Representing Difficult Histories in the museum: Virtual and Augmented Reality as Tools for Communicating Difficult and Dissonant Histories.

by

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Representing Difficult Histories in the museum: Virtual and Augmented Reality as Tools for Communicating Difficult and Dissonant Histories.

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Museums have often avoided displaying difficult and controversial historical subject matters in favor of more commercial and celebratory topics. The display of these difficult histories has now become a significant topic of debate within the museum community; the shift in this emphasis coincides with a rise in dark tourism and a movement by the museum to reach the visitor on a more personal level. Representing history through the stories of individuals to promote personal meaning-making, also brings into focus the responsibility of displaying a more holistic representation of the lived past. This representation of the problematic elements of the past presents a unique set of considerations and opportunities that need to be explored.

As museums develop these aspects of interpretation, and new opportunities afforded by technological advancement emerge, it is vital to investigate how visitors interact with information in this environment. Within the current information climate, the boundaries between library science, archive, and museum fields have become blurred. The use of emergent technologies is a particularly well-suited space to utilize human information interaction theory to explore the issues relating to visitor or user experience.

This thesis investigates the influence and potential impact that display medium has on information interactions within this context. Specifically, how virtual reality (VR) and augmented reality (AR) may influence human information interactions with difficult historical topics. A qualitative approach has been employed to explore these interactions with a focus on the visitor's perceptions of their experiences of, and with, difficult histories. This research has identified ways

in which the use of these technologies' affects visitor responses to displays of difficult histories. Visitors across the full data set communicated the beneficial nature of both VR and AR in the understanding and experience of difficult topics.

This research provides a foundation for further research which could lead to the development of professional practice guidelines for the use of VR and AR in enhancing visitor responses and understanding. This has the potential to bridge the information or "otherness" gap which often exists in this context.

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1.0 Introduction to Research

1.1 Background of the Study

Throughout history, the ability of the macabre to inspire interest and intrigue is well documented.[1] In fact, it could be claimed that a high proportion of the most notable historical events would fall under the description of 'the macabre' to some extent.[2] Images of death, human brutality, conflict, and adversity are often avoided or censored within modern society, despite these facets of the human experience being the moments that often encourage development and progress on both a personal level and a societal one. The topics which are often left undiscussed for dread of inciting anger, eliciting fear, and producing reflections of the very violence depicted, are becoming an increasingly prevalent focus for display. This is with the intent of providing a safe space for discussion through interaction with this potentially volatile information.[3] This is demonstrated with Phillip Stones' development of concepts pertaining to "dark tourism."[4] This term, coined in 1996 by John Lennon and Malcolm Foley, brings together a wide variety of difficult subjects by viewing them through the lens of visitor motivation and interaction.[5]

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[1] Marius A Pascale, "Macabre Fascination and Moral Propriety: The Attraction of Horror," *Contemporary Aesthetics (Journal Archive)* 14, no. 1 (2016): 13; Rose Cullen, "The Success of the Success: Negotiating Dark Tourism on an Exhibition 'Convict Ship,'" *Journal of Tourism History* 9, no. 1 (2017): 4–26.
[2] Dr Philip Stone, "A Dark Tourism Spectrum: Towards a Typology of Death and Macabre Related Tourist Sites, Attractions and Exhibitions," *TOURISM: An Interdisciplinary International Journal* 54, no. 2 (2006), https://works.bepress.com/philip_stone/4/.
[3] Jennifer Bonnell and Roger I. Simon, "'Difficult' Exhibitions and Intimate Encounters," *Museum and Society* 5, no. 2 (2007): 65–85.
[4] Bonnell and Simon.
[5] Philip Stone, "A Dark Tourism Spectrum."

As these concepts become increasingly more prevalent within the museum sector, it is important not just to evaluate the methods of display, but also to evaluate and explore how the visitors themselves react to their experience. This study sets out to explore the complexities presented when displaying difficult histories within the context of the Social History Museum (SHM), and how emerging technologies can contribute to the presentation and visitor experience.

In recent years there has been significant innovation and development of artificial digital environments for SHM exhibitions.[6] This is a continuation of the interest shown in multi-user virtual environments by museums, developed over the past two decades.[7] The development of displays making use of virtual environments has provided the SHM community with potential opportunities in moving forward as a profession. Due to the prevalence of this emerging technology, a major focal point of this study will be to explore the potential for Augmented Reality (AR) and Virtual Reality (VR) as alternative exhibition mediums, in helping the SHM represent the lived past; when that lived past, deals with a difficult, dissonant or turbulent point in history.

These particular aspects of Social History (SH) present unique hurdles for display, not only do they deal with daily issues which are already reflected in the visitor population, but they touch on ethically and emotionally challenging topics and themes, which even in their rawest of forms can lead to heightened emotional responses from people close to them. *Social History* is defined here as history which focuses on the social, economic, and cultural institutions of people. Working from Samuel's 1985 interpretation, this definition will deal with representations of the "human

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[6] Mandy Ding, "Augmented Reality in Museums," *Arts Management and Technology Laboratory*, 2017, 1–13; Brian Fisher, "Visual Representations and Interaction Technologies," in *Illuminating the Path: An R&D Agenda for Visual Analytics*, ed. James J. Thomas and Kristin A. Cook (Los Alamitos, Calif: IEEE Press, 2005), 69–104.
[7] Richard J. Urban, "A Second Life for Your Museum: 3D Multi-User Virtual Environments and Museums," *Archives & Museum Informatics*, 2007, https://www.ideals.illinois.edu/handle/2142/1619.

face of the past" within the museum environment.[8] This dissertation focuses on SHM exhibitions dealing specifically with difficult elements of SH, hereafter referred to as *Difficult and Dissonant Histories* (DDH). These difficult elements of SH are defined by MacDonald as: "a past that is recognized as meaningful in the present, but that is also contested and awkward for public reconciliation with a positive, self-affirming contemporary identity."[9]

VR is defined as a technology which has three key elements,

> *the three key elements that characterize VR are: (1) Visualization, where the user has the ability to look around, usually with the use of a head-mounted display; (2) Immersion, suspension of belief and physical representation of objects; (3) Interactivity, degree of control over the experience, usually achieved with sensors and an input device like joysticks or keyboards.*[10]

AR is viewed as a simplified version of VR where images are projected into a real world view in order to augment reality rather than the creation of an alternative, immersive reality.[11]

1.1.1 Interactions in the Social History Museum: Considering New Technologies

To fully understand how these technologies may benefit the educational purpose of SHM and the display of DDH, it is important to look at both the advantages and disadvantages of AR and VR within this context.

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[8] Raphael Samuel, "What Is Social History?" History Today, 1985, https://www.historytoday.com/raphael-samuel/what-social-history.
[9] Sharon Macdonald, *Difficult Heritage: Negotiating the Nazi Past in Nuremberg and Beyond* (Milton Park, Abingdon, Oxon ; New York: Routledge, 2009).
[10] Ryan Yung and Catheryn Khoo-Lattimore, "New Realities: A Systematic Literature Review on Virtual Reality and Augmented Reality in Tourism Research," *Current Issues in Tourism*, December 28, 2017, https://www.tandfonline.com/doi/full/10.1080/13683500.2017.1417359.
[11] Daniel A. Guttentag, "Virtual Reality: Applications and Implications for Tourism," *Tourism Management* 31, no. 5 (October 1, 2010): 637–51, https://doi.org/10.1016/j.tourman.2009.07.003.

Currently the use of AR, and VR in the preservation and representation of both cultural heritage and SH has become a topic of greater interest within the museological field, transferring the concepts widely accepted in the display of the hard sciences to the humanities.[12]

Driven by the aim to both educate and attract a wide range of people, SHM strive to provide interactive and enjoyable exhibitions which appeal to a wide demographic of visitors.[13] These exhibitions have become more digitally oriented as the technology has developed and become more widely available and accessible, providing the means for the SHM to communicate potentially complex ideas to a large group of people. A review of the advantages and disadvantages of the use of artificial environments for the purpose of display explores the elements of display which can be transferred successfully from the physical to the digital. It also highlights additional characteristics of difficult history display, which could be better served by the use of these digital technologies.

To examine the use of artificial environments as a method of displaying difficult histories in the SHM, current theory and practice in the field is explored and provides the basis for comparison of physical displays and those developed through digital means. Moving through traditional SHM practices and display techniques to develop a comparative analysis, highlights the advantages and disadvantages of using these technologies, specifically in relation to the display of difficult history.

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[12] Farzan Baradaran Rahimi, Richard M. Levy, and Jeffrey E. Boyd, "Hybrid Space: An Emerging Opportunity That Alternative Reality Technologies Offer to the Museums," *Space and Culture*, August 13, 2018, 1206331218793065, https://doi.org/10.1177/1206331218793065.

[13] Carmen Antón, Carmen Camarero, and María-José Garrido, "Exploring the Experience Value of Museum Visitors as a Co-Creation Process," *Current Issues in Tourism* 0, no. 0 (September 14, 2017): 1–20, https://doi.org/10.1080/13683500.2017.1373753.

Focusing primarily on the cognitive processes which are connected to interaction and interactivity enabled the investigation to assess the capabilities of virtual reality (VR) and augmented reality (AR) in relation to display. Taking an innovative approach to articulating the relationship between visitor and display through the development of sense-making theory, combining the work of Dervin (1999) and Tilden (1957), enabled the process of personal meaning making to be outlined in abstract terms, while also contributing to the current body of knowledge.[14] Moving away from the specific implications of the display topic provides space to evaluate the processes which are experienced by the visitor as they explore the SHM environment.

1.1.2 AR, and VR defined: Mediums of Information Transfer

In order to provide a clear evaluation of digital technologies in the display of difficult history, it is important to define the terminology used to describe the experience of the SHM visitor. Interactivity and interaction are terms commonly used interchangeably. Parsons and Sedig (2014) argue that one of the main problems when discussing interactivity is the lack of cohesion in the definition of these terms.[15] To provide clarity and structure to the following analysis, here *interaction* will refer to the dialog taking place between the SHM visitor and the exhibition, whereas *interactivity* will refer to the quality of the interaction, as provided by the display medium. This falls in line with the definition outlined by Parsons and Sedig (2014).

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[14] Brenda Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design," in *Information Design*, by Robert Jacobson (Cambridge, MA: MIT Press, 1999); Freeman Tilden, *Interpreting Our Heritage: Principles and Practices for Visitor Services in Parks, Museums, and Historic Places* (University of North Carolina Press, 1957).

[15] Paul Parsons and Kamran Sedig, "Adjustable Properties of Visual Representations: Improving the Quality of Human-Information Interaction," *Journal of the Association for Information Science and Technology* 65, no. 3 (2014): 455–82.

The specific digital technologies of interest within this study are VR and AR.[16] These terms, much like interaction and interactivity, are often misused due to the apparent similarities between the technology being described. Highlighting the differences and providing clear definitions for each approach will provide a consistent base for analysis. VR refers to a completely immersive environment, effectively shutting out the physical world and allowing for events to be experienced rather than recounted.[17] The distinction between AR and VR can also be articulated by looking at the way in which they provide an immersive experience to the visitor. Augmented reality allows the visitor to look deeper into an exhibit, engaging with the information underneath the display by using a device (usually a smartphone), to project a layer of digital content within a live view of the present physical environment. Virtual reality provides the means for the visitor to be transported into a historical setting and to witness or even become part of the event as it unfolds.

The advantages and disadvantages of using AR, and VR to create artificial digital environments for the display of difficult history as an alternative to a traditional physical museum exhibition is explored through an evaluation of current literature across the fields of information science, museum studies and visitor studies, using a qualitative systematic approach. This in turn informed the primary data collection and secondary data analysis situating this study within the current body of research.

