enhance the visitor's experience by making it as memorable as possible (Harada et al., 2018; Packer & Ballantyne, 2016). In this context, what remains understudied are digital technologies through the eyes of museum professionals and an examination of the extent to which the use of ICT is a museum's consistent decision, well-integrated with its entire museological strategy.

1.2 Aim and Research Questions

To fill the research gap presented above, this study aims to examine digital technologies integrated into archaeological museums from three different angles: the visitors, the exhibitions, and the museum professionals. By examining how digital technologies help the museum overcome the dominance of vision, this study attempts to shed some light on certain areas that remained understudied through a more holistic approach by considering the three key agents of the museum. The advent of digital technologies has not only transformed the way people acquire knowledge, but also altered the dynamics of museums. These technologies have become an integral component of exhibitions, rather than being stand-alone elements that are disconnected from the broader narrative of the museum. This paper also aims to examine the potential challenges that digital technologies might bring through the lenses of museum professionals, in order to voice their perspectives on certain matters previously addressed by literature.

To effectively address the issue presented above, it would be beneficial to conduct in-site visits but also look behind the scenes of the museum and seek the perspectives of its professionals on the matter. The questions are as follows:

- How do visitors engage with different types of technology within museum spaces?
- What factors should be considered when incorporating digital technologies in archaeologically based museums?

- According to museum professionals, what challenges might a museum face due to the integration of digital technologies?

1.3 Conceptual Framework

To analyze the collected data effectively, it's important to establish a theoretical framework. To ensure that questions and relevant responses are constructed upon a solid foundation, it is essential to establish a theory before dealing with data.

The concept of embodiment has attracted a great deal of theoretical attention from a wide range of disciplines in recent decades. Embodied practices carried out through digital technology have been employed to enhance the visitor's experience to the point that we mostly now talk about a “museum experience” rather than merely a “museum visit” (Wang, 2023:108). In the field of archaeological research, the concept of embodiment gained momentum, particularly after the publication of Tilley's book titled “A Phenomenology of Landscape: Places, Paths, and Monuments” in 1994. By adopting Heidegger's and Merleau-Ponty's phenomenological approach, he argued that rather than applying scientific or positivist methods, archaeologists should rely on their bodies and senses to observe and interpret the world (Tilley, 1994:13). In a similar vein, Tim Ingold follows the same approach by applying phenomenological concepts to the study of humans’ sensory perception, which is dynamic and ever-changing as a result of the perpetually changing of external factors, such as the weather (2011:126-135).

In the years following the book’s publication, Tilley’s ideas were subject to a diverse array of criticism. One such critique was that of Mark Edmonds, who argued that, despite Tilley’s stated goal of adopting a more sensory-inclusive approach in archaeological practice, in reality, his theoretical strand is infiltrated by an excessive emphasis on visual modes of interpretation (Edmonds, 2006). Further to that, Yannis Hamilakis (2013) expanded upon the concept of embodiment, suggesting that it goes beyond visual perception by including, apart from all the five conventional senses, some additional ones like the sense of place (168-170).

Because phenomenologists believed that a practitioner of this approach should not have any intermediating elements between the bodily experience and the physical world, they were reluctant to accept technology as a legitimate research tool. Tilley, for instance, opposes making interpretations based on maps, classification, statistics, and

computer modeling because, in his view, these media shape and filter the way experiences are transmitted (Moyes, 2023:308). The term “phenomenological walk” which Tilley extensively used throughout his book, describes this approach to phenomenology, which aims to reflect and analyze the sensory experience of walking in an environment (Tilley, 1994:28-29; 74; 111; 144). In that sense, the existence of digital technology or anything else standing between a person and a certain type of environment, such as the environment of a museum, limits the person from having a complete, multi-sensory experience in such settings.

New methods and reinterpretations of old theories arose as a result of technical developments throughout the years. Consequently, a new school of thought emerged, with its theoretical foundation based on the idea that digital applications may also provide sensory experiences and improve one's perception of the surroundings. The founder of the post-phenomenological school of thought, also known as “Experimental Phenomenology” (Crystal 2018:300), was Don Ihde who sought to legitimize and incorporate the role that technology plays in the human experience. Computers, according to post-phenomenology, may play an active role (Lock, 2003:3), and the advancement of digital technology and archaeological theory go hand in hand.

In post-phenomenology, technology is seen as an additional variable positioned in the middle of the linear equation that phenomenology had previously established: humans, technology, and the world are connected through reciprocal processes (Ihde, 1990). Moreover, Ihde explores the relationships that are formed between humans and the world through interaction with technology, establishing four distinct categories of relations (Ihde, 1990:72-111).

The first category is *embodiment relations*, which enable people to interact with the environment through the use of technology, resulting in an embodied experience (Ihde, 1990:73). An embodied relation might be developed in the setting of museums through the interaction of a touch-based screen that provides visitors with the chance to manipulate an artifact by zooming in and out, thereby providing them with a type of enhanced vision. The next category identified by Ihde is *hermeneutic relations*, and this time, technology is conveying symbols that require the interpretation of the viewer in order to be understood (Ihde, 1990:89). As an example of this, there may be a set of screens that display arrows within the museum that are strategically distributed

throughout the exhibition hall. These arrows would indicate to visitors the sequential flow that needs to be followed in the exhibition.

Ihde classifies *alterity relations* as the third type (Ihde, 1990:97). This category is tightly linked to interactiveness since in this case, the human being is interacting with technology while the environment plays little to no part. As an example, the process of printing out informational leaflets for the museum involves interacting with a printer, which may be seen as an alterity relation between humans and technology. Lastly, there is the *background relations* category (Ihde, 1990:108) which states that technology is intrinsic to our environments but often goes unnoticed because of its contextual function. Such is the intention behind the illumination of artifact-containing displays, which is to enable visitors to observe them; Nonetheless, visitors tend to disregard these kinds of elements in an exhibition until, for instance, they fail to function properly.

Viewing the engagement of the audience with the exhibits of a museum through the lenses of the theory of post-phenomenology is an approach that has developed quite recently. It was Pallud and Monod (2010) who first tried to use postphenomenological theory to assess how visitors experienced cultural heritage sites, demonstrating the theory's potential in this context. Further work in this area has been done by Moens (2018) and Drygalska (2023), who drew on post-phenomenology to analyze how people interact with technology in museum environments. It has been more than twenty years since Don Idhe first published his ideas, yet his approach remains as relevant as ever, with the increasing popularity of digital technology in museums paving the way to new studies grounded in Post-Phenomenology.

That being stated, this study explores the relations between humans and technology as they are formed within museum settings, using the four categories proposed by Don Ihde as post-phenomenological tools. However, many recent technologies do not neatly fit into just one category due to the fact that the features of their relations overlap with those of other groups. In this thesis, due to its emphasis on multisensory practices, the focus is mainly shifted toward embodiment relations where technology is perceived as an extension of the human body (Gattiglia, 2022:320).

1.4 Methodology

To set the stage for the discussion, this thesis will first present relevant literature, providing the groundwork upon which the questions will be examined. Following that, there will be a focus on demonstrating the two case studies and analyzing their data. Finally, based on data collected from both primary and secondary sources, this study will attempt to place the case studies in the broader context of current research, according to the results retrieved from the analysis, and draw conclusions.

The second chapter presents the literature review of two distinct fields of interest. At the beginning of this chapter, research on digital technologies and their use in exhibition spaces during the last 20 years will be presented. Following that, the case of the multisensory museum will be explored. The incorporation of multisensory practices in museums not only enriches the overall visitor's experience but also plays a significant role in the learning process. Nowadays, archaeological museums are using practices that enable more than one sense for disseminating scientific knowledge. As a result of technological advancements and their subsequent integration into exhibition halls, multisensory approaches as teaching methods are now reaching their full potential through the use of digital technologies.

The case studies are examined and presented in the third chapter. The Bryggens Museum in Bergen and the Viking Planet in Oslo will both be used as the main case studies of this research. In contrast to the former, which is more of a conventional archaeological museum, the latter labels itself as a digital museum, drawing the attention of visitors to the fact that it relies heavily on digital technology. They are both making use of digital technology that appeals to several senses. Furthermore, they both serve as cultural institutions that disseminate knowledge, but the chosen museums do it in quite different ways.

Two methodological frameworks will be employed to deal with the research questions. In order to understand the different elements that comprise an exhibition, the exhibition analysis as thoroughly presented by Stephanie Moser (2010) will be used. According to her paper, the exhibition analysis reveals eight distinct aspects of the museum that should be considered when laying out exhibitions. By analyzing all of the components that make up an exhibition, it becomes easier to identify the certain aspects that require additional attention when implementing digital technology in a museum environment. The second approach involves conducting interviews with museum

professionals in order to elicit their not-that-often-voiced perspectives on the difficulties that a museum may encounter when digital technology is incorporated into an exhibition.

The technological devices deployed by each museum will also be presented in terms of how they operate and the content they include. Additionally, the nature of the mediated relationship which develops between visitors and digital technologies will be defined, in accordance with Don Ihde's (1990) four categories of mediated relations. By identifying the various relations that are formed, a better understanding of the various ways that visitors engage with technologies is provided, in a museum that moved beyond the realm of vision.

The fourth chapter is dedicated to establishing a dialogue between primary and secondary sources. The results will be explored according to three thematic axes: digitized presence, the efficacy of multisensory practices, and the potential risk of the so-called "Disneyfication" of the museums. Considering the limitations that this study entailed, further developments will be proposed. Finally, in the last chapter, the research questions are answered clearly and directly in the conclusion, along with the relevance of the responses in connection to the broader field of archaeology.

1.5 Chapter Summary

The role of museums has evolved throughout the years, but their commitment to sharing specialized knowledge has remained constant. The integration of digital technologies in the exhibition hall has brought to the forefront various ways through which a museum can fulfill its mission. As a result of these changes along with the incorporation of multisensory practices into the museum's physical space, the emphasis shifted from the artifacts to the visitors. However, the literature mostly turns the spotlight on the individuals who visit the museum, and the examination of this matter from the viewpoint of museum professionals and evaluations of digital technology as an element of the exhibition, remain understudied. The post-phenomenological theoretical framework as well as exhibition analysis and interviews, will serve as the lens through which the research questions, drawing on a variety of primary and secondary sources, will be viewed and addressed at the end of this five-chapter thesis.

Chapter 2 Literature Review

2.1 Digital Technologies in Museum Settings

Recent years have seen the rapid development of digital technologies, which now affect every aspect of our lifestyle, transforming how we study, communicate, and perform the tasks of our daily lives in ways we never imagined possible before. By doing so, it was impossible for these technologies, which impact fields as diverse as medicine, science, and arts (Bowen & Giannini, 2014:327), to have no impact on museology and its practices. As a result, the integration of technological innovations within the museum environment has led to its transformation from passive display rooms into interactive, visitor-centered places (Macleod, 2005:227), reshaping their traditional features and purpose. This transformation, consequently, sparked a discourse on how visitor's interactions with ICT may result in long-lasting learning experiences along with enjoyment (Wishart & Triggs, 2010; Chen & Huang, 2012; Zaharias, Michael & Chrysanthou, 2013).