[16] Baradaran Rahimi, Levy, and Boyd, "Hybrid Space."
[17] Baradaran Rahimi, Levy, and Boyd; The Franklin Institute, "What's the Difference Between AR, VR, and MR?," 2018, https://www.fi.edu/difference-between-ar-vr-and-mr.

1.2 Need for the Study

1.2.1 Human Information Interaction and the Social History Museum

The primary aim of the field of Human Information Interaction (HII) is the investigation into how people interact with information;[18] specifically, "how people need, seek, manage, give and use information in different contexts.'[19] To begin to look at the interplay between people and information, it is first important to define exactly what the term 'information' refers to. This can prove more complex than it sounds: as the concept of information becomes more significant in a wider range of disciplines, due to the rise in the prevalence of digital media in education, entertainment and the service industries, this term is not only applicable across all academic fields, but ingrained in everyday life, both private and professional.[20] The focus of HII research can be seen to vary according to the dominant discipline in which the research is situated, and this is reflected in the use of terminology and thus requires the re-examination of definitions.[21] The study of HII has been described as a "meta-field", as it is applicable to all areas concerning the relationship between people and information.[22] It is therefore unsurprising that a unified definition of the term has not been formulated.[23] Consequently, in order to provide an overview of the field,

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[18] Raya Fidel, *Human Information Interaction: An Ecological Approach to Information Behavior*. (Cambridge, MA: MIT Press, 2012).
[19] Reijo Savolainen, "Information Behavior and Information Practice: Reviewing the 'Umbrella Concepts' of Information-Seeking Studies," *The Library Quarterly* 77, no. 2 (April 1, 2007): 109–32, https://doi.org/10.1086/517840.
[20] Gary Marchionini, "Human-Information Interaction Research and Development," *Library & Information Science Research* 30, no. 3 (2008): 165–74, https://doi.org/10.1016/j.lisr.2008.07.001.
[21] Parsons and Sedig, "Adjustable Properties of Visual Representations."
[22] Parsons and Sedig.
[23] Robert M. Losee, "A Discipline Independent Definition of Information.," *Journal of the American Society for Information Science* 48, no. 3 (March 1997): 254–69; Fritz Machlup and Una Mansfield, eds., *The Study of Information: Interdisciplinary Messages* (New York, NY, USA: John Wiley & Sons, Inc., 1983); William James Cameron and Anthony Debons, eds., *Perspectives in Information Science: Proceedings of the NATO Advanced*

the following evaluation aims to encompass HII research completed from within the information sciences and other disciplines where reflections of the same principles can be seen, i.e. visitor studies, tourism studies, museum studies and education. For the purpose of this research, and in accordance with Floridi's 2010 explanation of *Information*, a broad conceptual definition will be taken. The term Information will therefore encompass semantic, mathematical, physical, biological and economic influencers on both human cognitive processes and behaviors.[24]

1.2.2 The Changing Face of the Social History Museum

As the relationship between people and knowledge has shifted generally, the SHM has become a place for intellectual debate, learning and knowledge exchange. This shift highlights the relevance of HII research, specifically Information Behavior (IB), information seeking behavior (ISeB) and information use behavior (IUB), for the development of museum display techniques, as well as the role which research from the information sciences can have on creating new conceptual knowledge frameworks within the SHM.

There is a growing recognition within the museum community that theory in LIS, specifically HII, is increasingly relevant to the everyday needs within the museum.[25] This is supported by

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Study Institute on Perspectives in Information Science, Held in Aberystwyth, Wales, UK, August 13-24, 1973, NATO Advanced Study Institutes Series. Series E, Applied Sciences, no. 10 (Leyden: Noordhoff, 1975); Anthony Debons and Arvid G. Larson, *Information Science in Action: System Design: Volume I*, Nato Science Series E: (Springer Netherlands, 1983), //www.springer.com/us/book/9789401080569; Luciano Floridi, "Semantic Conceptions of Information," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, Spring 2017 (Metaphysics Research Lab, Stanford University, 2017), https://plato.stanford.edu/archives/spr2017/entries/information-semantic/; Peter Morville, *Ambient Findability: What We Find Changes Who We Become* (O'Reilly Media, Inc., 2005), https://proquest.safaribooksonline.com/0596007655.

[24] Luciano Floridi, *Information: A Very Short Introduction* (Oxford, UNKNOWN: Oxford University Press, 2010), http://ebookcentral.proquest.com/lib/pitt-ebooks/detail.action?docID=737413.

[25] Paul F. Marty, "Meeting User Needs in the Modern Museum: Profiles of the New Museum Information Professional," *Library & Information Science Research* 28, no. 1 (March 1, 2006): 128–44, https://doi.org/10.1016/j.lisr.2005.11.006.

research conducted by Wyman, Smith, Myers and Godfrey (2011) which states that there is an increased demand for "hyper-contextualized" information to be easily and quickly accessible.[26] Information resources within the SHM have often been lost or hoarded.[27] Traditionally this information has not been readily available or even offered as part of an exhibition. As Wyman et al.[28] state, the landscape has changed over the last twenty years. Increased use of digital technology within the museum has led to a greater emphasis being placed on the use of information and the changes which this can effect in visitor behavior, driven by the shift in mediums of display.[29] This *conversational approach*, that is a mode of information transfer which encourages a dialogue, in some form, between the museum and visitor, as opposed to a more traditional, authoritative structure where the museum imparts its knowledge, is particularly useful when dealing with difficult topics. A successful example of this is the "Without Sanctuary" exhibition which dealt with depictions of lynching across America in the twentieth century.[30] The exhibition itself was comprised entirely of postcards which were produced in order to commemorate these events, providing social commentary and context on widely held public views at the time the postcards were produced. While this exhibition was held at the Andy Warhol Museum in 2001, curators set up a video booth that allowed for visitors to express their reactions, opinions and emotions surrounding the exhibition post-experience. The collection of visitor responses is an excellent example of how thoughtful curation of difficult historical topics can bridge the gap between current

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[26] B Wyman et al., "Digital Storytelling in Museums: Observations and Best Practice.," *The Museum Journal* 54, no. 4 (2011): 461–68.
[27] Carolina Islas Sedano et al., "From Global Games to Re-Contextualized Games: The Design Process of TekMyst," in *Serious Games and Edutainment Applications* (Springer, London, 2011), 197–223, https://doi.org/10.1007/978-1-4471-2161-9_11.
[28] Wyman et al., "Digital Storytelling in Museums: Observations and Best Practice."
[29] S Syaiou et al., "Exploring the Relationship between Presence and Enjoyment in a Virtual Museum," *International Journal of Human-Computer Studies* 68 (2010): 243–53.
[30] James Allen and John Littlefield, "Without Sanctuary: Lynching Photography in America," 2018 2000, https://withoutsanctuary.org/.

societal issues and those experienced in the past. Here the visitors used the information presented to them to reflect on their own current behaviors and beliefs, as well as prevalent political and social issues.

1.3 Research Purpose and Questions

The purpose of this study is to explore the complexities of displaying difficult histories within the context of the SHM. Through the development of a multi-site case study where both the individual technologies and a traditional exhibition are represented, the central aim of this study is to **explore the interactions between visitors and difficult historical information to ascertain how, if at all, immersive technologies influence the way in which this information is processed.** In order to explore this phenomenon, exhibitions using different mediums to represent difficult historical events have been studied through the use of both primary and secondary data analysis., The central focus of this study is to discern if the way in which this information around difficult histories is communicated to visitors, alters their experience in interacting with the information presented in a SHM exhibit, in any way, providing insights and suggested ways forwards in the use of technology to enhance the visitor experience.

In order to investigate which display methods offer the potential for success, the following questions form the foundation of this study:

1.3.1 [RQ 1] Question 1: What role do immersive technologies play in the visitor experience of difficult history museum exhibitions?

- [RQ 1.1] Did the visitor find the exhibition useful in communicating difficult content?
- [RQ 1.2] Does the visitor express growth of knowledge?
- [RQ 1.3] Does the visitor express an interest in further learning post-exhibition?

Comparing exhibitions that deal with difficult histories through the use of different mediums will provide an opportunity to engage directly with visitors regarding how they believe the technology has impacted how they understand the information presented.

1.3.2 [RQ 2] Question 2: How do visitors respond to immersive representations of difficult histories?

- [RQ2.1] How do visitors express emotional responses to exhibition content?
- [RQ2.2] How do the visitor's emotional responses relate to the technologies used to deliver the exhibit?

Visitor responses may provide insight into how/if the technology used to communicate difficult histories alters the experience in any way. As immersive experiences afford the opportunity to forge deeper connections with the lived past, it is important to examine what effect this may have when displaying difficult topics.

1.4 Significance of Study

As the societal role of the SHM is brought into question during a time where information is easily accessible and more readily disseminated to the public through other avenues, there have been a number of elements that are now viewed differently by both the institution and the visitor. The purpose of the SHM, although still authoritarian in many aspects, relies more heavily on a conversation between curator and visitor. Representation of communities, histories and stories are largely more personalized, rather than dehumanized. This has highlighted "that a key ethical principle guiding all exhibition work should be openness and honesty."[31]

Existing research has focused on the general visitor experience within the SHM, emphasizing facilities, education, intergenerational learning and more recently the personal connection between visitor and information. As studies in meaning-making have developed, it has become apparent that more must be discovered about the way in which visitors experience different types of information, as well as how the methods of display may influence the experience. Although display and interpretive techniques are reassessed regularly and have developed over time, there is a tendency within the industry to adopt the seemingly most attractive options to increase foot traffic into the SHM. The current literature has focused on the ways in which immersive technologies may benefit informal learning; however, there has been limited research into how these technologies may change visitor interactions with information in the SHM.[32] Use of immersive technologies to provide valuable context to intangible heritage has been approached with

[31] Andromache Gazi, "Exhibition Ethics - An Overview of Major Issues," *Journal of Conservation and Museum Studies* 12, no. 1 (May 8, 2014), https://doi.org/10.5334/jcms.1021213.
[32] Alexandra Bec et al., "Management of Immersive Heritage Tourism Experiences: A Conceptual Model," *Tourism Management* 72 (June 1, 2019): 117–20, https://doi.org/10.1016/j.tourman.2018.10.033.

enthusiasm as a means to once again attract visitors. The use of VR and AR in creating representations of the intangible past has the potential to communicate context in a way which could preserve SH on an entirely new level; however, the display of difficult histories requires a more nuanced approach to display, due to the ethical considerations connected with emotionally and/or politically sensitive topics.

As displaying difficult histories is a more recent trend within academic study, there are areas which are yet to be explored. It is intended that this study will provide a starting point for further research into the way VR and AR technology may alter the information interactions between visitor and difficult history displays, with an aim to form a foundation on which guidelines for professional practice can be developed, filling the gap by the application of HII theory to the SHM sphere and providing a deeper understanding of how visitors navigate these information spaces.

1.5 Assumptions and Limitations

The data collected for this study includes secondary data in the form of self-reported visitor feedback and primary data collected through semi-structured interviews with museum professionals, involved in the implementation of AR presented in case study two. This is set within the theoretical framework developed from current literature in human information interaction, SH display, representations of difficult histories and the use of AR and VR as display techniques.[33] The main assumption is that visitors will engage with the display mediums in question before providing their responses. In the event that the visitors are passive through the exhibition

[33] Laurie Goldsmith, "Using Framework Analysis in Applied Qualitative Research.," *Qualitative Report* 26, no. 6 (2021): 2061–76.

experience, any feedback that is provided will not shed light on the interactions between visitors and difficult historical information to ascertain how, if at all, exhibition medium influences the way in which this information is processed. However, the role of the display medium in the absence of interactions could be articulated by participating visitors. Another practical assumption is that visitors will provide any feedback or that the volume of visitors willing to self-report on their experience will address the focus of this study as outlined by the research questions.

As this data collection is mainly reliant on self-reporting of both museum professionals and secondary data from visitors within a restricted period of time, depth of the collected responses is an unknown element, and although intended to provide insight into interactions between human and represented information, the qualitative nature of this data will not lend itself to extrapolation past the data sample itself. However, it will allow for transferability based on contextual applicability between display contexts.

1.6 Delimitations (intentional areas not investigated)

As this study explores the complexities of displaying difficult histories within the context of the SHM and evaluates the implications of visitor interactions with VR and AR technology, the exclusion of demographic has not been considered. This allowed for a sample of the whole visitor population to be represented, to deduce how exhibition medium may influence the way in which difficult historical information is processed.

In addition, the specific subject of the exhibition has not been taken into consideration during case selection or data analysis. The criteria for case selection required the exhibition content to represent an element of the past which is “recognized as meaningful in the present,

but that is also contested and awkward for public reconciliation with a positive, self-affirming contemporary identity."[34] Therefore the content and issues dealt with in both case studies will not be discussed during the cross-case analysis. This allowed for interactions with AR and VR to remain central throughout the investigation.

1.7 Organization of the Dissertation

The remainder of the thesis consists of a literature review of current scholarship, within the fields of library and information science as well as museology. This review highlights the intersection of human information interaction, difficult history representation and curatorial practices. This review forms the theoretical framework for the exploration of two cases displaying difficult histories using VR and AR, one case study where visitor feedback has been collected and is available for secondary analysis and another where visitor feedback has been collected and analyzed over numerous exhibition sites and in-depth, semi-structured interviews have been carried out with the museum professionals responsible for the design, collection and analysis of that data. Presenting the theoretical foundation for data collection and setting up a framework for discussion of the data, Chapter 2 grounds the methodology within current scholarship, providing a justification alongside recommendations from the pilot study that inform the methodology for this investigation. Details of the two chosen case studies, which represent each type of display technique applicable to this study, are also included in this section. Findings are presented initially in their "raw" form for each individual case study, (Chapter 4). As this study is based on qualitative

[34] Macdonald, *Difficult Heritage*.

data, it is important to state that even in its most “raw” form there will be a level of interpretation from the researcher at this point, with a view to consolidate the collected responses prior to analysis. A description of the sample is detailed here, providing context and a framework for the interactions, by collecting and analyzing both self-reported visitor feedback provided by the Shoah Foundation and primary data collected during semi-structured interviews with museum professionals from The United States Holocaust Memorial Museum (USHMM). Chapter 5 presents a cross-case analysis of the feedback, examining the results from each in light of each other, shedding light on the potential impact of display technique on visitor information interactions, and therefore the pros and cons of using AR and VR technology to create representations of difficult histories in the museum. Finally, conclusions from this cross-case analysis, combined with the background literature presented in Chapter 2 allow for the research questions to be addressed, the contribution of the study to the current body of knowledge to be assessed, and to articulate areas for further study identified during the course of this research study.

2.0 Theoretical Orientation for the Study: Review of Literature

2.1 Introduction

The following chapter provides a critical summary of literature published within Library and Information Science (LIS), Archival studies, Museology, and Education. Beginning with a discussion of how library, archive, and museum research intersects, then taking a thematic approach to analysis. The themes used to structure this critical analysis are drawn from an initial appraisal of the literature gathered, combined with the focus of this explorative study: Difficult and Dissonant Histories (DDH) and immersive technologies. This approach highlights the gap in current literature, supporting the need for this research.

As this review deals with relevant research from multiple disciplines, strict boundaries structured the research process while gathering works for consideration. Within LIS, research pertaining to Human Information Interaction (HII), Information Behavior (IB), and Affect Studies are considered. In addition, museological research pertaining to interpretation is considered, specifically regarding the interpretation of Social History (SH) and DDH. Interpretation of Art and Natural History are only considered when such research is focused on the use of immersive technologies as an approach for interpretation. These intentional boundaries have allowed for focus to be centered on information interactions with DDH in immersive environments.

2.2 The Intersection of Libraries, Archives, and Museums: Convergence or Re-convergence?

Increased recognition of the similarities between Libraries, Archives, and Museums (LAMs) has led to an emergence of literature dealing with the areas of convergence at the cross-section of these institutions. According to Bruce (2015), "Collaboration is one of the top trends in academic librarianship in the USA."[35] This is also noted by the Association of College and Research Libraries (ACRL) and is likely to be a growing trend in other countries as well (ACRL Research Planning and Review Committee, 2014).[36]

Brown describes the traditional boundaries which have existed between the library, archival, and museum environments as "dissolving." Proposing that this is primarily due to the increasing significance of digital technologies and their application across sectors, as well as the level of "interconnectedness" which this encourages between specialties.[37] She continues to highlight preservation as the link which connects these fields to one another. Postulating that "preservation management provides the principles and critical framework that underpins and guides the different strategies for safeguarding physical and digital collections."[38] This falls in line with an earlier study completed by Cloonan (2001), where the essence of preservation is referred

[35] Christine Susan Bruce and Diana K. Wakimoto, "Experiencing Archives at Universities: Archivists, Librarians, Understanding, and Collaboration," *Reference Services Review* 43, no. 2 (June 4, 2015): 182–98, https://doi.org/10.1108/RSR-07-2014-0025.
[36] Laura Saunders, "Academic Libraries' Strategic Plans: Top Trends and Under-Recognized Areas," *The Journal of Academic Librarianship* 41, no. 3 (May 1, 2015): 285–91, https://doi.org/10.1016/j.acalib.2015.03.011; 2021-22 ACRL Research Planning and Review Committee, "Top Trends in Academic Libraries: A Review of the Trends and Issues | Research Planning and Review Committee | College & Research Libraries News," June 2, 2022, https://doi.org/10.5860/crln.83.6.243.
[37] H Brown, *Painted Lines: Preservation Connections* (London, England: SAGE Publications, 2011).
[38] Brown. Pp.190

to as "a way of seeing.".[39] The fundamental drive to preserve heritage, either digitally or physically, is viewed as a value judgment by Cloonan, a way in which those of us who work in the LAM fields view the world. If we accept this statement, it is easy to see how the underlying functions of LAMs reflect one another and, therefore, how they can work together as a whole, preserving and providing access to information for the public, regardless of how "information" is defined in each context.

Brown continues by framing the blurring of the boundaries within the context of digitization, stating that the move towards digitalization blurs the lines drawn by physical difference.[40] It is possible and indeed prevalent to view the convergence of LAMs through the lens of the digital age. The digital era is an area of discussion which holds great importance to all LAM fields currently and will therefore be addressed in detail. The increased importance of digital mediums provides a meeting point where the aim of preservation and access to information meets, bringing together LAMs on the same platform; however, looking at the convergence of the industries as a purely modern phenomenon is to negate the historical connections. In order to fully understand how these industries meld together, it is essential to look at how they have run parallel to one another in the past and to highlight previous points of convergence.

Marty mentions how the concept of convergence of LAMs within the digital sphere is present historically.[41] In his introduction to volume 80 of *'The Library Quarterly,'* Marty cites Rayward (1998), commenting that the commonalities of LAMs have already served as the focus

[39] Michele Valerie Cloonan, "W(H)ITHER Preservation?," *The Library Quarterly* 71, no. 2 (April 1, 2001): 231–42, https://doi.org/10.1086/603262.
[40] Brown, *Painted Lines: Preservation Connections.*
[41] Marty, "Meeting User Needs in the Modern Museum."

for a number of conferences.[42] This trend can still be seen over the past decade or so with reference to the convergence of LAMs, for example: RLG 2005 "Libraries, Archives, and Museums—Three-Ring Circus, One Big Show?" and ACRL Rare Books and Manuscripts Section in 2006 "Libraries, Archives, and Museums in the Twenty-first Century: Intersecting Missions, Converging Futures?".[43]

It is fair to say from the above that the cross-overs between the fields are not new. Many principles apply to each different discipline; one example of this is in the education of LAM professionals. The 'overlapping educational goals' underpin the principles of Professional Practice, such as concepts in preservation, public access, user behavior, and user-centered design, to name just a few.[44] As museum professionals are becoming increasingly concerned with meeting user needs, the role of information in the museum is changing.[45] Ensuring that museum information resources are available to patrons as needed is much the same as ensuring library information resources are available as needed. This is shown in recent literature pertaining to museum interpretation, library design, and human information interaction.[46] Kraft describes 'user experience' as:

> *The changing feelings that a user gets when using a device, service, or system. User experience can come from a first impression. It can also come from positive and negative surprises experienced in the long term.* [47]

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[42] W. Boyd Rayward, "Electronic Information and the Functional Integration of Libraries, Museums, and Archives" (Clarendon Press, 1998).
[43] Paul F. Marty, "An Introduction to Digital Convergence: Libraries, Archives, and Museums in the Information Age," *Museum Management and Curatorship* 24, no. 4 (December 1, 2009): 295–98, https://doi.org/10.1080/09647770903314688.
[44] Marty; Leanne Bowler et al., "Issues in User-Centered Design in LIS," *Library Trends* 59, no. 4 (2011).
[45] Marty, "Meeting User Needs in the Modern Museum."
[46] Paul F. Marty, W. Boyd Rayward, and Michael B. Twidale, "Museum Informatics," *Annual Review of Information Science and Technology* 37, no. 1 (January 1, 2003): 259–94, https://doi.org/10.1002/aris.1440370107.
[47] Kraft, *User Experience Innovation: User Centered Design That Works*. Pp.9

It is easy to see how this perception of user experience applies to LAMs as a whole. Each separate profession engages with a user, aiming to provide them with a service. User-centered design of services, systems, and spaces are intrinsic to the development of access to library, archive, and museum resources, both digitally and physically. Rethinking the fundamental purpose of the physical space goes hand in hand with the move to a more digitally accessible environment. Removing the preconceptions of what a library building offers its users, what role an archive has to a community, and the experience which a museum offers is evident in the way in which these communities of users are now being consulted and integrated into the process of LAM design. The physical space and the services offered are built around the needs of the user rather than in service of the information housed.[48]

The same trend can be seen in the way in which the issue of access has been approached. The convergence of LAMs is not only evident in the literature pertaining directly to this movement but also in the parallel studies existing in each field.[49] The concept of public access, open access, and digitalization follow the same user-centric trend as the design of physical space.[50] Despite the way in which terminology might differ from field to field, the concept of providing information to the public for free is visible across LAMs. One of the main goals of digitalization or "going digital" is not only to provide a medium for users to interact with the information housed within LAMs but also to preserve information in the context of the modern world. The systems currently used by LAMs, although unique to the flavor of information being presented, are all becoming subject to the same user-centered design that the physical space has been designed around for some time. As

[48] Paul F. Marty, "The Changing Nature of Information Work in Museums," *Journal of the American Society for Information Science and Technology* 58, no. 1 (January 1, 2007): 97–107, https://doi.org/10.1002/asi.20443.
[49] Marty, "Meeting User Needs in the Modern Museum."
[50] Marty.

going digital presents its own challenges, libraries, archives, and museums are working with studies from each specialty in order to address problems within their own field, thus providing a catalyst for their convergence.

Marty's acknowledgment of historical convergence presents the opportunity to develop an analysis of the ebb and flow of how these professionals have run parallel, meeting at similar points repeatedly.[51] Investigation into what factors influence this reoccurring trend will aid in ensuring that convergence in the digital era sets the stage for ongoing collaboration as the LAM field moves forward, consequently ensuring its own survival. Digital literacy is a concern for all institutions under the LAM umbrella; this is a prime example of how literature in one field is being utilized across the LAM environment. Digital literacy has been championed as a cause within library and information sciences.[52] Much of the literature produced surrounding this issue comes from the specific perspective of the library. Despite the task of tackling issues pertaining to digital literacy falling mainly within the library field, it can be connected to the concept of 'cultural capital' within the museum field. Cultural capital was a term coined within the museum field in order to describe different audience demographics. The issues raised by digital literacy largely impact the same social groups as highlighted within discussions on cultural capital. These target audiences reoccur in a number of different studies as people who are less likely to engage with, be aware of, or find purpose in the essential functions of LAMs. This similarity is far from surprising but serves as a key example of where the LAM fields may begin to learn from one another. For instance, work in the community from both library and museum outreach programs can be utilized by archives with

[51] Marty, "An Introduction to Digital Convergence."
[52] Annemaree Lloyd, "Information Literacy Landscapes: An Emerging Picture," *Journal of Documentation* 62, no. 5 (September 1, 2006): 570–83, https://doi.org/10.1108/00220410610688723.

a view to increasing the usage of resources offered to the public. It also presents a prime example of how LAMs can work together towards a common goal, aiding each other.