During the initial stages of integration of technology in museums, standalone kiosks were widely used and received favorable feedback from both visitors and museum professionals (Serrell & Raphling, 1992:181). The year 1988 marked the installation of the first interactive touchscreen associated with archaeology at the National Museum of Natural History in Washington D.C. (Plaisant, 1991:500). In order to inform the public about volunteer archaeology opportunities, two interactive touchscreens were placed in the "King Herod's Dream" exhibition. By touching the screen and selecting highlighted words, users could navigate through a world map, search the database by region, and access detailed maps of archaeological sites that are open for volunteer work (BenShneiderman, 2008).

With the increased accessibility of the internet and computational power during the turn of the century, museums and art galleries have been given the opportunity to share their collections with a global audience. Even as early as the 1990s, the REVELATION project proved the potential to digitally represent the physical space of archaeological sites for educational purposes (Devine & Welland, 2000:32). In the year 1998, the expedition team responsible for this project traveled to Crete intending to collect on-site data from Knossos and then processed them to create a virtual tour of

Minos' Palace. On the other hand, the Teylers Museum in Haarlem is one of the earliest examples of publicly accessible museum websites that was launched in 1994 (Navarrete Hernández, 2014:40). The museum's introductory page featured images that depicted a 20-minute-long downloadable tour of the exhibition, enabling viewers to navigate from room to room, exploring the information provided about the collection.

The opening years of the 21st century gave prominence to the concept of interactivity. At this time, the functionality of the kiosk-based technologies appeared to be limited, putting into question the interactiveness of these devices which was restricted to a single button that was triggering a response from either a screen or an audio system (Danks et al., 2007:105). To broaden the appeal of their product and attract more visitors, museums have increasingly begun adopting the engagement strategies used by the entertainment industry (Ioannidis et al., 2013:421). Edutainment, a term that was created with the merging of Education and Entertainment, is an approach that has also found application in the museum sector. This approach achieved a double benefit by incorporating entertaining techniques into the educational process and by also seeking to increase museum attendance (Dilevko & Gottlieb, 2004:3).

Some have voiced their disapproval of museums that incorporate entertainment aspects from television or other media sources that do not pertain to pure academia. The fundamental claim was that museums lose some of their academic character when they incorporate features that aren't necessarily part of their mission (Perl, 2000:32). Today, edutainment has expanded into numerous directions, but one of the most interesting is "archaeogaming"— which can be briefly defined as the intersection of archaeology and video games. The game spaces within these media can be viewed from an archaeological perspective as "digitally built environments containing their own material culture" (Reinhard, 2018:2).

Recently, the notions of "immersion" and "immersive experience" have reached their highest levels of popularity, and museums are taking advantage of this. In certain instances, cultural institutions are making investments in augmented reality (AR) and virtual reality (VR) applications in an effort to overcome the constraints that are imposed by the physical space of the museum (Shehade & Stylianou-Lambert, 2020). Innovation in museums is now regarded not only as a strategy to draw visitors but also as a way to invite an ever-increasingly diverse audience, thereby creating an accessible

and inclusive environment in a technologically evolving society (Antón et al., 2018:1406).

Apart from cutting-edge technologies such as VR and AR, which promise immersive experiences, museums have also adopted the Bring Your Own Device (BYOD) model as one of their main marketing strategies (Hornecker & Ciolfi, 2022:32). According to Shah and Ghazali (2018:40) the two most prevalent types of technology utilized within a museum setting were smartphones and tablets. This was because most museum visitors who brought their own devices and mobile apps found it very convenient to have information about exhibits and historical events right at their fingertips. However, regardless of the apparent ease of use that mobile applications can provide to museumgoers, studies have shown that application development can be costly (Barbosa, Saboya & Bevilaqua, 2021:16). Particularly, for smaller museums, it can be financially challenging to develop, and subsequently maintain an effective application usage continuity program.

Considering how pervasive digital technologies are in our everyday lives, we often make use of them without being consciously aware of it. Because of this, is crucial to define the term "digital technologies," often known as ICT. According to the official definition given by UNESCO (2009:120):

> Information and Communication Technologies (ICT) is defined as a diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting), recorded broadcasting technologies (podcasting, audio and video players, and storage devices), and telephony (fixed or mobile, satellite, vision/video-conferencing, etc.).

As indicated above, all of the multimedia employed by the museums included in this research, fall under the umbrella of ICT, ranging from basic ones like projection mapping on printed walls and speakers to more complex and big-budget VR installations and interactive touchscreens.

2.2 Multisensory Learning: The Case of the Multisensory Museum

The inclusion of different senses in educational processes, as well as its positive impact on pedagogy, has been recognized as an effective learning practice in the first teaching manuals, encouraging teachers to use techniques that enable children's senses (Montessori, 1912). Multisensory learning involves motivating learners to take in new information by using more than two sensory systems at a time. Research on multisensory learning strategies showed that when students in any type of learning environment associate new information with more than a single sense, they are more likely to retain it after the end of the learning experience (Shams & Seitz, 2008). In the spirit of fostering long-lasting impressions in the museum, which serves as a common learning environment, efforts have been made to overcome the unisensory nature that possesses. Did each display, however, consistently bear the "Do Not Touch" label throughout history?

From the very beginning, museums have been intentionally designed to enable more than one sense. Museums, as we know them today, originated in the seventeenth and eighteenth centuries when their visitors were allowed to have tactile engagement with the artifacts (Classen, 2007:897). The collections that were now housed at the newly constituted institutions initially retained the character they had when serving as the so-called "cabinet of curiosities" (Classen, 2005:275). While it may seem fairly odd to interact physically with original artifacts in the context of museums nowadays, at their earliest form museums served as private places to which only a selected few had access (McGinnis, 2014:325).

Midway through the nineteenth century, museums open their doors to a wider audience in an effort to redefine their role as educational institutions. This initiative was driven by the belief that the more accessible the museums became, the more the rough and rowdy citizens may observe how the middle class behaved and possibly learn to be civilized (Bennet, 1995:28). During that period, museums were mostly controlled by the visual sense, as no other sense could be employed inside a museum environment. This phenomenon, which Levin calls the "hegemony of the vision," is closely associated with modernity due to the fact that the eye becomes the dominant sense (Levin, 1993:340).

One of the earliest indicators of a shift towards a more sensory-oriented approach in museum exhibitions was when the artifacts started breaking out of their glass cases and were exhibited according to an open display practice (Morgan, 2012:69). Apparently, individuals were still forbidden from physical contact with the authentic artifacts but the notion that their display held less physical deterrent qualities facilitated the development of an intimate form of exhibition. However, in the case of the archaeological museum, curators sometimes are forced to enclose artifacts in glass cases, despite their exhibitionary preferences. The archaeological museum houses artifacts not merely for displaying them to the public but also for preservation and conservation purposes (Shanks & Tilley, 1992:90). In that case, glass displays provide a controlled environment that insulates artifacts from external factors that can cause damage, such as humidity (Shinner, 2007:269).

Living History Museums, such as the Lofotr Viking Museum in Norway and Skansen in Sweden, actualized the idea of the museum as a place that engages several senses. Based on the premise that visitors prefer a whole reconstruction rather than receiving a fragmentary impression of how the past might have looked like, these museums pursue reconstructing the past in its entirety (Marstine, 2006:3). These settings encourage tactile engagement through replicas derived from authentic objects, serving also as reflections of the societies that those objects represent (Ambrose & Paine, 2018:140). In some cases, as in the Jorvik Viking Centre in York, these museums recreate a sensory environment by integrating smells and sounds (Shanks & Tilley, 2022:329).

Apart from living history museums, traditional museums have also been intrigued by the concept of a multisensory museum. ABS (Art Beyond Sight, former Art Education for the Blind) came into existence in 1987. It was founded on the assumption that museums and other public spaces must cease being ocular-centric and start making steps towards accessibility and inclusion for those with vision impairments (Levent & Pascual-Leone, 2014:14). In a short time, it became clear that multisensory experiences help not just those with visual disabilities, but also a larger range of visitors such as the elderly and children (Harada et al., 2018:2221).

In an age when addressing social exclusion in museum settings is considered a pressing challenge that needs to be addressed (González-Herrera et al., 2023), the

multisensory museum is actively striving to make itself an inclusive environment that welcomes a wider range of visitors. A new type of museum is on the horizon, one that brings the cultural institution back to its original roots while retaining a fresh perspective on museological practices.

2.3 Chapter Summary

Digital technology and multisensory practices are two distinct facets of museums that have been covered in this chapter. Museums have evolved from static exhibition spaces into dynamic, visitor-focused venues thanks to the incorporation of technological advancements. As a result, the focus of research has also shifted towards the visitors and how to enhance their museum experience. The inclusion of digital technologies as integral components of exhibitions has not been thoroughly addressed, and the perspectives of museum professionals on digital technologies also remain understudied. The only paper that deals with this issue, albeit on a smaller scale, is the study by Shehade & Stylianou-Lambert (2020), which solely examines the case of VR applications within museums. On the other hand, there is a lot of discussion about museums returning to their multisensory roots, since the exhibitionary space became a multilayered space that engages more senses at once. Modern museums have completely overcome the dominance of vision and transformed the ways people engage with displays through a multisensory approach.

Chapter 3 Case Studies

3.1 The Archaeological Museum in the Digital Age

To investigate the research questions posed at the beginning of this thesis, research was conducted concerning the digital technologies employed by two archaeology-related museums, as well as how these technologies have been seamlessly integrated into the exhibition's sequential flow. Built on top of the remains of Bergen's oldest structures dating back to the first half of the eleventh century, the Bryggens Museum will be the first museum to be discussed. In its permanent exhibition, there is a wealth of archaeological artifacts that paint a vivid picture of how everyday life in the Middle Ages would look like. As for the second museum, it's the Viking Planet based in Oslo. In its entirety, it is a digital museum, serving as a virtual portal to the Viking Age, with no original artifacts to show and consequently is exclusively reliant on emerging technologies.

These museums were chosen as the case studies for this research because of the diverse ways in which their respective exhibitions use technology to disseminate archaeological knowledge. As will be shown in the next section, the collection of data illustrates two distinct types of the modern archaeological museum: one that uses technology to remain relevant in the Digital Age, and another that functions by default in an extensive technologically mediated setting. The diversity of technologies, ranging from basic and budget-friendly to costly and cutting-edge ones, lays the groundwork for further research on the concepts of visitor's experience and multisensory learning.

With an aim of gaining a better understanding of the performance and the adoption of digital technologies within the exhibitionary space, it is necessary to investigate the role they play and, consequently, whether they are integral parts of the exhibition as a whole. To do so, this thesis examines the museum as a set of distinct components that need to be disassembled and analyzed according to each case study. After analyzing each aspect of the museum individually, at the end of this chapter it will be defined which of them are more important and require further consideration in terms of the integration of digital technologies.

In this regard, Museum Exhibition Analysis as has been thoroughly presented by Moser (2010), will serve as the analytical framework for this research. According to

her account, a consistent analysis of an exhibition must take into consideration a complex set of factors in order to evaluate the epistemic role of the museum's content (Moser, 2010:22). For this reason, digital technologies must be evaluated in the context of the exhibition to which they belong rather than be considered as stand-alone elements.