As the push for digitalization continues, it is important to factor in the barriers to access, beyond the physical aspects, which digitalization aims to cure. This task is one that encompasses many social issues, and Neuman addresses many of these in his study of digital literacy in urban schools.[53] This study resonates with many outreach programs developed by museums worldwide, where the aim is to reach communities who would not usually engage with the institution due to issues of traditionally perceived cultural capital. The ownership of digital literacy within LAMs has been taken most formally by the library could be attributed to the history of HII. This, although by no means an old field, has been in existence for a number of decades.[54] Examining how people interact with their information; more specifically, how they search, process, and indeed satisfy their information needs.[55] This area of study has become increasingly more prevalent and again offers examples of museums utilizing the theories developed by information science. The theory of "meaning making" when discussing visitor interactions with interpretive text is one of these examples.[56] This technique, which has also been adopted by the archival field, can be seen to reflect Dervin's theory: the concept of building a bridge between the user and the information in order for the user to satisfy their information need.[57]

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[53] Delia Neuman, Allen Grant, and Mary Jean, "Information and Digital Literacy in a High-Poverty Urban School," *School Libraries Worldwide*, School Libraries and Diversity in the 21st Century, 21, no. 1 (2015), https://www.academia.edu/27377020/Information_and_Digital_Literacy_in_a_High-Poverty_Urban_School_Delia_Neuman_Allen_Grant_Mary_Jean_co-authors_.
[54] Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design." (1999).
[55] Dervin.
[56] Wendy M. Duff et al., "Contexts Built and Found: A Pilot Study on the Process of Archival Meaning-Making," *Archival Science* 12, no. 1 (March 1, 2012): 69–92, https://doi.org/10.1007/s10502-011-9145-2.
[57] Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design."

The role of the information professional within the context of the museum has been outlined somewhat over the last decade. From the descriptions provided by Marty in his 2006 paper, it is easy to see how these traditionally linked disciplines are coming together again in the digital age. Roles such as chief information officer, information resource manager, and information and communication technology specialist are typical in the modern museum. These roles are arguably the most concrete examples of LAM convergence, although it is important to acknowledge that there is an element of fluidity in job responsibilities. Even when looking at the role of the information professional within the museum as an example of how the disciplines are re-converging in the digital age, it is challenging to outline boundaries between roles with any certainty.[58]

These changes are also reflected in LIS education.[59] Considering the LIS field as a 'meta discipline' and viewing the information management skill set as a specialization that is required across LAMs provides a lens in order to address practical and professional concerns as well as those that are more theoretical.[60] This "re-convergence"[61] of the LAM fields reflects both a shift in the way the LIS field views itself and broader change in LAM organizations, as well as the values that underpin them.[62] This can be seen in the increased emphasis on play and its role in both library and museum programming.[63] Literature such as Ward-Wimmer and Kolb and Kolb deal

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[58] Marty, "The Changing Nature of Information Work in Museums"; Marianne Martens and K. F. Latham, "Convergence in Library and Museum Studies Education: Playing around with Curriculum?," *Journal of Education for Library and Information Science* 57, no. 1 (2016): 79–82.
[59] Marcia. J. Bates, "The Information Professions: Knowledge, Memory, Heritage.," *Information Research: An International Electronic Journal* 20, no. 1 (March 15, 2015), http://www.informationr.net/ir/20-1/paper655.html#.WkJxZbacbBJ.
[60] Bates.
[61] H Brown, *Painted Lines: Preservation Connections* (London, England: SAGE Publications, 2011).
[62] Brown, *Painted Lines: Preservation Connections*; Martens and Latham, "Convergence in Library and Museum Studies Education."
[63] Robin S. Grenier, "All Work and No Play Makes for a Dull Museum Visitor," *New Directions for Adult and Continuing Education* 2010, no. 127 (September 1, 2010): 77–85, https://doi.org/10.1002/ace.383.

with play as one of the highest forms of learning, pinpointing the museum and the library as presenting the perfect platform for more engaging and potentially 'novel' learning environments.[64] Wakimoto stated in 2012 that:

> *Librarians and archivists have increasing opportunities for collaboration at colleges and universities as seen by the trends affecting higher education today, and understanding of varying experiences of archives should only strengthen these collaborations through enabling clear communication.*[65]

This supports the ongoing collaboration between the LAM fields from the perspective of the archive, again highlighting the importance and potential for the convergence of LAMs.

As the connection between LAMs exists in so many facets of the individual professions, it is no surprise that the cycle of convergence is reoccurring. Much of the literature deals with the convergence of LAM as a reaction to an imminent threat. VanderBerg uses sensationalistic language to describe this convergence, dealing with it as a new phenomenon. This is in direct contrast to Marty and Brown's assessments of the historical aspects of convergence between the fields and appears to negate the innate similarities in the primary function of these institutions.[66]

It is perhaps more accurate to deem the most recent move towards a more cohesive LAM field as a "re-convergence" rather than dealing with this as a new phenomenon, as Brown suggested. Rather than deeming convergence as a new trend, it may be more accurate to consider

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[64] Dottie Ward-Wimmer, "Introduction: The Healing Potential of Adults at Play," in *Play Therapy with Adults*, ed. Charles. E Schaefer (Hoboken, NJ: Wiley, 2003), 1–14; Grenier, "All Work and No Play Makes for a Dull Museum Visitor"; Alice Y. Kolb and David A. Kolb, "Learning to Play, Playing to Learn: A Case Study of a Ludic Learning Space," *Journal of Organizational Change Management* 23, no. 1 (February 16, 2010): 26–50, https://doi.org/10.1108/09534811011017199.

[65] Diana K. Wakimoto and Christine Susan Bruce, "Experiencing Archives at Universities: Archivists, Librarians, Understanding, and Collaboration," *Reference Services Review* 43, no. 2 (June 4, 2015): 182–98, https://doi.org/10.1108/RSR-07-2014-0025.

[66] Robert VanderBerg, "Converging Libraries, Archives and Museums: Overcoming Distinctions, but for What Gain?," *Archives and Manuscripts* 40, no. 3 (November 1, 2012): 136–46, https://doi.org/10.1080/01576895.2012.735826.

the increase in the literature pertaining to this issue as a re-emergence of interest in LAMs.[67] This will better allow for the lessons learned in the past to be reflected in the digital era. The parallel lines which exist between the individual fields and the way in which they already lean on one another are evidence of professional similarities which are beginning to be reflected within the literature.[68] A change in the way we handle exhibition in the digital era and the acknowledgment that the information which objects represent is required by the public in order to provide a truly educational experience, which in turn, aids in ensuring that the past is not lost and is held in context with the present. This can be seen to be particularly relevant when displaying DDH as the likelihood of visitors' personal memory may often represent distortions of SH, which can lead to negative affective responses.

2.3 Interpretation, Interaction, and Interactivity

The study of HII has been seen within Library and Information Science as a branch of social epistemology, the theoretical and practical application of the processes by which a 'knowledge relationship' is achieved: this concept has since been challenged by Floridi.[69] Floridi's

[67] T Clement, W Hagenmaier, and J.L. Knies, "Toward a Notion of the Archive of the Future: Impressions of Practice by Librarians, Archivists and Digital Humanities Scholars.," *Library Quarterly: Information, Community, Policy* 83, no. 2 (2013): 112–30; Lisa M. Given and Lianne McTavish, "What's Old Is New Again: The Reconvergence of Libraries, Archives, and Museums in the Digital Age," *Library Quarterly* 80, no. 1 (January 2010): 7–32, https://doi.org/10.1086/648461; Aaron D Purcell, "Chapter 10: Emerging Trends and the Horizon," in *Academic Archives: Managing the Next Generation of College and University Archives, Records, and Special Collections* (Chicago: Neal-Schuman, 2012), https://www.alastore.ala.org/content/academic-archives-managing-next-generation-college-and-university-archives-records-and.
[68] Bates, "The Information Professions."
[69] Richard Fyffe, "The Value of Information: Normativity, Epistemology, and LIS in Luciano Floridi," *Portal: Libraries and the Academy* 15, no. 2 (April 2015): 267–86, https://doi.org/10.1353/pla.2015.0020; Luciano Floridi, "LIS As Applied Philosophy of Information: A Reappraisal," *Library Trends* 52, no. 3 (2004).

reorientation of HII theory moved away from this concept, offering what Fyffe (2015) deems as: "an important conceptual foundation for our emerging understanding of what is often called 'knowledge as a commons."[70] This theory provides a foundation from which the study of HII has come to be developed. The complexity of this area of study is not simply derived from the very nature of variation in the way each individual 'experiences' information but also its existence as a meta-field. If we are to take the widest definition of "information," it is not hard to see how interaction with information occurs in all areas of life at different levels and across many disciplines. HII as a subject is, itself approached from many different perspectives, the field from which it is approached offering a different framework, terminology, and interpretations of the significant theories.[71] In order to assign structure to ontological analysis between human and information, a level of conceptual modeling is required.[72] This can not only be found in literature across libraries, archives, and museums, but functions as a meta field across academic disciplines of all natures today.[73]

Interpretation techniques within the context of the museum environment have been a popular area of research in museum studies since the 90s. Work such as Nikonanou and Venieri (2017) and Gonzalez-Sanz, Feliu-Torruella, and Cardona-Gomez, (2017) detail the approaches which can be taken to encourage information transfer, focusing mainly on how the museum can

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[70] Fyffe, "The Value of Information." Pp.268
[71] T.D. Wilson, "Models in Informaiton Behaviour Research," *Journal of Documentation* 33, no. 4 (1999): 249–70; T.D. Wilson, "Human Information Behavior," *Informing Science* 3, no. 2 (2000): 49–56.
[72] Parsons and Sedig, "Adjustable Properties of Visual Representations."
[73] Markus Knauff and Ann G. Wolf, "Complex Cognition: The Science of Human Reasoning, Problem-Solving, and Decision-Making," *Cognitive Processing* 11, no. 2 (May 1, 2010): 99–102, https://doi.org/10.1007/s10339-010-0362-z; Parsons and Sedig, "Adjustable Properties of Visual Representations"; Ute Schmid et al., "The Challenge of Complexity for Cognitive Systems," *Cognitive Systems Research*, Special Issue on Complex Cognition, 12, no. 3 (September 1, 2011): 211–18, https://doi.org/10.1016/j.cogsys.2010.12.007.

provide informative and captivating information as part of the exhibition.[74] This line of inquiry has since expanded into the realms of study such as "personal meaning-making." On examination of HII literature to date, specifically that discussing interpretation in the context of the museum, a number of similarities are evident to the study of HII in LIS.[75] Here, interpretation as a tool of communication between object and visitor is the medium through which interaction occurs. Within this interaction, personal interpretations become part of the complex cognitive processes.

When considering the physical environment as a different entity to that of the digitally created environment, different boundaries are drawn in order to facilitate accurate analysis. One of the main boundaries to the cross-discipline discussion is the terminology used. The ontological boundaries are often discussed in the literature and have presented an interesting topic of debate for a lengthy period of time, within a wide variety of contexts themselves.[76]

Museum interpretation of information is a point of convergence where the use of literature produced within the field of LIS has been beneficial within the context of the museum. It is here where museums are building upon studies in human information interaction and utilizing them in ways that can then be transferred back to the library sphere. This is a prime example of how communication between the disciplines can aid in the development of LAMs as a whole.

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[74] Niki Nikonanou and Foteini Venieri, "Interpreting Social Issues: Museum Theatre's Potential for Critical Engagement," *Museum and Society* 15, no. 1 (2017): 16–32; Myriam Gonzalez-Sanz, Maria Feliu-Torruella, and Gemma Cardona-Gomez, "Visual Thinking Strategies from the Perspective of Museum Educators: A SWOT Analysis of the Practical Implementation of the Method," *Universitat de Barcelona*, 2017, https://doi.org/10.4438/1988-592X-RE-2016-375-339.

[75] Parsons and Sedig, "Adjustable Properties of Visual Representations."

[76] Fisher, "Visual Representations and Interaction Technologies"; Tera Marie Green and Brian Fisher, "The Personal Equation of Complex Individual Cognition during Visual Interface Interaction," in *Human Aspects of Visualization*, Lecture Notes in Computer Science (Workshop on Human-Computer Interaction and Visualization, Springer, Berlin, Heidelberg, 2009), 38–57, https://doi.org/10.1007/978-3-642-19641-6_4; Joerg Meyer et al., "From Visualization to Visually Enabled Reasoning," in *Scientific Visualization: Advanced Concepts*, ed. H Hagen, vol. 1, Dagstuhl Follow-Ups (Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik, 2010), 227–45; Parsons and Sedig, "Adjustable Properties of Visual Representations."

Interpretation is, in effect, part of the information interaction process. Dumbraveanu, Cracun, and Tudoricu (2016) discuss the role of interpretation in the cognitive process of interacting with information. This study deals with the process of how people interact with information, highlighting the role of interpretation as part of the interaction process. Interaction is defined here as "[…] the cognitive process underlying the composition of reality, as each person perceives it".[77]

This definition of interpretation is formulated from a cross-disciplinary point of view. Rather than focusing on interpretation as a tool, Dumbraveanu et al. (2016) combine the long-accepted theories of Freeman Tilden as an authority in the field of heritage interpretation under the current museum climate.[78] Tilden expressed the importance of personal perception decades ago, stating that 'the individual is present in his interpretation by means of coherence.' This text is now considered the cornerstone in the interpretation of any type of heritage and remains valid today.[79] Tilden stated, "Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile." [80]

The idea that interpretation is primarily a personal experience, which defines itself regardless of the information transmission channel, is strikingly similar to the studies completed by Dervin (1999) on information interaction.[81] It is easy to see the parallel lines in academic

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[77] Daniela Dumbraveanu, Ana Cracun, and Anca Tudoricu, "Principles of Interpretation, Tourism and Heritage Interpretation – the Experience of Romanian Museums," *Human Geographies – Journal of Studies and Research in Human Geographies* 10, no. 1 (2016): 51–63, https://doi.org/10.5719/hgeo.2016.101.4. pp. 59.
[78] Tilden, *Interpreting Our Heritage*.
[79] Dumbraveanu, Cracun, and Tudoricu, "Principles of Interpretation, Tourism and Heritage Interpretation – the Experience of Romanian Museums."
[80] Tilden, *Interpreting Our Heritage*.
[81] J. Keil et al., "A Digital Look at Physical Museum Exhibits: Designing Personalized Stories with Handheld Augmented Reality in Museums," in *2013 Digital Heritage International Congress (DigitalHeritage)*, vol. 2, 2013, 685–88, https://doi.org/10.1109/DigitalHeritage.2013.6744836.

thought here, and as we move through the literature in human information interaction (HII) and museum interpretation, the lines become ever more blurred.

Dumbraveanu et al. also discuss interpretation as part of a process that begins with the relation to external stimuli. This broad look at the information interaction process may have a number of professional applications if looked at as a theory outside of any one specific field. This trend in academic thought is therefore not new. In 2003, Coren stated that, "along with sensation, perception, and representation, interpretation too is an important step in processing information as part of the communication process."[82]

Processing information is reliant on a number of factors that impact upon interpretation. External stimuli, namely the environment in which the information is presented, and personal perception of the information, impact upon how the information is interpreted or 'translated' by each individual.[83] Dumbraveanu et al. developed Coren's concept, postulating that in order for the interpretation process to take place, three important segments are required: first is the "Addresser," secondly, the material subject to interpretation (text, object, etc.), and finally, the "Recipient." It is easy to see how this applies to the interpretation of heritage or within the concept of the museum exhibition; however, on closer inspection, this concept can be seen to apply to the engagement found in libraries. Take, for example, the role of the reference librarian: if we view the role of the librarian as the addressor, the information being presented as the subject, and the library user as the recipient, it is easy to see the correlation. The reference librarian, in this case, is addressing the issue or information need of the user, providing them with a solution to this problem; the user who

[82] Stanley Coren, "Sensation and Perception," in *Handbook of Psychology* (John Wiley & Sons, Inc., 2003), https://doi.org/10.1002/0471264385.wei0105.
[83] Dumbraveanu, Cracun, and Tudoricu, "Principles of Interpretation, Tourism and Heritage Interpretation – the Experience of Romanian Museums."

has presented with the information need receives this information much in the same way as a museum visitor does when engaging with an exhibition.[84] There may be a level of mediation involved in this transfer of information, and there will be a number of different levels of interpretation involved in the transfer.

A holistic approach is often taken in the reference process: information is not just handed over on request, but the need of the user is addressed, and information is communicated and mediated in order to ensure complete use and understanding. This concept is reflected within the interpretive approach taken by museums as articulated by Dumbraveanu et al., "[the] human mind does not process all the information received from the outside, instead it makes a selection, depending on the individual's personal motivations." [85]

This fundamental principle that interpretation is fluid and available to everybody is one of the elements in museum interpretation that is played upon frequently in order to trigger a connective response.[86] The concept of interpretation itself takes on additional features and has special importance when the intention behind it is to trigger certain attitudes or states among those receiving the message.[87] In order to understand, memorize and critically analyze a received message, the visitor or user must feel involved, so that the information provided complements the experience and knowledge which the visitor already holds. Visitors do not want to "listen to

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[84] Marty, "Meeting User Needs in the Modern Museum."
[85] Dumbraveanu, Cracun, and Tudoricu, "Principles of Interpretation, Tourism and Heritage Interpretation – the Experience of Romanian Museums." Pp 60.
[86] Fisher, "Visual Representations and Interaction Technologies"; Gunther Kress and Staffan Selander, "Introduction to the Special Issue on Museum Identities, Exhibition Designs and Visitors' Meaning-Making," *Designs for Learning* 5, no. 1–2 (December 1, 2012), https://doi.org/10.2478/dfl-2014-0001; A. Mckay, "Affective Communication: Towards the Personalisation of a Museum Exhibition," *CoDesign* 3, no. sup1 (January 1, 2007): 163–73, https://doi.org/10.1080/15710880701333183; Meyer et al., "From Visualization to Visually Enabled Reasoning."
[87] Dumbraveanu, Cracun, and Tudoricu, "Principles of Interpretation, Tourism and Heritage Interpretation – the Experience of Romanian Museums."

words"; they want to be "spoken with."[88] This is evident in modern museum exhibitions and heritage interpretation, and is another point of convergence between the library field and that of museums. This long-respected theory can be applied to the practice of library instruction and the way in which best practice in the library field is presented, engaging with the user and aiding them in their own discovery of information, whether that be information literacy instruction, digital literacy instruction or finding out more about a particular author; just as the holistic nature of the reference interview can aid in developing the museum experience.

The process of interacting with information may be individual, but it is a point of consistency between the LAM fields, which is clearly evidenced in the literature. This is an interesting and potentially impactful opportunity for LAMs to engage and collaborate within the education of future professionals, preparing them with the cross disciplinary knowledge that can be transferred, and shared across these fields to mutual advantage. This is particularly valid as we move toward a more substantial and sustainable digital presence. The removal of barriers created by physicality can be mitigated against, and movement toward a new view of the museum as providing a service to the public can be built upon. If preservation of information (both digitally and in physical form) is seen as the underlying purpose of LAMs, then facilitating interaction with that information is the public service that justifies the preservation.[89]

[88] Tilden, *Interpreting Our Heritage*. Pp 12.
[89] Fyffe, "The Value of Information."

2.4 Affect Theory, HII, and Information Behavior

Within the intersection of LIS and Museum Studies literature, *Affect Theory* presents a specific incidence that is of particular relevance to display techniques, which will be examined within this study. Here literature relating to affective experiences in both museum and HII literature will be analyzed, providing both justification and a basis for the following methodology. Literature in both fields has begun to appear more frequently, coinciding with the rising interest in the use of VR and AR technology as a display medium. Gregory and Witcomb discuss Chrakrabarty's 2002 argument that "traditional ways of producing and disseminating knowledge are no longer sufficient to equip contemporary citizens."[90] The ability of the Social History Museum (SHM) to influence social change through personal connections to the past, relies on forming connections between the visitor and the information in meaningful ways.[91] Gregory and Witcomb argue that "emotional responses open up possibilities for interpretation that engage with the politics of representation and identity formation," providing a justification for increased affective responses to historical events.[92] This concept is developed from Chakrabarty's claim that "embodied forms of knowledge production apprehended by the senses rather than through analytical processes that we need to understand."[93]

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[90] Andrea Witcomb, "Understanding the Role of Affect in Producing a Critical Pedagogy for History Museums," *Museum Management and Curatorship* 28, no. 3 (August 1, 2013): 255–71, https://doi.org/10.1080/09647775.2013.807998; D Chakrabarty, "Museums in Late Democracies" IX, no. 1 (2002): 5–12.
[91] Eddie Harmon-Jones and Judson Mills, "An Introduction to Cognitive Dissonance Theory and an Overview of Current Perspectives on the Theory," in *Cognitive Dissonance: Reexamining a Pivotal Theory in Psychology, 2nd Ed* (Washington, DC, US: American Psychological Association, 2019), 3–24, https://doi.org/10.1037/0000135-001.
[92] Witcomb, "Understanding the Role of Affect in Producing a Critical Pedagogy for History Museums."
[93] Chakrabarty, "Museums in Late Democracies."

These ideas are reflected in Golding's 2013 work, "museums, poetics and affect," which begins to examine Affective practice in SH museums by drawing on Blanchard's 1994 work, stating that the notion of poetics as "an imaginative 'awakening' that the 'exuberance and depth of a poem' may bring about in audience" is useful in developing an understanding of Affective design in this environment.[94]

Golding provides a feminist lens in her description of Affect in the SHM environment, including examples of how this theory is reflected and built upon in a practical museum space through the display of SH. The case studies chosen by Golding deal with difficult topics and challenge traditional power structures within both the SHM and society; however, the personal experience is somewhat neglected, presenting a rather reductive analysis of this phenomenon.

Within the field of human information interaction, the study of affect theory is comparatively new. In 2014, Lyn Robinson proposed that Affect in HII needed to be looked at more closely, as the need for a new set of digital literacy skills was becoming normalized in information behaviors with the development of new technologies.[95] There is a word missing in this sentence; it is ungrammatical as it currently reads: This statement supports the relevance of affect theory within both fields, the role of emotion and connection in interaction with information are provided as a means to support the implementation of both VR and AR technology in SH displays. However, how this alters when dealing with more sensitive topics must be more closely evaluated to ensure that the trauma of the witness or victim will not be transferred to the visitor.

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[94] Annemaree Lloyd, "Information Literacy Landscapes: An Emerging Picture," *Journal of Documentation* 62, no. 5 (September 1, 2006): 570–83, https://doi.org/10.1108/00220410610688723.
[95] Lyn Robinson, "Multisensory, Pervasive, Immersive: Towards a New Generation of Documents," *Journal of the Association for Information Science and Technology* 66, no. 8 (n.d.): 1734–37, https://doi.org/10.1002/asi.23328.