Through this process, exhibitions will be examined according to eight categories, with the first of them being the *architecture, location, and setting* of the museum. It is of vital importance for the exhibition's analysis to start with a bigger and external picture and then specify the examination in an inward and in-depth manner. The second category concerns the *space* itself, which includes the entire interior of the museum and how it's laid up to make the most efficient use of the area for visitors. Third, the analysis focuses on *design, color and light*, factors that transform the exhibitionary space into a silent theater where the audience, the artifacts on display and the environment are all involved in an ongoing, yet unconscious, interaction. Following this, the examination of factors that are more abstract and not immediately apparent, like the message an exhibition conveys in relation to more tangible and factual components like the textual accompaniments, is the goal of the fourth category, which refers to *subject, message, and text.*

The fifth category deals with the *layout* of an exhibition and puts in the spotlight how the different components comprising the exhibition are arranged and how they relate to one another. An examination of the *display types* used by the two cultural institutions under consideration, along with an examination of the functions performed by these displays within the exhibition, ensues. Presenting these key exhibitionary elements has prepared the stage for the next step, which is to introduce the *exhibition style* as a communicative tool that contributes to the museum's narrative. Lastly, as the visitors are the ones the exhibitions are designed for, the *audience and reception* section will adopt a visitor-centric approach, discussing how the exhibition has developed in response to specific types of audiences who are likely to be interested in it. To complement the text, visual material has been used throughout the chapter of analysis.

In this manner, a solid foundation will be established upon which the descriptions of a number of selected technological apparatuses being used by each museum will be presented. The ICT will be classified based on the sensory organ they primarily appeal to, indicating which sense is dominant while visitors engage with them.

In order to properly understand the manner in which individuals within a museum interact with technological devices, Don Ihde's four categories will be employed to illustrate the relationships being formed between visitors and technology for each specific device.

3.2 Rising from the Ashes: The Case of the Bryggens Museum

The Bryggen Quarter, burnt to the ground several times in the past, the most recent of which occurred in 1955 (Helle, 1998:66). However, new possibilities may still arise among the most severe disasters and challenges: The year 1955 also marked the beginning of 13-year-long excavations that unearthed several thick fire layers, revealing useful information about Bergen's history over the centuries (Herteig, 1985). Because of the large number of artifacts and the historical significance of architectural remains uncovered, it became apparent that a new museum needed to be built in order to breathe new life into Bergen's post-Viking history.

3.2.1 Architecture, Location, Setting

Situated in the heart of the historic wharf, Bryggens Museum lies very close to the modern city center of Bergen. The setting in which the museum can be found combines the lively harbor, the picturesque Bryggen quarter, and the solemn presence of St. Mary's Church. Collectively these three elements endow the scenery with a diverse atmosphere, characterized by the church's imposing presence and the port's vibrant existence. Today, the erstwhile old harbor remains active, with many tourists filling the narrow streets of the historic area, which serves as the main trademark of the city of the Seven Mountains.

The museum's building, which has been recognized with several awards, was designed by Øivind Maurseth in the year 1975 (Nyberg & Røyrane, 2014:181). It is characterized by maintaining a modern architectural style. The architecture of a building plays a significant role in conveying messages about the exhibitions contained in it (Moser, 2010:24). For instance, installing an exhibition within a modern building is a manner of instilling a more modern vibe to its content (MacLeod, 2005:11). This gives

the impression to visitors that they will be viewing displays that are more relevant to the current museological practices, as is the case with Bryggens Museum.

The first curator of the museum and leader of the archaeological excavations at Bryggen, Asbjørn Herteig, considered the idea of an independent institution that houses the archaeological material which has been found as a great opportunity to introduce a new type of modern museum. Instead of following the model of the traditional museum which functions in a static and inward-looking manner, Herteig envisioned a museum that not only aids scientific research but also would serve as a cultural center of activity (Herteig, 2005:28). His vision was well suited with a museum that adheres to the modern style of architecture. The building's generally simple form is disrupted by just two decorative elements. The chosen artifacts, which are associated with the maritime culture, were historically significant and aesthetically appealing, making them ideal for use as decoration (Herteig, 2005:45).

The Bryggens Museum is known as a "site museum" because it was built over an area of unearthed architectural remnants from the town's earliest phase (Handbook to the Cultural History of the Middle Ages, Supplementary to the Displays and Exhibits in Bryggens Museum, 1978:11). As a result, the location of the museum has been determined based on the place where the archaeological material was originally uncovered. In total, there are five timber structures considered the oldest secular architecture yet found in Bergen, separated by passageways. Because of the very sensitive nature of this historical environment, the building of the museum proved to be a good decision to make in order to protect the vulnerability of the site (Nyberg & Røyrane, 2014:181).

3.2.2 Space

An important aspect of how exhibitions are seen is the physical space in which they are displayed. As a fixed factor, space can be a decisive parameter when considering the integration of digital technologies, and for that reason, this aspect necessitates further consideration when a museum intends to incorporate digital elements into an exhibition. According to Swain, the spatial factor is of importance because it determines how visitors interact with the exhibition's many spaces (Swain, 2007:226). In a broad sense, the exhibition hall can be divided into two main sections: one that displays the architectural remnants in their original settings and the other that

houses a collection of numerous artifacts from Bergen and Western Norway dated back to the Middle Ages. The latter is organized around broad themes related to medieval archaeology, including trade, power and authority, clothing and attire, craft, and shipping, just to mention a few.

In the room that follows the original archaeological site, all the portable treasures recovered from the excavations are on display. The physical space of the exhibitionary environment is undivided since there aren't any structural separations demarcating the single-room area. However, the theme in the exhibition titled "An Age of Faith/Life and Death" is the only one that deviates from this rule. To convey the message of how thin the line between life and death was throughout the Middle Ages due to low life expectancy, artifacts and bones are displayed in an enclosed space with a low ceiling, in an effort to evoke the imposing atmosphere of death. Here, visitors are invited to interact with the presented content on a more personal and self-reflecting level while the rest of the exhibition can be seen at the glance of an eye, leading to a higher aesthetic visual (Moser, 2010:25).

3.2.3 Design, Color, Light

The "Under Jorden" exhibition is housed in an open-plan space that lacks strong design features. The only decorative elements that can be found are on certain sections of the walls and floor surfaces. In the case of the walls, inscriptions may be seen where the displays are wall-mounted, depicting the many cultural layers recorded throughout the excavations. In this manner, the exhibition demonstrates how the artifacts that are on display have been dated in accordance with the several layers of soil in which they have been found. In other parts of the exhibition, the walls feature line drawings that are used to help visitors comprehend the objects' usage. In the same spirit, the floor surfaces are covered with line drawings indicating the floor plan of the settlement that the excavation brought to light.

An exhibition's most important physical elements to draw visitors' attention are color and light which work either alone or in combination (Roppola, 2013:128). In the case of the exhibition "Under Jorden," color and light are working together and moreover, color is at the service of light; as part of the museum's broader attempt to protect the light-sensitive artifacts on display, the decision to paint the exhibition walls

and floor a hue of deep blue assists in minimizing the overall light levels in the museum. The lighting of an exhibition proves to be particularly important for the way the exhibits are presented since our eyes are naturally drawn to bright items. The lighting designer can direct the viewer's attention to some artifacts while drawing their gaze away from others by making use of this property (Vane, 2021:8). In the exhibition "Under Jorden" a combination of natural and artificial light sources is used. The section of the museum where the architectural remnants lie is illuminated by natural light permeating the large windows of the building.

The light levels are decreased as one moves towards the exhibition where the glass displays are positioned. This is because the exhibition chiefly consists of artifacts with high sensitivity to light, such as textiles, wood, and leather. As a result, illumination is restricted to spots where it is considered essential, namely the glass cases and the text panels to ensure they are readable by the visitors. As it stands, the museum's choice to employ video projectors was well suited to the low-light environment.

3.2.4 Subject, Message, Text

As a site museum, Bryggens' permanent exhibition has as its main subject the excavations that unearthed thick layers of architectural and cultural remains (Herteig, 1978:47). From a broader context, the museum tells the story of Bergen during the Middle Ages, emphasizing the important role the city played in an extensive and international trade network. Despite the successive fires that turned the city to ashes, Bergen continued to rebuild and remain relevant to Northern Europe's trading system. On a narrow scale, the exhibition showcases artifacts that tell the story of people in the Middle Ages, a result of the wealth of such objects unearthed during the excavations. Visitors may get a glimpse of everyday life that is long gone through clothing that has survived in a remarkably good condition, leather shoes as well as leather waste left behind by craftspeople.

"Under Jorden" is an example of a thematically organized exhibition, which differs from chronological ones in the way it showcases certain subsets of material, allowing visitors to actively engage in understanding cultural themes that resonate with them (Moser, 2010:26-27). Central themes revolve around Shipping, Craft, Life in the Countryside, Power and Authority, Clothing and Attire, The Middle Ages in Writing,

and An Age of Faith/Life and Death among others. In addition to the archaeology related topics, the exhibition attempts to engage visitors with contemporary issues, in that case with environmental sustainability.

The inclusion of textual accompaniments that enhance the comprehension of the displays is another key factor that should be considered when analyzing museum settings. Over the past two decades, traditional written text panels have been subject to criticism because it appeared that curators didn't succeed in taking into account the background knowledge, interests, and visual ability of visitors (Skeates, 2022:348). This led to the composition of texts that merely demonstrated the curator's intellectual expertise. In response to this criticism and in the spirit of museum democratization, readability and comprehension have been prioritized in terms of text panels at museums, including introduction and section panels but also the object labels (Ambrose & Paine, 2018:167).

The creative style of writing, characterized by the frequent use of colorful language, is easy to identify when examining the textual information presented by the Bryggens Museum. The language is more descriptive in nature, intending to create an atmosphere that encourages visitors' engagement by making the artifacts presented seem more approachable (Moser, 2010:27). The text panels are up to three short paragraphs that include text comprised of little sentences in a literary tone. Furthermore, to help visitors understand what they're looking at, the object labels at grouped displays contain plain depictions of the items that are on display. All the written content included in the exhibition hall can be found in both Norwegian and English.

3.2.5 Layout

The layout of an exhibition is significantly influenced by the type of the host museum. For instance, it is a common practice for national museums to employ a linear layout in their exhibitions since it is an efficient strategy for systematically developing the history of a nation (Skeates, 2022:383). The Bryggens Museum's permanent exhibition has a non-linear arrangement due to the lack of signs indicating the proper sequence in which one may see the various exhibitions. Arranged in a way that doesn't give any of the themes a greater importance than the others, "Under Jorden" presents

all exhibits as equally integral parts of the exhibition's main theme —everyday life in the Middle Ages.

Visitors unconsciously "read" a narrative as they make their way around an exhibition based on the arrangement of the components and how they relate to one another (Moser, 2010:27). For that reason, every exhibition incorporating digital elements within the exhibition space should do so by first examining the layout of the entire exhibition. The displays of "Under Jorden" are arranged in a perimetrical manner along the walls of the exhibitionary space. The only exhibits that are standing in the middle of the room are those being kept in glass showcases, which are arranged not in a row but rather alternately, giving the impression of movement.

3.2.6 Display Types

The exhibition at the Bryggens Museum is comprised of sections, each of which has a range of displays that are designed to demonstrate daily life throughout the Middle Ages. The museum is, as previously mentioned, categorized as a site museum. Site museums, in contrast to larger regional and national museums, may display the histories of artifacts in their original settings or in close proximity to the sites of their discovery, which provides a substantial interpretive benefit (Skeates, 2022:17). In that context, the section where the architectural remains and features can be found might be viewed as the first display that visitors encounter when entering the exhibition.

The object displays follow the type of grouped displays organized in thematic order, showcasing the breadth of archaeological findings unearthed during the excavations. According to Ambrose and Paine, the type of grouped displays is commonly used by archaeology-related museums because a group of objects can be displayed with very little interpretation (Ambrose & Paine, 2018:159). However, there are some cases in which well-preserved artifacts such as the Guddal garment, or artifacts of historical importance such as the Rune stick with the Norwegian leidang (war fleet) are displayed individually. These solitary displays are also accompanied by further information about the showcased objects in order to give visitors a better understanding of the exhibition. By directing the visitor's attention to certain displays, the exhibition might encourage a closer, more attentive examination of the artifacts on show (Falk & Dierking, 2016:69).

The rest of the museum's displays fall within the category of ICT. The museum uses sound installations that play audio recreations throughout the exhibition hall, creating an ambience sound design in each of its sections that goes beyond background music. In that manner, the creation of a soundscape serves as a supplementary element to the visual narrative and the incorporation of sound becomes one component of a multimodal whole (Cluett, 2014:109). On the other hand, projection mapping technology has also been utilized in exhibitionary space, transforming static displays into dynamic ones. The projections, which include maps and a 3D animation demonstrating the building of a ship in stages, provide a dynamic teaching resource that enhances the otherwise static museum setting.

3.2.7 Exhibition Style

The permanent exhibition of Bryggens Museum uses a combination of exhibition styles to convey its central topic. Primarily, the exhibition, as stated earlier, is a thematic one. The organizing structure of thematic exhibitions classifies artifacts in an ahistorical manner focusing more on their aesthetical value rather than their historical context: they show a subset of items that adheres to a certain idea or theme from which only a selection of well-preserved artifacts may be displayed (Bertrand, 2021:39). This practice is compatible with the waterlogged soil conditions of Bergen which resulted in the discovery of organic materials with exceptional preservation. Because many artifacts have survived in good condition, they not only have historical importance but also aesthetic value to display.

The second exhibition style that can be found in "Under Jorden" is that of the object-based displays. As shown earlier, Bryggens Museum remains committed to its object-based exhibits, while the current trend in museology is for museums to shift their focus from showcasing objects to creating environments that are more visitor-centered (Parry, 2013:297). Despite all the efforts made to improve the visitor experience, such as with the installation of ICT, the core of "Under Jorden's" exhibition is still devoted to its artifacts, which are sometimes shown statically behind glass cases. On certain occasions, the glass cases may become cluttered with objects, creating the illusion of a

"visual storage" that may discourage visitors from holding an interest in the exhibits due to lack of time or patience. The exhibition style also indicates the role that digital technology may play in the exhibition. In the Bryggens Museum, for instance, where the objects are at the center of attention, digital technology serves to supplement the knowledge that the artifacts themselves may provide.

3.2.8 Audience and Reception

The reception and engagement of the audience with archaeological displays have come to the foreground as a result of the growing interest in visitor-centered exhibitions. According to Falk and Dierking, each visitor who crosses the museum's threshold carries an agenda compiled by a multitude of factors related to their own background assumptions and expectations (Falk & Dierking, 2016:25).

Museums that house archaeological collections tend to play a significant role in the dissemination of archaeological knowledge. Museum education programs aim to engage a variety of audiences, although the key targets are young visitors and especially school groups (Skeates, 2022:21). This approach is also noticeably evident at the Bryggens Museum, where the "Under Jorden" exhibition consistently emphasizes subjects that appeal to younger visitors. The whole exhibition is organized as a treasure hunt with each of those displays indicated by a specific logo that the kids may use to find their way from one spot to another. These displays have a lower hanging height than the others and serve as cabinets, allowing the children to open them up to view their contents.

3.3 Blending Exhibitions with Digital Technologies through Multisensory Practices: The Case of the Bryggens Museum

In a broader sense, the Bryggens Museum makes use of basic technological devices limited to speakers and projectors. Each one acts as an integral part of the exhibition; therefore, they are tightly linked to artifacts and archaeological remains, making them unable to exist independently in the exhibition. The sensations enabled by ICT in Bryggens are associated with a particular sense: sound and visual effects correspond to the senses of hearing and vision, respectively, and there is no sensory

crossover. However, all of the digital technologies cooperate with one another in an effort to make it easier for visitors to understand the story being presented, acting as a lens that intensifies and enriches what they see and experience.

3.3.1 The Dominance of Hearing

Regardless of the curator's or exhibition designer's intentions to incorporate auditory elements in support of the visual ones, the museum as a physical space is inherently an audiovisual environment: echoes of footsteps, children's laughter, whispers, and guided tours are some of the auditory elements that one is most likely to encounter while visiting an exhibition (Voegelin, 2014:120). In the case of "Under Jorden," the exhibition is transformed into a visual and aural experience as a result of the implementation of sound effects across the whole exhibition setting. In each of the three distinct sections of the exhibition, there is a set of speakers producing sound effects linked to the theme being presented. The setups are set apart from each other in order to prevent the sound from overlapping.

The first sound elements that a visitor encounters can be found in the area where the archaeological site lies, contributing to the storytelling of the city's fires. Every twenty minutes, a two-minute field recording is activated, serving as an auditory description of what the soundscape of a city that is being burned to the ground might sound like. A carillon begins to ring when the first crackles of fire start to echo. A crowd grows louder, and the speakers fill the room with the sounds of people rushing around and coughing, and there is an overall sense of nervousness and tension. As a response to audio speakers, the light sticks that hang over the building structures indicating the potential height of the tenements, change their coloration from neutral to red.

As one enters the exhibition where all the portable artifacts are displayed, a second field recording plays on repeat. This time, the sound effects are related to everyday sounds from the Middle Ages: footsteps on wooden floors, doors closing, children playing, and other background noises playing repeatedly. In terms of thematic relevance, the decision to recreate a sonic experience related to everyday life is seen as a suitable one: the exhibition "Under Jorden" primarily showcases artifacts that provide a window into medieval daily life (Bymuseet, no date:online). Unlike the powerful fire sound effects in the archaeological site area, the everyday sound effects in the main

exhibition are subtle and nearly unnoticeable, allowing visitors to fully immerse themselves in the authentic material culture on display without getting distracted.

A third sound installation has been set up in the room dedicated to the theme of Life and Death. The sound recording plays a Gregorian chant and as a result of the exhibit being positioned within an enclosed space, the auditory exposure is limited to those who are entering the chamber. In this instance, the liturgical aspects of the sound in conjunction with the display showcasing human skeletal remains and the low-light conditions speak to the visitor primarily emotionally, rather than purely intellectually, as ambient sound effects, have the ability to impart a spiritual atmosphere to the room (Locker, 2011:97).

According to the four categories that Don Ihde outlined, the sound effects that indicate the city of Bergen burning down as well as the sound of a Gregorian chant playing in the room with the theme "An Age of Faith/Life and Death," both have the potential to be characterized as an "embodiment relation". As he puts it, "the reflexive transformation of my perceptual and body sense" (Ihde, 1990:72) is what forms a relation as an embodied experience. Both instances involve sound effects that actively involve visitors' senses: initially, through the burning city soundscape, and afterward, through the evocation of an emotional response through a Gregorian chant. Visitor's bodies are physically immersed in the technologically formed environment.

However, the sound effects related to background noise utilized by the museum in the main exhibition can be categorized as "a background relation" (Ihde, 1990:108). In this instance, the sound effects function in an effort to aurally furnish the context within which the artifacts are displayed. As a consequence of the speakers' production of particularly low levels of sound to reconstruct an everyday soundscape situated historically in the Middle Ages, visitors might not intentionally direct their attention toward this technology. These sounds, however, still contribute to the overall ambience of the museum through their contextual function in the exhibition.

3.3.2 The Dominance of Vision

The Bryggens Museum also takes advantage of digital technologies that are designed to appeal to the sense of vision. These technologies are performed through projections on either a wall or on floor-based installations. The inclusion of these

elements serves the purpose of providing a visual representation of information that extends beyond the information that can be received just from the artifacts themselves. The projections, according to the theme that they are based on, can easily be categorized into two types: dynamic maps and animated explanatory visualizations.

The first projection takes place on a floor-based installation with an embossed surface, in an effort to give a three-dimensional impression to the map. From 1100 AD to the present, the map depicts the evolution of the city, from Bjørgvin to Bergen, and its subsequent expansion through time. Both data visualizations make use of geographical information in an engaging and easy-to-understand manner, while also effectively capturing the interest of visitors. First, it's important to make the best use of a museum's physical space since it's by default restricted to certain square meters. A means of accomplishing this is by using dynamic maps. These maps only cover a specific area within an exhibition, but the screen may display an unlimited amount of data. One way to put it in perspective is to think about what would happen if Bryggen's Museum wanted to show the same data visualized by the dynamic maps but didn't want to make use of projectors. In that case, many analog maps should be displayed in order to share the same spatial information and that would affect the expanse of the physical space.

One of the oldest media for illustrating data and storytelling is maps. The exhibition's theme "A Trading City" features archaeological artifacts that demonstrate the extensive trading network that had been developed in Bergen throughout the Middle Ages. Visitors need spatial awareness to fully grasp the presented collections, and for that reason, Bryggens Museum uses a global map that is projected onto a printed wall, the trade routes of which alter and evolve with a fluid motion. The projection lasts nearly four minutes and each time within this dynamic map, according to the route of a specific commodity that is about to be presented, different trade routes are highlighted. For instance, the map shows stockfish and all the potential routes that this product followed to find its way to the rest of Europe. From the 12th century onwards, the city of Bergen held a monopoly on the international export of stockfish, which played a crucial role in the affirmation of the city as an important port (Wickler, 2021:103). These maps shortly and effectively depict geographical information.

Animated drawings that are projected onto a plain wall surface are an additional type of projection that the Bryggens Museum makes use of. The projection takes place

above an authentic part of a ship that was retrieved from the excavations as one of the few surviving wooden parts of a merchant vessel, providing valuable insights into the shipbuilding technology of the Middle Ages (Englert, 2001). An animated visualization is continuously playing to help visitors understand which section of the ship this mast crossbeam belonged to. In that way, the Bryggen's Ship outline is progressively assembled and disassembled, demonstrating to the audience how it was constructed.

Bryggens Museum's projection technology might be classified as a "hermeneutic relation" according to Don Ihde (1990:89). As its name suggests, this set of mediated relations requires the viewer's interpretation in order to understand a representation of the world (Verbeek, 2001:127) and both the dynamic maps and the animated visualizations are representations of the world or a part of it. For example, in the case of the projection related to the extensive trading network of Bergen, the viewer is not engaged with the projector per se but rather with the world into which the projector provides a window—in this case, the medieval commercial network of Bergen—as depicted on the printed wall. The viewer must interpret the flowing lines that reflect the routes that each product took to reach certain locations in Europe in order to understand the spatial information shown by the map.