2.5 The Lived Past in Digital and Physical Environments

Social History is defined here as history which focuses on the social, economic, and cultural institutions of people. Working from Samuel's 1985 interpretation, this definition will deal with representations of the "human face of the past" within the museum environment.[96] This includes but is not limited to exhibitions dealing with past events, trends, relationships, rituals, and examples of daily life. These elements of history cannot be fully represented by physical objects, as many of the intricacies of human social interaction fall under the umbrella of intangible heritage.

The interpretation that surrounds the object on display has become increasingly more important to the representation of the past.[97] Given the intangible nature of the human experience, considerable development of interpretation in SH displays has led to immersive exhibitions and environments of all kinds.[98] Visitor responses and levels of engagement are largely articulated through the concept of meaning-making.[99] This, along with the collection of oral histories, has impacted the way in which curators approach the development of displays.[100] As displays have moved past the idea of simple descriptive interpretation and more towards contextual story-based presentation, the idea of the SH exhibition has become more of an *experience* surrounding a display than a display focusing solely on an object. Much of SH is found not in the artifact but in the stories

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[96] Raphael Samuel, "What Is Social History?" History Today, 1985, https://www.historytoday.com/raphael-samuel/what-social-history.

[97] David Raymond Bell, "Aesthetic Encounters and Learning in the Museum," *Educational Philosophy and Theory* 49, no. 8 (July 3, 2017): 776–87, https://doi.org/10.1080/00131857.2016.1214899.

[98] Kali Tzortzi, "Museum Architectures for Embodied Experience," *Museum Management and Curatorship* 32, no. 5 (October 20, 2017): 491–508, https://doi.org/10.1080/09647775.2017.1367258.

[99] Silverman (1995) describes the process of meaning-making in the museum as visitors making meaning "through a constant process of remembering and connecting. As educational theory has long purported, both perception and learning hinge upon the accommodation of new information into existing mental structures and frameworks. In museums, people attempt to place what they encounter - be it text, object, fact, perspective - within the context of their experience."

[100] Lois H. Silverman, "Visitor Meaning-Making in Museums for a New Age," *Curator: The Museum Journal* 38, no. 3 (1995).

surrounding its creation, use, and the meaning placed on it by the owner or community.[101] Communicating these aspects leads to a contextual display, containing many different elements and built with the intention of drawing upon the visitor's own memory and experience; [A noun is needed here, or the preceding semi-colon should be omitted and replaced with a comma] bridging the gap between information need and satisfaction in order to cement new knowledge.[102]

The idea of providing context within the display of SH is not new. The past two decades have seen a steady rise in the expansion of techniques that represent these principles, but the acknowledgment of the need for more developed displays can be traced back to the 1970s. The first newsletter produced by the Social History Curators Group (SCHG)[103] discussed the collection, preservation, and display of oral histories as early as 1975.[104] A number of methods have been employed (many of which make use of earlier audio-visual technologies) with the aim of representing and communicating these stories, providing a personal lens through which the visitor can begin to connect.

Other methods of satisfying the unique needs of SH representation are first-person interpretation or real-life enactments. These are often used in conjunction with intentional manipulations of the environment, such as lighting, temperature, and even the addition of specific

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[101] Federica Dal Falco and Stavros Vassos, "Museum Experience Design: A Modern Storytelling Methodology," *The Design Journal* 20, no. sup1 (July 28, 2017): S3975–83, https://doi.org/10.1080/14606925.2017.1352900; H. Graf et al., "A Contextualized Educational Museum Experience Connecting Objects, Places and Themes through Mobile Virtual Museums," in *2015 Digital Heritage*, vol. 1, 2015, 337–40, https://doi.org/10.1109/DigitalHeritage.2015.7413896.

[102] Silverman, "Visitor Meaning-Making in Museums for a New Age"; Marty, "Meeting User Needs in the Modern Museum"; Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design."

[103] SHCG was formed to improve the status and provision of social history in museums and the standards of collections, research, display and interpretation. The newsletter has since become a well-respected professional journal, providing professional guidance and a space for communication between professional social history curators.

[104] J.G. Jenkins, "Newsletter 1," *Social History Curators Group* 1, no. 1 (1975), http://www.shcg.org.uk/domains/shcg.org.uk/local/media/downloads/journal/Journal%20001.pdf.

smells and sounds as a means to communicate intangible information.[105] The aim of these techniques is to provide an adaptable, interactive, and immersive medium that has the potential to promote meaning-making to as diverse an audience as possible while keeping the experience engaging and fun.[106]

A major disadvantage of this approach is the requirement to alter the physical site in some way. Whether it is a recreation of an entire environment in situ (as in the case of Beamish Open-Air Museum),[107] minor preservation and restoration of a site (as seen at the National Justice Museum),[108] or a full restoration (in the case of Colonial Williamsburg),[109] this approach is largely dependent on maintaining a level of the physical environment which is connected to the past which it is representing. The development and use of artificial digital environments may provide an opportunity for this immersive and interactive experience to be created without the need for a physical environment, providing opportunities for exhibitions to be updated and moved on a more manageable scale. An example of this is the virtual world of Caen.[110] Caen is an authentic 3D representation of the Scottish town in the 1800s, depicting daily life at the time, allowing visitors to explore both the time and area. Timespan describes the experience as "the first virtual world with historical content, accessible in a cultural context in the UK."[111] This early example of virtual

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[105] David B. Allison, *Living History: Effective Costumed Interpretation and Enactment at Museums and Historic Sites* (Rowman & Littlefield, 2016).
[106] Silverman, "Visitor Meaning-Making in Museums for a New Age"; Susan A Crane, "Memory, Distortion, and History in the Museum," *History and Theory: Studies in the Philosophy of History* 36 (2002): 44–63; Urban, "A Second Life for Your Museum."
[107] "Beamish Open Air Museum, Durham, UK," Beamish, accessed June 22, 2022, https://www.beamish.org.uk/.
[108] "National Justice Museum, Nottingham, UK," National Justice Museum, accessed June 22, 2022, https://www.nationaljusticemuseum.org.uk/.
[109] "Colonial Williamsburg | The World's Largest Living History Museum," accessed June 22, 2022, https://www.colonialwilliamsburg.org/.
[110] J. McCaffery et al., "The Virtual Museums of Caen: A Case Study on Modes of Representation of Digital Historical Content," in *2015 Digital Heritage*, vol. 2, 2015, 541–48, https://doi.org/10.1109/DigitalHeritage.2015.7419571.
[111] "Virtual Reconstruction of Caen · Timespan: Virtual Museum · Open Virtual Worlds," accessed June 27, 2022, http://openvirtualworlds.org/omeka/exhibits/show/timespan-virtual-museum/virtual-reconstruction-caen.

reconstruction is a great example of how historical information can be used to develop educational content for virtual worlds, providing a new way for people to access and engage with historical information.[112]

The way in which social issues are represented through a combination of story and physicality in the context of the museum environment is demonstrated exceptionally at Jorvik Viking center. Jorvik focuses specifically on the "rich Viking heritage" of the city of York in the UK.[113] Beginning with an archeological dig in 1984, Jorvik has been continually updated and developed to provide a historically accurate experience representative of the area at the time of Viking occupation. Here all elements necessary for the interpretation of information (as outlined by Tilden, 1957) are considered.[114] Sight, smell, sound, touch, and taste are all accounted for during this experience in order to communicate real life at this time. As further discoveries are made, these experiences are adapted and expanded upon.[115] Every aspect of this experience provides information that helps to build a picture of a time, place, and event in the visitor's mind. Each person will experience this differently, but the same senses help to build this personal meaning. Multisensory perception is discussed by Tilden when detailing the procedure of processing information.[116]

This discussion is ongoing: Nikonanou and Venieri (2017) and Gonzalez-Sanz, Feliu-Torruella, and Cardona-Gomez, (2017) detail the variety of approaches that can be taken to encourage information transfer, focusing mainly on how the SHM can provide informative and

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[112] "Virtual Reconstruction of Caen · Timespan: Virtual Museum · Open Virtual Worlds."
[113] "JORVIK Story," JORVIK Viking Centre, accessed April 9, 2018, https://www.jorvikvikingcentre.co.uk/about/jorvik-story/.
[114] Tilden, *Interpreting Our Heritage*.
[115] "JORVIK Story."
[116] Tilden, *Interpreting Our Heritage*.

captivating information as part of the exhibition.[117]Interpretation as a tool of communication between object and visitor is the medium through which meaning-making occurs.[118] Within this interaction, personal interpretations become part of the complex cognitive processes which encompass many of our senses.[119]

The sensory elements of information processing have presented interesting challenges in the development of artificial environments. Chalmers (2017) discussed the extent to which current technology can replicate these visceral influences, providing insight into the requirements of "Real Virtuality."[120]

One of the main issues, which is a continuing topic of conversation regarding contextualized spaces that hope to represent SH, is the risk of sensationalist interpretation and representation.[121] The grey line between factual representation, recreation, and an over-dramatization of events and times can easily be crossed when reinserting information lost in traditional object-focused displays. Sensationalism can lead to inaccurate information being transferred to the visitor, which, despite often increasing foot traffic to the museum's site, works against the purpose of informal education.[122]

This is perhaps most seen in SH museums that provide first-person interpretation as a method of communicating context to the visitor and can be closely linked to ethical considerations

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[117] Parsons and Sedig, "Adjustable Properties of Visual Representations"; Nikonanou and Venieri, "Interpreting Social Issues"; Gonzalez-Sanz, Feliu-Torruella, and Cardona-Gomez, "Visual Thinking Strategies from the Perspective of Museum Educators: A SWOT Analysis of the Practical Implementation of the Method."
[118] Marty, "The Changing Nature of Information Work in Museums."
[119] Alan Chalmers, "Experiencing the Multisensory Past," in *Mixed Reality and Gamification for Cultural Heritage* (Springer, Cham, 2017), 359–70, https://doi.org/10.1007/978-3-319-49607-8_14.
[120] Chalmers.
[121] Gazi, "Exhibition Ethics - An Overview of Major Issues."
[122] Jonathan Amakawa and Jonathan Westin, "New Philadelphia: Using Augmented Reality to Interpret Slavery and Reconstruction Era Historical Sites," *International Journal of Heritage Studies* 24, no. 3 (March 16, 2018): 315–31, https://doi.org/10.1080/13527258.2017.1378909.

regarding the use of replicas within the display of SH.[123] Using a copy rather than the original object has been a point of discussion in relation to both visitor experience and preservation. The ability to keep the original, valuable artifact safe and protected in a SHM store, while a replica, made in the same fashion, often with the same tools and materials, is available to view by the public The continued discussion surrounding the use of replicas in SH displays carries forward into the digital space. Here the debate seems to favor the use of digital replicas, making the distinction between a digital representation and a physical replica. In the digital space, there is no need to state that the object is not original, as, through a digital medium, this is already presumed by the visitor.[124]

2.6 Augmented Reality: Playing with the past

Wojciechowski, Walczak, White, and Cellary (2004) define Augmented Reality (AR) as a technology which "allows SHM visitors to interact with the content in an intuitive and exciting manner."[125] This is expanded upon by Ding (2017) as: "a technology that imposes layers of virtual content on the real environment, enables a smartphone or tablet user to aim the device at a designated point and watch a still scene come into life."[126] The ability to impose virtual content on the real environment presents interesting opportunities for curators to develop interactive

[123] Amakawa and Westin.
[124] Mark T. Marshall et al., "Using Tangible Smart Replicas As Controls for an Interactive Museum Exhibition," in *Proceedings of the TEI '16: Tenth International Conference on Tangible, Embedded, and Embodied Interaction*, TEI '16 (New York, NY, USA: ACM, 2016), 159–67, https://doi.org/10.1145/2839462.2839493.
[125] Rafal Wojciechowski et al., "Building Virtual and Augmented Reality Museum Exhibitions," Web3D '04 (New York, NY, USA: ACM, 2004), 135–44, https://doi.org/10.1145/985040.985060.
[126] Ding, "Augmented Reality in Museums."

options for visitors. The use of AR can increase engagement and spark the senses in a way that aids in information transfer and allows for meaning-making to be encouraged in a more adaptable and personal manner.[127]

AR provides the visitor a means to explore artifacts in more detail, removing limitations of traditional exhibitions, which provide no option to manipulate the experience, increasing the level of personalization within the exhibition medium. The 2015 "Trendswatch" Report refers to this as "digitally mediated personalization and personalized learning," claiming that these are two globally prominent trends in SHM.[128] This can also be seen within current research, which focuses on the capabilities of AR, the impact AR has on the exhibition experience for the visitor, and the benefits and limitations of using AR in the process of transferring, retaining, and interpreting the displayed information. [129]

According to "Trendswatch" (2015), "a majority of museums with over 50,000 on-site visitors are using new mobile-only technology."[130] Applying AR in this manner "can provide supplemental information about an exhibit or the SHM itself; or as a personalized mobile guide through the museum collection or gallery spaces."[131] The ability to add additional levels of

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[127] Timothy Jung et al., "Effects of Virtual Reality and Augmented Reality on Visitor Experiences in Museum," in *Information and Communication Technologies in Tourism 2016* (Springer, Cham, 2016), 621–35, https://doi.org/10.1007/978-3-319-28231-2_45.
[128] American Alliance of Museums, *Trendswatch 2015: Center for the Future of Museums* (Place of publication not identified: American Alliance of Museums, 2015).
[129] Chia-Yen Chen, Bao Rong Chang, and Po-Sen Huang, "Multimedia Augmented Reality Information System for Museum Guidance," *Personal and Ubiquitous Computing* 18, no. 2 (February 1, 2014): 315–22,; J. M. Darling et al., "Enhancing the Digital Heritage Experience from Field to Museum: User-Centered System Design of an Augmented Reality Tablet Application for Cultural Heritage," in *2013 Digital Heritage International Congress (DigitalHeritage)*, vol. 1, 2013, 453–453, https://doi.org/10.1109/DigitalHeritage.2013.6743782; Eleanor E Cranmer, M. Claudia tom Dieck, and Timothy Jung, "How Can Tourist Attractions Profit from Augmented Reality?," in *Augmenting Reality in Museums with Interactive Virtual Models*, ed. Timothy Jung and M. Claudia tom Dieck, Progress in IS (Springer, Cham, 2018), 21–32; Namho Chung, Heejeong Han, and Youhee Joun, "Tourists' Intention to Visit a Destination," *Comput. Hum. Behav.* 50, no. C (September 2015): 588–599, https://doi.org/10.1016/j.chb.2015.02.068.
[130] American Alliance of Museums, *Trendswatch 2015*.
[131] American Alliance of Museums.

information provides an avenue for educational engagement, both in terms of moving through a historical place or event and providing information on professional practice. AR has the potential to spark the imagination, encourage observations, and initiate conversations between visitors, bringing a surprising level of value to the SHMs educational programming.[132]

The impact that AR can have on education is possibly one of its greatest benefits to the SHM. The use of AR in education highlights its ability to provide gateways to the formation of new knowledge in people holding a wide range of prior knowledge, literacy levels, and cultural capital. The concept of cultural capital is well known in museum studies and has been developed since Pierre Bourdieu's pioneering visitor-focused research in the 1960s.[133] Despite being revisited by a number of different scholars since its initial publication, the basic concepts which Bourdieu outlines have remained fundamentally unchanged. The inter-generational transmission of knowledge provides a framework within which the visitor situates themselves. This framework, or level of personal awareness, is the bias that the visitor brings with them to the SHM. Designing interpretation that can reach across these socially constructed identities and boundaries has been an ongoing challenge for the SHM professional. These levels of cultural capital function on a scale and can be mapped to levels of comfort in the museum environment and informal learning environments. When looking at AR as an educational tool that has the ability to reach across these boundaries, it is useful to visit research produced by the field of education.[134]

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[132] Crane, "Memory, Distortion, and History in the Museum"; American Alliance of Museums, *Trendswatch 2015*.
[133] Gordon Fyfe and Keele University, "Reproductions, Cultural Capital and Museums: Aspects of the Culture of Copies," *Museum and Society* 2, no. 1 (2004): 21.
[134] [Formmatting is highlighting Footnote 118 for some reason] A Tesolin and A Tsinakos, "Opening Real Doors: Strategies for Using Mobile Augmented Reality to Create Inclusive Distance Education for Learners with Different-Abilities.," in *Mobile and Ubiquitous Learning. Perspectives on Rethinking and Reforming Education.*, ed. S Yu, M Ally, and A Tsinakos (Springer, Singapore, 2018), 59–80.

As the SHM aims to reach a wide demographic of visitors and provide an informal learning environment that is engaging and informative, it is those visitors who may struggle to connect themselves with the social concepts, events, and frameworks that are displayed that could benefit the most from the use of new technologies. Despite the problematic elements which arise within the concept of cultural capital, this theory provides a lens through which the benefits of AR can be assessed. Working from Bourdieu's outline of this concept, museum visitors who hold a lower level of cultural capital can benefit from the additional information access that AR can offer. Tesolin and Tsinakos's 2018 study showed the benefits of AR in inclusive education. This study focuses on learners with different abilities and provides useful information on the ways in which AR can provide a more accessible and inclusive environment for interaction with difficult information, one which promotes the growth of knowledge through experience.[135] AR was seen to increase interactions between peers, encouraging discourse surrounding the topics which were being presented.[136] The concept of person-to-person interactions while present in the SHM is a primary area of discussion which feeds back to the idea of inter-generational information transfer.[137] Other benefits discovered during this study were the ability of AR to increase the presence of contextual learning and heighten learner motivation.

> *The real environment that makes the content and concepts authentic and relevant and the virtual information that can grab the learner's attention are [M]AR features that increase learning motivation. [M]AR increases interaction with the subject as it contextualizes concepts.*[138]

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[135] Tesolin and Tsinakos.
[136] Tesolin and Tsinakos.
[137] Angelina Russo, Jerry Watkins, and Susan Groundwater-Smith, "The Impact of Social Media on Informal Learning in Museums," *Educational Media International* 46, no. 2 (June 1, 2009): 153–66, https://doi.org/10.1080/09523980902933532.
[138] Tesolin and Tsinakos (p. 70). NOTE: MAR is defined by Tesolin and Tsinakos as: "Mixed Augmented Reality."

Motivating visitor engagement is an opportunity to enhance the educational relevance of display. This moves far beyond a gimmick used as part of a marketing strategy to draw in visitors to the SHM. This is supported by previous studies in the field of education as well as recent studies focusing on the amount of time visitors spend at a display and how they move through the museum exhibition.[139] Overall, AR as a means of display is adaptive, attractive, and advantageous to the professional aims of the SH museum.

2.7 Virtual Reality: Live the past

> *VR has the potential to support incredibly complex narratives, tailored to promote complex viewer interactions. Put simply, users feel they are present in VR; they are dropped right into a scene, as if they were part of the story. Immersion and presence are terms used to describe an experience in which the line between reality and imagination is blurred.*[140]

Where AR provides a means to apply an additional layer of information onto the physical SHM display, VR allows for the development of artificial worlds through the use of digitally rendered images. Artificial environments created through the use of VR are experienced through multisensory stimuli.[141] VR is often used as an umbrella term that encompasses all types of

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[139] Seyyed Hadi Hashemi and Jaap Kamps, "Skip or Stay: Users' Behavior in Dealing with Onsite Information Interaction Crowd-Bias," in *Proceedings of the 2017 Conference on Conference Human Information Interaction and Retrieval*, CHIIR '17 (New York, NY, USA: ACM, 2017), 389–92, https://doi.org/10.1145/3020165.3022160; Marilena Alivizatou-Barakou et al., "Intangible Cultural Heritage and New Technologies: Challenges and Opportunities for Cultural Preservation and Development," in *Mixed Reality and Gamification for Cultural Heritage* (Springer, Cham, 2017), 129–58, https://doi.org/10.1007/978-3-319-49607-8_5.

[140] Donghee Shin, "Empathy and Embodied Experience in Virtual Environment: To What Extent Can Virtual Reality Stimulate Empathy and Embodied Experience?" *Computers in Human Behavior* 78 (2018) p.65: 64–73, https://doi.org/10.1016/j.chb.2017.09.012.

[141] Chalmers, "Experiencing the Multisensory Past."

immersive experiences; for the purposes of the present analysis, a narrower definition will be taken. Kerrebrock, Brengman, and Willems' 2017 definition will therefore be used here as it provides concise boundaries which discern between VR and AR displays.

> *Virtual Reality technology provides a computer-mediated environment in which the user feels a sense of presence and which has the ability to engage the human senses including vision and hearing, but also kinematic and proprioception experiences.* [142]

The theory surrounding the use of VR in SHM displays focuses on its ability to provide an immersive environment that allows the visitor to participate in experiencing knowledge. This can be seen across the fields of Visitor Studies, HCI, Education, and Museum Studies.[143] Dealing with the opportunities which this technology provides in the educational context of the museum environment requires these studies to be approached from the viewpoint of case studies, representative of the technology.

Studies in the field of education have shown that VR environments are more successful in developing memorable experiences, emphasizing that "VR environments could create more memorable learning environments compared to other […] environments."[144] This notion provides clear benefits to the SHM in both attracting visitors and supporting learning. It has also been found

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[142] Helena Van Kerrebroeck, Malaika Brengman, and Kim Willems, "Escaping the Crowd: An Experimental Study on the Impact of a Virtual Reality Experience in a Shopping Mall," *Computers in Human Behavior* 77 (December 2017): 437–50, https://doi.org/10.1016/j.chb.2017.07.019.
[143] Guy Peter Schofield et al., "Viking VR: Designing a Virtual Reality Experience for a Museum," n.d., 12; Van Kerrebroeck, Brengman, and Willems, "Escaping the Crowd"; Shin, "Empathy and Embodied Experience in Virtual Environment"; Chairi Kiourt, Anestis Koutsoudis, and Dimitris Kalles, "Enhanced Virtual Reality Experience in Personalised Virtual Museums," *International Journal of Computational Methods in Heritage Science (IJCMHS)* 2, no. 1 (January 1, 2018): 23–39, https://doi.org/10.4018/IJCMHS.2018010103; Gürkan Yildirim, Mehmet Elban, and Serkan Yildirim, "Analysis of Use of Virtual Reality Technologies in History Education: A Case Study," *Asian Journal of Education and Training* 4, no. 2 (2018): 62–69.
[144] Yildirim, Elban, and Yildirim, "Analysis of Use of Virtual Reality Technologies in History Education."

that VR environments are more "enjoyable and interesting," consequently leading to a heightened motivation to engage with the medium and, therefore, the information disseminated through it.[145]

The ability to offer a greater sense of immersion which includes multi-stimuli influencers, not only has the novelty factor that attracts visitors to the SHM but also has the ability to communicate intangible factors and provide contextualized information. Immersion has been shown to increase engagement just as interactivity does in the case of AR displays. With VR, immersion goes hand-in-hand with interactivity. The interactive component here is derived from the visitor's ability to move around a digitally created replica of a historical space, providing the same control and autonomy over experience as AR but in a more fluid and stimulating environment.

Immersion has been discussed from a positive stance, highlighting the benefits of its use in the display of SH. This, although very beneficial and vital to a holistic representation of the past, comes with its own hurdles. The ability to connect the visitor with the person lies not only in building on a current knowledge set but in drawing upon personal experiences. In order to evoke meaning-making through the process of sense-making, the emotional aspect of an immersive environment must be considered.[146] This is particularly prevalent in a VR environment as the current limitations on representations and re-enactments are removed.