3.4 Towards a Digital Shift in Museum: The Case of the Viking Planet

As already demonstrated in the case of the Bryggens Museum, it becomes evident that in recent years, while acknowledging the importance of interacting with physical artifacts, museums have transitioned their exhibition focus from being object-based to visitor-oriented. However, the case of the Viking Planet exemplifies this transition to its greatest degree: serving as a virtual portal to the Viking Age, the exhibition has no physical artifacts to show at all. A new type of glass case is being used to tell the story that would have been normally told by the authentic material culture coming from the late Iron Age. This new way of displaying includes technology such as VR applications, holographic theater, a 270° cinematic experience, interactive touchscreens but also the digitalization of the Viking Ship Museum exhibition. Honoring technological advancements at their finest, the Viking Planet serves as a digital museum, the first of

its kind and it does what the museum's name implies: it transports visitors to a multisensory realm where skalds recite poems and warriors come to life.

3.4.1 Architecture, Location, Setting

According to Lord and Lord (2002:69) the so-called visitor's experience "begins as the visitor approaches and enters the museum". In that sense, Viking Planet can be easily approached by whoever wishes to visit its exhibition due to its location in Oslo, which lies close to both of the city's central rail stations. The surrounding area is densely built up by several complexes of buildings, one of them being the Rådhus, Oslo's City Hall, and is characterized by a high level of activity.

Museums are considered to function as "adaptive media" since their physical architecture is strongly tied to the collection of objects on display (MacLeod, 2005:39-42). However, in the case of the Viking Planet, there wasn't any intentionally designed and built structure for the particular use of accommodating the apparatuses. The digital museum found its home in a pre-existed physical space at the ground level of a mixeduse building that uses the street-level units for commercial purposes while on the upper stories are lying residential apartments. The main entrance resembles more of a store, with its distinctive presence marked by decorative elements such as the logo of the museum, the feather flags, and the red carpet.

3.4.2 Space

Architecture has an impact on visitors' experience through the way in which it forms the spatial relationships between exhibition halls, objects, and visitors (Tzortzi, 2016:103). Particularly in the case of the Viking Planet, the immersive experience is further enhanced by the architectural design and the spatial arrangement of the physical space considering that access to the exhibition room requires descending one floor from the entrance hall. Laursen, Kristiansen, and Drotner have extensively analyzed the physical transition from the reception to the actual gallery area and they define the museums' foyers as "contact zones to the outside world as much as transit points to museum interiors" (Laursen, Kristiansen & Drotner, 2016:86). In that sense, the visitors of the Viking Planet pass from the everyday world represented by the entrance hall to a

new, curated environment, with a thematic exhibition dedicated to the people of the Viking Age.

After descending to the Viking Planet's basement level, visitors will find themselves in the vast 1600 sqm exhibition hall where all the technological tools and entertainment devices are ready to be used. The exhibition area is divided into two main sections: the permanent exhibition and the temporary displays where the latter are contained in a distinct room separated from the permanent exhibition by wall dividers. The rest of the exhibits are set without any physical dividers, which enables visitors to navigate freely through the exhibition and interact with them. Depending on the technology being utilized, the area occupied by each exhibit varies. For instance, the interactive touchscreens occupy a relatively small area within the exhibition, as visitor's interaction with them necessitates closeness. Conversely, the area where VR technology can be found is more expansive due to the incorporation of haptic 4D chairs arranged in rows.

Space plays a key role in the Viking Planet. The digital museum is able to make use of a wide range of technological possibilities thanks to the spacious area it occupies. In the instance of Viking Planet, the spatial component dictated the dimensions and placement of every technological device.

3.4.3 Design, Color, Light

The integration of emerging technologies in the archaeological museum not only changes the way visitors interact with the artifacts but also causes a realignment of museography from an object-centered design to an experienced-centered one (Shehade & Stylianou-Lambert, 2023:21). The shift of the museological focus from the object to the experience is especially apparent in the case of the Viking Planet. As a Digital Museum that makes great efforts to provide the most immersive experiences possible, the implemented design attempts to optimize the capabilities of the immersive technologies.

The only enclosed room within the permanent exhibitionary space is the glassrounded structure called "the Helmet," an enclosed space where the 270-degree film is projected four times an hour. This enclosed environment is specifically designed for the screening of a film presenting both the natural beauty of Norway and various

aspects of everyday life during the Viking Age. The architectural design of this structure is more in line with modern aesthetics, which makes it consistent with the new technologies utilized by this museum. Concurrently, due to the usage of glass, visitors don't get the feeling that they are entirely detached from the main exhibition, and those who wish to enter the film or exit it to further explore the exhibition space are not bothered by its imposing presence.

Equally effective in conveying the exhibition's message is the design of the space where the VR technology is being kept. Virtual Reality exhibition is designed around the theme of the Viking raids, exploring the significance of the Viking Age longships. To give the visitors the impression of embarking on a Viking adventure, the exhibition space is designed to resemble a longship with its forward-most part forming a spiral prow embellished with wood carvings. The Oseberg Ship, an authentic find that dates back to the Viking Age, serves as the source of inspiration. Additionally, to give a modern touch to the ship's form, LED lighting is installed to draw attention to its outline.

The use of light especially in a display setting holds significance in the process of assigning meanings to objects (Moser, 2010:26). Furthermore, the light conditions of a museum should be taken into consideration with great care, especially in cases where the artifacts are light-sensitive, as evidenced by the Bryggens Museum. In the case of the Viking Planet, the exhibition room maintains a dark environment, not due to the presence of artifacts that require minimum exposure to light, but rather because the displays serve as light sources themselves. By keeping low the levels of illumination, the area maintains a cinematic atmosphere and the focus of attention is the apparatuses.

In contrast to traditional exhibition spaces, where different colors can bestow particular meanings and significance on a collection of objects (Moser, 2010:26), the manner in which color conveys messages in an exhibition that is heavily reliant on technological devices is not necessarily meaningful. In the setting of the Viking Planet, for example, the color appears to serve no particular purpose other than to break up the monotony of the dark environment. Without carrying a particular meaning, the exhibition makes extensive use of LED lighting in different colors. For instance, the LED lighting installed along the seats in the designated area for viewing the

documentary “Norvergr” is blue, the same color utilized to illuminate the Yggdrasil wall decoration.

3.4.4 Subject, Message, Text

The Viking Planet serves as the world’s first digital museum dedicated to the Viking Age (The Viking Planet, no date:online). The exhibition has, as its main subject, the Norse-Viking culture being presented from a global perspective rather than narrowly focusing on Norway’s Viking Age. This approach is more in line with Viking Planet’s long-term goal, which is to expand the museum’s content to other places, both within and outside of Norway, by opening additional digital museums under a franchise agreement. In contrast to the Bryggens Museum, whose exhibition’s focus alternates between the history of Bergen and the daily lives of medieval people, Viking Planet does not center on any particular aspect of the Viking Age. The exhibition covers a wide range of Viking Age history ranging from clothing and longships to wars and strategies employed during battles.

Instead of following a chronological sequence, the exhibition is structured thematically; however, in the case of Viking Planet, the themes are not merely abstract ideas or concepts as is the case with the usual thematic exhibitions. They are experience-based and differ according to which technology is being used each time. In this regard, one theme of the exhibition is the VR experience that can be found in both a film and a game, or touch-based experiences through the interaction with touchscreens. Additionally, visitors are afforded the opportunity to enjoy cinematic experiences through the screening of two different documentaries running at the exhibition.

The visual content in the Viking Planet is complemented by a variety of textual accompaniments. Certain multimedia incorporated in the exhibition contain concise informative texts. For instance, there are two interactive touchscreens that narrate the history of the Viking Age in chronological order according to turning points or battles. Both of them provide supplementary details regarding the historical events being presented, helping visitors to get a better understanding of the historical occurrences under discussion. Furthermore, conventional text panels, which are frequently found in archaeological museums, have been integrated into the exhibition. Reading the text panel might provide a more generalized understanding of the Viking Age rather than

facts unique to a single nation or region. Much of the information presented on the text panel is supplemented by images, making the visual element prevalent. Textual information is also available through a mobile application developed exclusively for the Viking Planet, in addition to the textual content that is accessible only during visits. Visitors may use the app as a virtual tour guide while they explore the exhibition, as it is organized into several categories based on the main attractions.

The writing style of the textual content is characterized by brevity, as the texts are usually small and consist of small sentences. The tone is natural and intimate, easily conveying the messages that it attempts to express. On the plus side, the smartphone app and all the technological devices provide language customization options, so users may choose from twelve different languages to read the content. As stated by Stobiecka, the first obvious benefit of multimedia within museum settings is the increased inclusivity and participation they offer to visitors (2023:107). Contrarily to Bryggens Museum with its content limited to only English and Norwegian speakers, Viking Planet encourages participation and inclusivity in terms of the textual information by giving the option to use the devices in languages other than Norwegian and English.

3.4.5 Layout

When designing a museum's layout, numerous factors that extend beyond the spatial arrangement of its components must be taken into account, especially when digital technologies are also included. In conventional museums, the decisions made regarding the design and placement of a collection can shape perceptions of the artifacts' significance and their role as indicators of cultural evolution (Moser, 2010:27). However, this practice is not applicable in the particular case of the Viking Planet because practical considerations are the ones which dictate the space layout rather than aesthetic choices. The various components of the museum's exhibition are circularly arranged, with the 270-degree cinema positioned at the exhibition's center. However, the fact that the 270° cinema was installed in the middle of the exhibition does not necessarily suggest that this particular technology is considered the main attraction of the exhibitionary area. Its installation in a centered place was determined by practical considerations such as the dimensions and shape that this technology occupies inside the interior, which led to its placement in the middle of the room.

The exhibition's themes are arranged in a systematic manner with arrows on the floor indicating the sequential flow of the exhibition. The digital components occupy space according to the needs and functions that one technology requires in order to perform properly. Due to the spatial requirements of the VR applications, which allow visitors to fully immerse themselves in the content, the area for viewing is also rather spacious.

3.4.6 Display Types

According to Stobiecka, digital exhibits are becoming increasingly common in archeological museums as a means of sharing and visualizing specialist information (Stobiecka, 2023:104). However, the two museums that she analyzed and presented as case studies in her lengthy essay indicate that the multimedia means in each museum serve as an additional resource that enhances the information of the physical artifacts. That is the case with most archaeological museums; digital displays serve to supplement the knowledge that physical objects may provide, but the primary focus remains on the objects themselves. An exception to this rule is seen in the case of the Viking Planet as it completely lacks physical artifacts and instead relies only on digital displays.

In terms of technological features, the displays can be categorized into 4 types: VR, interactive displays, movies and laser projection technology. Thematically, each piece of equipment possesses its own narrative related to the Viking Age and provides insights into certain historical aspects of the late Iron Age. For instance, the holographic theater specializes in showcasing clothing that has been preserved and discovered during excavations. On the other hand, the Viking Timeline device chronologically traces the entirety of the Viking Age, encompassing all significant historical events.

3.4.7 Exhibition Style

The exhibition style is characterized by a cinematic character. As Stobiecka identifies, an environment that makes use of digital multimedia requires special lighting and dark rooms to create a mysterious atmosphere that draws visitor's attention (Stobiecka, 2023:107). In addition to evoking an emotional response, this dark environment also serves a functional purpose: brighter lighting conditions would

diminish the impact and presence of electronic equipment. As a result of the fact that the entire environment is centered on experience-based methods, the style of the exhibition is consistent with the overall exhibition's subject and approach of the Viking Planet.

3.4.8 Audience and Reception

The concept of designing exhibitions that take form intending to appeal to a certain target audience is an essential part of an exhibition's development. For this reason, it is necessary to target a particular group of visitors in advance and incorporate this strategy into the overall mission of a museum. This is because, as Ambrose and Paine have stated, if the curators desire to develop exhibitions with the intention of pleasing everyone, they are likely to end up satisfying nobody (2018:157).

In the case of the Viking Planet, young people and families with children are the main focus of the marketing efforts. This is particularly obvious when one considers the prevalence of technology in the museum, which tends to attract younger audiences. Drygalska's research on the impact of touchscreens on the visitor's experience also reinforces this statement. According to her study, which took place at a museum in Poland, younger visitors were more engaged with the interactive devices and proved to be more tolerant when there were technological breakdowns compared to older visitors (Drygalska, 2024:19). The youth-oriented approach is also identifiable in the content of the museum, which is kid-friendly since it lacks violent elements in all of the visual material, making it ideal for families with young children who want to try a variety of entertainment options.

As a final point, the inclusivity in terms of language makes the content available to a wide range of tourists visiting the capital of Norway who seek to have a more interactive experience with history. From widely spoken languages like Mandarin and Spanish to less commonly spoken ones like Italian and Korean, Viking Planet strives to be as inclusive as possible, offering all of its content in a wide range of languages.

3.5 Blending Exhibitions with Digital Technologies through Multisensory Practices: The Case of the Viking Planet

The Viking Planet was introduced to the public in June 2019, and it stands as an exclusively Digital Museum, offering a wide selection of immersive experiences, without displaying physical artifacts. Through cutting-edge technologies and entertainment devices, the Viking Age is being unfolded and transports visitors to the fascinating world of the Vikings. A mobile app, designed to act as a digital guide while a visitor is in the museum, plays films, and provides more information about the exhibits. Visitors may access information about the exhibition through the app even after they leave the museum, however, the information provided is limited when the app is used outside the museum's context. Contrarily to the Bryggens Museum, the Viking Planet possesses an extensive range of digital devices, and due to their abundance within the museum's exhibition, in the following section only a few of them will be presented.

3.5.1 The Dominance of Touch

In the exhibitionary area of the Viking Planet, an enclosed room serves the purpose of hosting temporary exhibitions. Currently on display and set to remain until 2027, is the exhibition named "the Viking Ship Exhibition" which borrows its content from the Museum of the Viking Age, formerly known as the Viking Ship Museum (Museum of the Viking Age, no date:online). An interactive digital walkthrough of the museum's interior is the main theme of the exhibition. The data obtained from the digitization of the old museum's interior, as well as the data of digital replicas of the most prominent artifacts displayed in the exhibition, are both on loan. This initiative comes as a solution that permits access to content that would otherwise be inaccessible since the Museum of the Viking Age undergoes extensive refurbishment and expansion, requiring its closure for five years.

A total of six screens are included in the room, five of which are touchscreens. The sixth screen functions as a widescreen, projecting on a larger scale the content displayed on the central touchscreen. In terms of content, the touchscreens are divided into two distinct themes. The first thematic category is a digital walk-through within the old museum's interior and the user can choose to explore one of the three distinct themes

at a time: “Gokstad,” “Oseberg,” and “Artefacts”. On this basis, the visitor can get the entire view of the exhibition hall as it used to be arranged and may explore the exhibits by taking different directions.

The interactivity allows visitors to zoom in and out and rotate the content so viewers can see it from different angles, and even see the whole interior from above, which would not be feasible in a physical museum. The high resolution of the images gives visitors the impression of an “enhanced vision,” allowing them to see in great detail all the components comprising the museum’s exhibition. Since not all sides of the artifacts could be seen in the physical museum owing to their placement in the layout, the virtual tour also allows one to view hidden parts of the exhibits that were previously inaccessible to the naked eye. Additionally, an available feature enables users to measure distances and artifacts on display. As a result, visitors seeking to gain a better understanding of the exhibition hall’s scale may employ the measurement functionality to appreciate the size of objects and to measure the distances.

The second thematic category is artifact-oriented, and the user can manipulate one artifact at a time, as the artifacts on display have been scanned individually rather than in the context of the exhibition hall. Users can choose from three categories of artifacts: “Transportation,” “Woodworking,” and “Metalworking”. Regardless of the category in which they belong, all artifacts can be examined in high resolution and interacted with by rotating, scaling, enlarging, and shrinking them. The displayed items may be viewed in great depth due to their realistic representation, exposing the most intricate details that an artifact holds, similar to the digitized interior described above.

The touchscreens only offer a virtual tour or the ability to manipulate 3D models, and they do not include any textual accompaniments that would make it possible for visitors to expand their knowledge of a specific artifact through written descriptions. The sole source of textual information regarding the artifacts is accessible through the mobile application “The Viking Planet,” which provides relevant information on every artifact displayed.

Aside from the interactive displays set up in the room of the temporary exhibition, the exhibit named “Viking Timeline” is another piece of technological equipment that enables the tactile sense. It is positioned at the very beginning of the exhibition’s sequential flow and serves as the permanent exhibition’s introductory presentation. The apparatus consists of four touch-based screens that are interconnected

with each other and, as its name suggests, allows visitors to delve into the history of the Viking Age following a chronological order.

By beginning on the left side of the screen and continuing all the way to the right, Viking History is presented in a linear manner, and the historical sequence is demonstrated with turning points. The first historical point listed is the raid of the Lindisfarne monastery in the year 793 AD the final one is represented by the year 1066 AD when the Battle of Stamford Bridge took place. The exploration of this four-century historical journey is accompanied by films, pictures, short animations, and interactive objects that appear each time the user taps on a specific year displayed on the screen. In some cases, between certain historical dates, there are icons that, when tapped, provide information about various aspects related to the Viking Age. A few examples of topics covered are Norse mythology, weaponry, and the role of the Vikings as warriors.

The interaction in all three of the aforementioned types of technology forms embodied relations between humans and technological devices. According to Don Ihde, the key characteristic in embodiment relations is the transparency of the technology (Verbeek, 2001:127) that calls the attention of people not to the physical features of a technology but rather than to the world that is presented through them. This can be exemplified by touchscreens in the best possible way: what matters most is not the screen's physical characteristics but rather the content that can be accessed through them. Visitors tend to overlook the screen's physical presence, making it difficult to see the technology for what it is: an external tool that seamlessly integrates with our bodies, providing us with a sort of enhanced vision.

3.5.2 The Dominance of Vision

The exhibit "Hologram Theater" brings together cutting-edge projector technology with an old illusion technique derived from theater. Following the principles of Pepper's Ghost technique, a screen is placed off-stage and is reflected in a transparent screen of 45º angle (MoMA, no date:online). A reflected virtual image that appears to have depth and emerges seemingly out of nowhere can be viewed by the audience. A total of 25 types of characters of various social statuses appear on the screen clothed in historically accurate attire and battle gear, shown in front of the visitors in an attempt to combine artifacts discovered during excavations with dramatizations. There are four

touchscreens on the stand that guests may use to learn more about the artifacts presented and the archaeological context of the locations where they were found. When the Skald character enters the stage and begins reciting a poem in Old Norse, coupled with the melodic accompaniment of a harp, everything that follows takes an audiovisual quality. As the music keeps on for a minute, all of the characters of hologram theater begin to act as if they are in a performance.

The holographic theatre presenting life-size Vikings would mostly be classified as an embodiment relation between humans and technology (Ihde, 1990:73). In this case, visitors may perceive the holograms as extensions of themselves in the sense that they appear in the same size as them, blurring the boundaries of what is real and what is virtual. Consequently, it seems like the holograms share the same physical space with the viewers. The fact that the audiences are also able to use interactive touchscreens does not make this form of relation an alterity one, as has been described by Don Ihde (Ihde, 1990:97). The interaction with the touchscreen does not affect the hologram theater, as the performance will proceed regardless of the visitor's usage of the touchscreens.

3.6 Interviews

The previous section outlined the process for analyzing the entire exhibition to determine the aspects that need to be given more consideration when integrating digital technology in archaeological museums. Incorporating innovative technologies in archaeologically-based settings, however, does not come without consequences. Research has already addressed a number of challenges that a museum might face due to its reliance on technological devices. Even though the challenges have been thoroughly discussed in the research, there is still a lack of addressing them from the perspective of those who actually work in museum settings and consequently deal with these types of concerns more frequently. The three challenges that the analytical discussion deals with are: Digitized Presence, the effectiveness of Multisensory Practices and Static vs Dynamic.

In addition to gathering observational data on-site, which resulted in the production of thorough field notes and the visual material provided in the previous

section, interviews were conducted with experts from each museum to answer the final research question. From a post-phenomenological standpoint, interviews serve as a valuable method for collecting first-hand information regarding the ways in which individuals engage with digital technologies. At its core, the theoretical framework of phenomenology seeks to elicit experiential descriptions of the participant's interaction with the technology of interest (Drygalska, 2024:9). Interviews offer an occasion wherein participants are provided with the opportunity to contemplate and articulate their experiences, as is the case with this research where museum experts who work in different technologically mediated settings give their insights. The questions that were asked to both interviewees are attached in the appendix section of this thesis.

The main aim of the method of interview is to integrate them into the text of the analytical discussion. By examining the participants' experiences and perspectives, this study aims to gain a deeper understanding of the challenges that a museum might encounter when digital technologies are present in the exhibition. The questions are structured according to the following four categories: Dissemination of Knowledge, Visitor Participation and Engagement, Multisensory Strategies, and General Questions.

3.7 Chapter Summary

This chapter presented and analyzed two case studies using the first methodological framework applied in this thesis. The exhibition analysis revealed eight aspects of the museum that should be considered when laying out exhibitions. In terms of integrating digital technologies within the exhibition space, three aspects are the most important to take into account: the space, the layout, and the exhibition style. The space is an exhibition hall's fixed parameter, and for that reason, it must be carefully evaluated for both the constraints and opportunities it may present. The layout is also an important factor that requires consideration because digital technologies and other types of displays should always be in accordance. If each component of the exhibition is not distributed with great care, the exhibition might fail to communicate its message. Finally, the exhibition style can dictate the kinds of technologies that can be used in the museum and their function, such as whether they are meant to supplement the exhibits containing the artifacts or to stand on their own and enhance the visitor's experience. The different digital elements have also been presented, revealing the ways people

interact with technological devices and the mediated relations that are formed according to Don Ihde's four categories. Of the ten different technologies presented, six revealed embodiment relations, three hermeneutic relations, and only one background relation. As a second method for gathering and analyzing data from museum experts, this thesis makes use of interviews, which will be explored in the next chapter in accordance with three challenges that have already been addressed by researchers.

Chapter 4 Analytical Discussion

4.1 Digitized Presence: is it truly effective in practice?

The *digitized presence* as described by Arvanitis and Pavlovskyte (2023:33) speaks to the idea of using technology to create as realistic 3D environments as possible by exploring how visual realism contributes to the sense of being present in a digital space. On a smaller scale, the concept of digitized presence may also be applicable in terms of viewing 3D models of artifacts that are detached from their museological context and visually represented as single objects. The Viking Planet provides this kind of experience by offering a virtual tour of the Viking Age Museum that also allows interactions with 3D models of original artifacts dating back to the Viking Age.

Digitization of archaeological artifacts provides museums with new possibilities that go beyond the static displays that were formerly the norm (Pattakos et al., 2023). Frequently, artifacts are restricted to revealing only one surface, typically the most wellpreserved one, because their placement in the display prevents them from being seen from other sides. However, archaeological artifacts weren't supposed to have exhibitable and non-exhibitable surfaces because no one in the past created the artifacts anticipating that they would be displayed for generations to come. In this manner, interactive touchscreens were able to overcome limits that would not have been feasible without the tools that technology provides to museums.

The data themselves that may be used to obtain the digital versions of the objects also have significant advantages in terms of re-usability: they can be effortlessly moved from one museum to another in contrast with the physical artifacts. Given the benefits of 3D models as presented above, one would reasonably wonder why all museums aren't using digital screens to either project or enable interaction with digital representations of artifacts. The question becomes even more relevant in the context of an archaeological museum: the artifacts were meant to be touched and interacted with by the people who created them rather than merely viewed through glass showcases. Practical factors such as the museum's budget and availability of physical space can play a role, but curatorial preferences can also determine such choices.

The cost of virtually reconstructing spaces, however, is the primary barrier, limiting its implementation to museums that possess the financial means to invest in such technologies (Hvass et al., 2017:339). Furthermore, maintenance is an aspect of digital technologies that is often disregarded, and equipment designed for public use requires maintenance more regularly.

If a museum can find a way to afford the expense of purchasing and maintaining a device that enables direct interactions, visitors/users stand to gain numerous advantages from these technologies. The Bryggens Museum houses mainly sensitive artifacts and as a result their conservation requires a lot of time and care. As a consequence, visitors to the museum's exhibition will encounter empty glass cases on many occasions, given that the objects contained therein are undergoing conservation. In that sense, Skeates is right to claim that the archaeological museum must adhere to some key principles to achieve effective archaeological management of collections, with the main focus on their long-term preservation (Skeates, 2022:2). The preservation of artifacts is by any means the priority for all the archaeological museums. However, the presence of several empty glass cases might disrupt the sequential flow by causing discontinuity in terms of the museum's narrative. In such a scenario, a technological device that displays an artifact, which is currently not physically present in the exhibition area but accessible to museum visitors through its digital version, serves to bridge the gap between its presence and its absence.

With the launch of Google Arts and Culture in 2011, which was formerly known as the Google Project, virtual tours got a lot of attention resulting in the familiarization of the public with the digital reconstruction of exhibitions from existing museums. This initiative aimed to create a virtual repository to disseminate knowledge and make the museums accessible to everyone (Bonacini, 2015:152). However, there is no way that a virtual tour of a museum's whole exhibition can compare to actually visiting its physical space. Museums may be more democratic if they make their collections available to the public, whether by making them accessible online or, like the Viking Age Museum, at another location. During the pandemic, digital tools were considered a resource for strengthening new connections between objects, people, and museums and this is the point where the notion of a virtual museum became the most popular it could be (Zuanni, 2020:64). This was because the museum could only exist online.

The issue is that it can only provide a limited experience of an exhibition because as has already been presented in the part of the analysis, an exhibition is more than the artifacts displayed. From the broadest features, such as the architectural style, to the smallest and least noticed aspects, like the type of display cases, all of them constitute important components of an exhibition that work collectively to create the museum experience. A visit to the museum is inherently an embodied experience due to the visitor's physical movement within the exhibition hall, according to a complex web of gestures, positions, and motions. This is especially evident in the Bryggens Museum's wall-mounted exhibit featuring a set of dice. By design, this glass display is situated at a significantly lower height, necessitating visitors to assume the same bending position as the dice players did.

Some components, such as light, cannot be recreated through a virtual tour, particularly when an exhibition uses natural sources of light, as is the case with the Bryggens Museum. In the case that Bryggens Museum offered its visitors a digitized presence, the lighting conditions at the moment of the virtual tour's capture are reflected in the images, and these conditions will remain unchanged. Virtual Tours, by default, rely on screens or computers, acting as intermediaries between the viewer and the physical object. The Viking Planet's temporary exhibition, which is essentially a virtual tour of a real museum, is similarly the target of this type of criticism. The Museum of the Viking Age, on the other hand, will not welcome visitors to its physical space until the year 2027; up to this time, virtual visits are the sole means by which one can explore the exhibition hall and engage with the artifacts on display. This alternative is preferable to the situation in which a museum of that significance would not be able to show its content at all.

Another aspect of digitization that can be easily disregarded is the role that the museum plays as a social environment. Museums are also places where people may gather, communicate with one another, and reflect on their experiences. At least up until this point, virtual tours have not been successful in connecting people. That was particularly evident in the Viking Planet where all the interactive exhibits were designed for individual use. As with interactive touchscreens, VR technology is more about individual activity within the museum because once someone puts on the headset, they become excluded from the museum as a communal space and the engagement is more about the interaction between the viewer and the content.

The duality of the museum as a place of both cultural and leisure activity (Christidou, 2016: 28) is relevant to what technology the visitors use at a given moment. In that way, digital technologies influence and profoundly alter museum visits, and as museums enter the digital era, digital technologies increasingly have the upper hand in how the museum is seen by those who choose to pay a visit there.

4.2 The Museum of the Senses: Educational or Experiential?

Even though museums can benefit from multisensory practices, such as making exhibits more accessible to diverse audiences and enhancing visitors' learning experiences, these methods have also been the target of criticism. A very often-voiced critique against multisensorial experiences is questioning the actual impact they have on the educational mission that a museum serves (Griffiths, 2008:162). Moreover, Heath and vom Lehn in an effort to assess the effectiveness of computer-based interactives, investigated an extensive assortment of interactive exhibits deployed by several museums. Aside from the overall reception and active engagement with the interactive technology, visitors were preoccupied with running the interactives' various functions without being able to make the connection of the information to the authentic object being displayed. (Heath & von Lehn, 2010:271).

Both interviewees agreed that multisensory practices within the museum promote inclusivity. From the perspective of the curator of Bryggens Museum, inclusivity is more related to people with disabilities. The CEO of Viking Planet on the other hand promotes a broader definition of the term inclusivity: visual learners can benefit from visual representations, such as a digital walkthrough or a 3D projection of the map. Audio learners can also benefit from this inclusion because there are audio elements that might elicit an emotional reaction to exhibits. Similarly, learners who can understand information through touch-based devices might benefit from interactive displays. The use of digital technology in museums is mostly considered in terms of being inclusive and most often in relation to people with disabilities. In fact, multisensory practices concern a broader audience than one might think because they actually affect every visitor who crosses the museum's threshold.

An essential determinant that requires evaluation concerning the incorporation of interactive technology is whether it is in accordance with the mission and strategies of the museum as a whole. Adopting an exhibition strategy that is easily perceivable by the visitors is crucial for its success. This strategy should permeate all facets of the museum environment, aid visitors in comprehending their surroundings, motivate them to engage with the exhibits, and ultimately improve the quality of their interactions (Caulton, 1998:27).

An additional concern that may arise in relation to multisensorial practices is that individuals are naturally inclined to perceive all museum recreations—from sound effects to replicas—as precise and authentic depictions of the past (Magelsson, 2007:22). In this regard, a critique is leveled at the multisensory strategies employed by museums, referring to their insufficiency in evoking sensations of the past within a contemporary setting (Smith, 2007). For instance, the Bryggens Museum, which uses sound effects to simulate the sounds of a city that is on fire, will never be able to express the emotional intensity that the inhabitants of the Middle Ages felt as they witnessed the entire city being reduced to ashes. The recreation of sounds representing everyday activities, such as the sound of a hammer hitting a wooden surface, will not transport visitors of Bryggens Museum to the medieval world of Bergen, regardless of how accurately the sound reproduction has been done.

Even if it's feasible to recreate smell or sound to the most possibly accurate extent, the experience would not be the same as it was for the people living in the past, which is why Smith is so critical of sensory reproductions (Smith, 2007:846). In the past, humans lived in a civilization that was culturally different from our own, and as a result, they had different experiences and perceptions. When we seek to reproduce the senses in the present, we are also projecting our own and current experiences onto the people who lived in the past (Fleming, 2006:276).

Since museums are meant to be more of an informal learning setting and the audiovisual reproductions are just meant to help visitors better understand the past, this criticism of multisensory methods based on the authenticity of visuals and sounds seems a bit extreme. Recreations of the past through the senses are a valuable tool to disseminate archaeological knowledge, especially in cases where the artifacts have survived in a fragmentary condition and visitors might strive to understand these

artifacts in their historical context. By relying on research and the knowledge that the artifacts provide, the museum can breathe new life into the history of past people.

When selecting which multisensory strategies to employ, curators and exhibition designers must take into account every aspect of the exhibition space. This concern was widely evident in both museums. Particularly, despite the presence of three distinct sound effects in an open-plan space at the Bryggens Museum, there was no sound overlap. The whole sound design must be compatible with the acoustic environment of the exhibition and must fall under the overall management of sound to be considered effective (Mayrand, 2001:411).

The real challenge though, can be detected in the Viking Planet which makes extensive use of audio-visual digital technologies as presented above and it could easily be an overlap of sounds. For an exhibition to be successful, particularly when including multisensory approaches, it is crucial to carefully analyze the potential and constraints of the physical space. Because of the level of sound that could be generated by continuously playing videos and films and the potential for audio to overlap, the Viking Planet examined thoroughly the design plan of digital technologies. It was not feasible to run a film with language in an open-source environment, the 270-degree cinema that plays films only includes visuals and sounds and there is no language. In that sense, always exploring the possibilities of multisensory practices while also recognizing the limits they might have in a museum setting is crucial for succeeding in meaning-making processes.

4.3 Static vs Dynamic: Are museums heading towards a Disneyfication?

The manner in which visitors engage with the objects displayed in a museum has ultimately been redefined by digital experiences. The museum of the 21st century, as described by Greenberg (2005), is a vital one, which has brought to light many pairs of opposite concepts: from static displays to interactive ones, from object-based to experience-based exhibitions, and from object-centered museology to the one that places the visitor at its center. Different museological approaches that instill into

exhibitions elements such as interactiveness or references to pop culture are considered a challenge to the museum's previously held image of authority (Macdonald, 1998:123).

Some museum professionals view the incorporation of ICT into an exhibition as a strategy that is not compatible with the educational mission of the museum, whereas others view it as a chance to reach a wider audience. The risk associated with excessive dependence on digital technologies has been previously discussed by scholars: in an effort to overcome their previous sterile, museums may go too far, putting in the forefront entertainment over factual education (Nikolaou, 2024:1787).

This state is frequently labeled "Disneyfication" as a result of the cultural institution's commercial transformation (Balloffet, Courvoisier & Lagier, 2014:4).

In the case of the Bryggens Museum, the concept of "Disneyfication" is not applicable. Aside from the elements that have been incorporated to make the exhibition "Under Jorden" more dynamic, the artifacts unearthed remain at the center of visitors' attention. That suggests that the museum has a strategy in place, and that strategy is to showcase actual artifacts found during the excavations. That is why digital components are included to support any information gained from the artifacts.

By integrating new technologies into the formerly three-dimensional space of a museum interior, which was traditionally divided into sections including a gift shop, café, reception area, and exhibition hall, a new "fourth dimension" has emerged —one that is audio-visual, and it can also enable the sense of touch. However, the introduction of technological devices can lead to discontinuities within the exhibitionary space, causing visitors to become disoriented in regard to the sequential flow of the museum (Barry, 1998:108). Drygalska (2024:3) has already stated that museums' efforts to overcome the so-called "museum fatigue" which refers to a mental and physical state of exhaustion experienced when visiting a museum, may finally lead to technological fatigue. It appears to be a very thin line dividing the bombardment of information that one acquires from authentic artifacts but also the bombardment of information coming from technological devices.

It is possible that the visitor would be distracted by swiping and tapping various tasks, leading to excessive multitasking. Thus, despite the promise, the presentation is not making the most of its multimodal nature with all the information offered. The device's attempts at coherent storytelling can also be unsuccessful because of all the

multitasking, which distracts the focus of the visitors. It is difficult for a user to maintain concentration due to the intensity of the experience.

On the contrary, the maps displayed in Bryggens Museum presented through a blinking screen are the centerpiece of attention because of their ability to show constant activity, and for that reason, they draw attention. The information they wish to provide is concise and to the point, so the visitor can grasp it without putting a lot of effort or having to choose between many functions, as in the case of touchscreens.

The content of digital technologies is determined by humans, and the extent to which a technology contains well-curated and historically accurate material relies also on them. Digital technologies and the design of their integration within the exhibition hall must, above all else, be in full accordance with the overall mission of each museum. This approach, termed "dynamic stability" by Bearman and Geber (2008:388) exemplifies this sort of museological practice. The inclusion of ICT within the archaeological museum environment should be handled with careful consideration of multiple factors, rather than solely focusing on the incorporation of cutting-edge devices to attract a broader audience. Furthermore, technological devices must be seamlessly integrated into the physical space in order to maximize their effectiveness in communicating the exhibition's message (Shehade & Stylianou-Lambert, 2020:14).

As a result of their inherent nature as repositories of artifacts from times long gone, archaeological museums are typically very reluctant to embrace contemporary methods of exhibition. This phenomenon was also indicated by a survey in 1998 that revealed museums' reluctance to invest in online platforms and was remarkably noted during Covid-19, when museums lacked the technological resources to start operating online.

Consequently, archaeological museums are linked to environments that offer visitors genuine encounters with the past; if digital technologies are particularly pervasive, it becomes an effortless task to characterize this museological trend as "Disneyfication". As a consequence, archaeological museums tend to avoid employing innovative technological means in order to convey narratives. However, what we occasionally overlook is that museum exhibitions also refer to choices. The displayed subset of objects represents curatorial decisions, and these objects convey the narratives desired by the curator. These decisions are part of a larger epistemological framework, but so can be the decisions for what content technology can include.

One positive aspect of technology is its ability to improve museum visits through the provision of interactive exhibitions, VR tours, and immersive narrative methods. These innovations have the potential to broaden the audience for museums and make them more interesting. On the other hand, others think that museums should stick to their original mission of promoting culture and education by putting too much focus on technological attractions and entertainment value.

How museums use technology while staying true to their cultural and educational goals will determine if they are being "Disneyficated" or not. While some museums employ technology to their advantage while still being true to their academic roots, others may put more emphasis on entertainment than on the actual exhibits. The solution to that is to use technology where is needed and not because museums are striving to keep up with technological innovations.

4.4 Limitations and Future Developments

To overcome the limitations of this thesis and further examine its central ideas and objectives, more research is needed. An initial consideration is the spatial constraints of this research, as it solely involves two museums that are both located in Norway, a technologically advanced country. When considering the overall impact of technological advancements on museum transformation, it is important to incorporate museums from nations that are currently in the process of developing their technological infrastructure.

Because the emphasis was primarily placed on the senses of hearing, vision, and touch, this thesis does not include any research into the incorporation of other senses, such as the sense of smell or taste. An additional opportunity exists to demonstrate how museums have shifted their focus from the dominant sense of sight to the other four. Posing new questions and making reflections lead to the development of new theories and new methods. By expanding research in different directions or viewing a topic from various perspectives, we push research forward both theoretically and methodologically.

4.5 Chapter Summary

There are three broad categories into which the challenges discussed in literature and by museum experts fall: digitized presence, the effectiveness of multisensory practices, and the challenge of Disneyfication of museums. Digitized presence is effective mostly in small-scale contexts, such as the manipulation of single artifacts, but by no means can a virtual tour replace an actual visit. The environment of a museum is multilayered and social, and some aspects of it cannot be fully represented through images, no matter how high the resolution of them is. Although multisensory practices are an effective learning tool that promotes inclusivity, reproductions and recreations must rely on archaeological evidence to the greatest extent feasible. When considering their integration into the exhibition hall, many aspects of the exhibition space must be taken into account. The issue of Disneyfication may arise when digital technologies are merely implemented in an exhibition hall for the sake of novelty, rather than for the potential benefits they offer in terms of content and opportunities they present. The limitations of this thesis are eventually discussed, including the fact that the entire research was conducted in a single and by default technologically advanced country, and the restricted range of senses that were investigated.

Chapter 5 Conclusions

The main goal of this research was to evaluate the incorporation of digital technologies into archaeological museums as perceived by museum professionals, visitors, and exhibitions. The existing corpus of literature primarily examines digital technologies through the lens of visitors and their experiences. Digital technologies as perceived by museum professionals and an analysis of the extent to which the implementation of ICT is a consistent decision and seamlessly incorporated into the overall museological strategy of a museum are areas that have received insufficient attention thus far. Consequently, a holistic approach when examining the impact of each technology and the importance of incorporating them into the overall strategy of the museum is more crucial than ever.

The manner in which visitors interact with various technological devices differs and is based on the technology used each time—whether it be interactive, immersive, or dynamic. Or if it concerns visual elements and sound effects, as well as the level of sophistication of the technology, ranging from cutting-edge to budget-friendly options. And the list could go on and on. The integration of digital technologies in the archaeological museum has led visitors to assume many roles rather than that of passive observers: visitors can also be users, active participants of the museum's narrative, immersive learners, and potentially even experience seekers.

Consequently, there is a wide variety of possible embodiment relations and equally diverse types of visitors' interaction with technology. This is precisely the case when considering this thesis: even though this study examined only two museums as its main case studies, the technology employed by both sheds light on several ways digital components mediate between humans and the museum environment. Visitors are able to interact with these technologies by touching screens, watching dynamic maps, wearing virtual reality headsets, hearing and eventually listening to sound effects, or tapping and swiping on touch-based exhibits. The museum becomes a multi-layered space where the dominance of vision gives way to that of hearing, and then the dominance of touch might follow. Occasionally, the senses are complementary and contribute to a unified whole.

The exhibition analysis revealed eight factors that need consideration when implementing digital technologies in archaeologically-focused museums. These aspects range from the most external, including the architectural design of the structure, to the most internal, including the display and exhibition style. Regarding digital technologies, space, layout, and exhibition style are the three most important considerations among these eight factors. Space is an unchanged parameter that can be used to specify the size and shape of a digital technology. While layout may not be a fixed parameter, it ultimately determines the implementation of digital technology in the exhibition hall by considering the technology in its entirety. Additionally, the exhibition style is an aspect that requires attention. In the end, it will specify which digital technologies may be incorporated and their operational mechanisms so as to align with the aesthetic of the exhibition.

In addition, the analysis demonstrated that digital technologies should not be seen as stand-alone displays but rather as components of the exhibition; otherwise, they will eventually not play a part in fulfilling the museum's overall mission. Professionals at the museum bear the greatest amount of responsibility in this regard; they can balance practical factors, such as the budget, with the critical question of whether or not these technologies will help fulfill the museum's educational mission in society.

Technology is presented as more of a realm of possibility than merely a tool. However, where possibilities exist, challenges might also arise. The analytical discussion has identified three distinct challenges that a museum may encounter when attempting to adapt to the digital age. The digitized presence can be highly effective because it blurs the lines between our innate abilities and those that are reinforced or borrowed, as it happened with the interactive touchscreens which give the impression of enhanced vision. Therefore, they are unable to serve as an absolute substitute for the entire museum exhibition, as the museum contains more than just artifacts. It is the whole experience that comes from following the sequential flow, aspects of illumination and sound effects, as well as the museum as a space of socialization.

Another challenge is that a museum might prioritize experience over educational purposes. The visual representations and audio reproductions that a museum may provide are simply this: representations and reproductions based on data obtained from textual sources and archaeological sites. This view is more in accord with archaeology than one might expect: the artifacts on display at a museum are a small portion of what

the institution actually possesses, and the fact that curators choose which subsets of objects to exhibit is a result of their own priorities. Additionally, this may play a part in a museum's educational goal by conveying the idea that we should always be critical of replications of the past, especially when dramatization is included and performed very realistically.

The evolving demands of visitors reflect the transformations that have occurred in contemporary society at large. The risk of turning museums into entertainment parks can be diminished when the museum stays true to its academic and preservation-oriented roots. A key concern is that technology should serve the museum, rather than the museum serving the technologies. Since professionals make all decisions in a museum setting, the content of technological devices is also dependent on them. By consistently selecting content that complements the archaeological evidence on display and refrains from using it to detract from the exhibits, an appropriate balance can be achieved, thereby appealing to a wider range of audience.

Since modern museology emphasizes experience-based methods above object-based exhibits, conventional displays that focus more on displaying artifacts in a sterile and lifeless manner must be reconsidered. A new type of archaeological museum is on the horizon, presenting a contradiction: it seamlessly integrates innovative technology and authentic artifacts from times long gone, all housed within the same exhibition space. The archaeological museum should be dynamic and ever-evolving, just as the discipline of archaeology is always subject to change.

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Appendix

List of questions posed to the curators/professionals.

~ Dissemination of Knowledge~

1) In what ways do digital technologies provide a better understanding of archaeological artifacts and historical knowledge within a museum setting?
2) Can you provide examples of cases where digital technologies have effectively conveyed complex concepts related to archaeology?
3) What role can digital exhibits play in making scientific knowledge more accessible to diverse audiences? (different ages, backgrounds, disabilities, etc).

~Visitor's Participation and Knowledge~

4) Are there any particular technologies that visitors find more interesting or entertaining to use?
5) Has the integration of digital technologies in the exhibition hall been wellreceived by visitors? What is the feedback?
6) To what extent does digitization of museums enable ongoing engagement with museum content? Does it encourage or discourage physical visits?

~Multisensory Strategies~

7) Do exhibitions benefit much from multi-modal experiences (e.g. combination of visual with aural information) in the context of the museum?
8) Are multimodal exhibitions more engaging and entertaining for visitors than traditional object-based displays? Does it imply that people are becoming so attached to technology that they have lost interest in original artifacts?

~General Questions~

9) In order to remain relevant with the constant advancements in technology, how often do museums work with technology companies, universities, or other institutions?
10) Are there strategies that the museum follows to ensure that digital technology is frequently updated so it can keep up with the ever-evolving technological advancements?