> *The immersive properties of a VR story promote the perception that the story is real and live, helping to break down barriers between virtual reality and users. The findings also*

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[145] Luigi Barazzetti and Fabrizio Banfi, "Historic BIM for Mobile VR/AR Applications," in *Mixed Reality and Gamification for Cultural Heritage* (Springer, Cham, 2017), 271–90, https://doi.org/10.1007/978-3-319-49607-8_10; Grenier, "All Work and No Play Makes for a Dull Museum Visitor."

[146] Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design"; Silverman, "Visitor Meaning-Making in Museums for a New Age"; Sophia Diamantopoulou, Eva Insulander, and Fredrik Lindstrand, "Making Meaning in Museum Exhibitions: Design, Agency and (Re-)Representation," *Designs for Learning* 5, no. 1–2 (December 1, 2012), https://doi.org/10.2478/dfl-2014-0002; Shin, "Empathy and Embodied Experience in Virtual Environment."

> *reveal the users' cognitive processes in the VR storytelling context, explaining the dynamic role played by immersion.*[147]

As the museum visitor can be seen to actively create their own personal VR experience based on their current understanding and attachment to the story, the emotional implications have the potential to be dramatic.[148] The process of and ability, or even intent, to instigate an empathetic response or connection is a double-edged sword. This requires the SHM to carefully consider how far removed the visitor is from the topic on display. In the case of Jorvik Viking Center, York, UK, there is such a great level of separation between visitor and history that this poses less of an issue, whereas representations of modern history may prove more troublesome.

The success of a VR display can be reliant on how technologically advanced the technology is, and the way in which the visitor can move through the different scenes. This was found when Jorvik Viking Center added a VR experience to their already immersive environment. Although it provided an additional level to the display and allowed for information which had been previously inaccessible to be communicated in a coherent manner, the "fixed-viewpoint" approach lacked the desired level of interactivity. This limited how the objects represented through this medium could be experienced. This reflection on the practical application of VR for the display of SH highlights a challenge faced in the development of this environment which could have a great impact on meaning-making through this medium.

The replication of self within the VR environment is a hurdle which must be addressed in order to develop truly immersive environments which are inclusive to a wide demographic. The ability of the visitor to look down and recognize their 'own' legs and arms reaffirms their feeling

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[147] Shin, "Empathy and Embodied Experience in Virtual Environment."
[148] Shin.

of being present in the story. Unrealistic actions and a feeling of disparity between the virtual and physical self can distract from immersion; however, this requires the developer to address not only computer-generated body movements which correspond to the visitor's but also how this manifestation might affect the narrative of the space. This necessitates considerations of gender, ethnicity, differing abilities, and intersectionality, all of which are necessary to increase the authenticity of the experience.[149]

2.8 Dark Tourism and Difficult History: Representation in the Social History Museum

Dark Tourism is defined as: "visiting places linked to genocide, assassination, incarceration, ethnic cleansing, war or disaster."[150] Former sites of punishment and incarceration have become a popular tourist experience as defunct prisons are converted into museums or heritage sites.[151] This phenomenon was examined through the lens of "dark tourism," focusing mainly on the representation of death, pain, and punishment until 2003, when Carolyn Strange and Michael Kempa highlighted the importance of the history surrounding these facets of the displays. Strange and Kempa moved away from visitor motivation to experience these pasts and towards an examination of what methods of display may be employed to best communicate these histories, within the context of society, in that time period. This effectively rehumanizes the history,

[149] Yildirim, Elban, and Yildirim, "Analysis of Use of Virtual Reality Technologies in History Education."
[150] Hannah Sampson, "Dark Tourism, Explained: Why Visitors Flock to Sites of Tragedy," Washington Post, accessed June 27, 2022, https://www.washingtonpost.com/graphics/2019/travel/dark-tourism-explainer/.
[151] Carolyn Strange and Michael Kempa, "Shades of Dark Tourism: Alcatraz and Robben Island," *Annals of Tourism Research* 30, no. 2 (April 1, 2003): 386–405, https://doi.org/10.1016/S0160-7383(02)00102-0.

presenting a less sensationalized view of the lived past, without removing space for visitors to feel emotions connected to the "darker" or more "difficult" aspects of history.[152]

> *Their stories drowned with them when they jumped into the Atlantic Ocean and avoided a life of slavery in the New World. Their stories suffocated with them in gas chambers in Auschwitz-Birkenau. Their stories evaporated with them when a madman in Oklahoma City blew them up. Their stories disintegrated with them when terrorists of a different sort flew planes into the twin towers of the World Trade Center.*[153]

Rose (2016) provides a graphic and moving representation of the practical hurdles encountered when dealing with historical representations of any type in the SHM, none more so than those of a difficult nature. As perceptions of the past often differ, there can be more than just one 'truth' which needs to be considered.[154] Not only are these stories often lost but what is collected, and preserved can feed into a recorded history that reflects power structures, and their perceived narratives. This shows how important representations of intangible heritage are, especially when present in historical realities that inform present political policy, societal reform, and accepted daily behaviors.

Representations of these largely unevidenced and even *ephemeral* stories present the curator with practical considerations which are unique to displaying the human condition.[155] Rose supports this statement by highlighting the issue of "personal memory." This concept (which has long been reflected in archival practice),[156] compares how the individual's memory is impacted by

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[152] Philip Stone, "A Dark Tourism Spectrum."
[153] Julia Rose, *Interpreting Difficult History at Museums and Historic Sites* (London, England: Rowman & Littlefield, 2016).
[154] Julia Rose, *Interpreting Difficult History at Museums and Historic Sites* (London, England: Rowman & Littlefield, 2016).
[155] Alivizatou-Barakou et al., "Intangible Cultural Heritage and New Technologies."
[156] Rose, *Interpreting Difficult History at Museums and Historic Sites*; S. Anderson, "The Construction of National Identity and the Curation of Difficult Knowledge at the Canadian Museum for Human Rights," *Museum Management and Curatorship* 33, no. 4 (July 4, 2018): 320–43, https://doi.org/10.1080/09647775.2018.1466351; Jennifer Bonnell and Roger I. Simon, "'Difficult' Exhibitions and Intimate Encounters," *Museum and Society* 5, no.

their bias and how what the individual may know as "true" may not be the reflection presented by the SHM.[157] The intangible and contested elements of history cannot be fully represented by physical objects, as many of the intricacies of historical human social interactions go unrecorded, and those *known factors* are constantly refuted due to the hierarchical structure in which they were recorded.[158]

2.9 Summary

This chapter critically analyzed and reviewed extensive literature based on the research aims and questions. Various theories were discussed and presented in order to establish an underpinning theory for this investigation. By critically appraising literature at the juncture of HII, the use of VR and AR in education, and SH representation, this review has shown that combining these theories and approaches in the analysis of interactions between visitors, and DDH information will allow for an exploration into the role, which immersive technologies may play in developing Affective exhibition content, which effectively communicates the complexities of DDH.

The creation of DDH representations deals with the same challenges as other SH displays when creating displays, such as the utilization of oral history and personal stories; however, difficult topics also present additional ethical considerations. The professional community has

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2 (2007): 65–85; Kamila Szczepanska, "Towards a 'Common' View of Difficult Past? The Representation of Atomic Bombings of Hiroshima and Nagasaki in Trilateral Teaching Materials," *Journal of Peace Education* 14, no. 1 (January 2, 2017): 114–29, https://doi.org/10.1080/17400201.2016.1269733.

[157] Crane, "Memory, Distortion, and History in the Museum."

[158] Crane.

been discussing methods of representing, displaying, and preserving the intangible heritage, and ensuring that this information is communicated in engaging ways for visitors for the last two decades.[159] These same principles apply to displaying DDH within a practical context. Despite traditional DDH exhibitions taking a more conservative approach due to the inherently challenging elements of DDH, they are, in fact, social issues that cannot be truly represented without an explanation of intangible elements. The utilization of HII theories in order to assess how these representations can provide an engaging and educational experience allows for VR and AR technology to be explored as a means for DDH representation. This review has articulated the literary framework which supports the following empirical investigation. Analysis of the data collected for this study will be completed in line with the theoretical concepts outlined above, aiming to **explore the interactions between visitors and difficult historical information to ascertain how, if at all, immersive technologies influence the way in which this information is processed.**

[159] Silverman, "Visitor Meaning-Making in Museums for a New Age"; Antón, Camarero, and Garrido, "Exploring the Experience Value of Museum Visitors as a Co-Creation Process"; Ben Booth, "Understanding the Information Needs of Visitors to Museums," *Museum Management and Curatorship* 17, no. 2 (January 1, 1998): 139–57, https://doi.org/10.1080/09647779800301702.

3.0 Methodology

3.1 Introduction and Context

The empirical investigation for this study was planned to take place early to mid-2020, a time when we were amid a global pandemic, and subject to both complete and partial lockdown conditions at various times throughout the period. As it was clear that museums would not be operating under normal conditions, it was necessary to design a methodology that could accommodate the situation. The theoretical orientation for the study was not impacted, but the design of the empirical investigation needed to respond to the context. The decision was taken to identify two case studies where VR and AR technology had been used to display difficult histories. It was also vital that these case studies had an existing repository of visitor feedback that could be accessed to enable data analysis. This was analyzed alongside the secondary data provided through interviews with museum professionals and a Key Informant interview.

The use of secondary data has long been encouraged by the scientific community; the International Science Council was formed to pursue the vision that 'Scientific knowledge, data and expertise must be universally accessible and its benefits universally shared"[160] First introduced in the mid-1950s, the Open Data movement gained considerable traction with our increased capabilities to store and share data globally. How researchers engage with secondary data has also developed, although it is still underused in Library and Information Science.[161]

[160] "About Us," *International Science Council* (blog), accessed April 12, 2022, https://council.science/about-us/.
[161] Melissa P. Johnston, "Secondary Data Analysis: A Method of Which the Time Has Come," *Qualitative and Quantitative Methods in Libraries* 3, no. 3 (May 28, 2017): 619–26.

Bowler, Julien, and Haddon[162] propose six approaches to secondary data analysis. For the purposes of this investigation, the approach taken is the first of those six proposed approaches, a "reanalysis of a data set, in which one asks new questions of the data."[163] Whiteside, Mills, and McCalman argue that "(p)erhaps most importantly, the use of secondary data reduces research obtrusiveness."[164] The two chosen case studies provided access to extensive data already collected by the exhibition producers and museum professionals. The secondary data analysis of the existing data sets was through a qualitative lens guided by and grounded in the research questions of this investigation. Although the application of Grounded Theory to secondary data analysis does bring challenges, the challenges faced by this research are discussed in this chapter. Glaser proposed the use of secondary analysis with existing qualitative data sets as a means "*to solve some typical problems faced by an independent researcher*" as early as 1963; whilst a global pandemic is by no means typical, the solution to use Grounded Theory in the analysis of data "which were originally collected for other purposes" was appropriate for this study.[165]

[162] "Exploring Youth Information-Seeking Behaviour and Mobile Technologies through a Secondary Analysis of Qualitative Data - Leanne Bowler, Heidi Julien, Leslie Haddon, 2018," accessed April 12, 2022, https://journals.sagepub.com/doi/abs/10.1177/0961000618769967.
[163] "Exploring Youth Information-Seeking Behaviour and Mobile Technologies through a Secondary Analysis of Qualitative Data - Leanne Bowler, Heidi Julien, Leslie Haddon, 2018." Pg. 323.
[164] Mary Whiteside, Jane Mills, and Janya McCalman, "Using Secondary Data for Grounded Theory Analysis," *Australian Social Work* 65, no. 4 (December 1, 2012): 504–16, https://doi.org/10.1080/0312407X.2011.645165.
[165] Barney G. Glaser, "Retreading Research Materials: The Use of Secondary Analysis by the Independent Researcher," *American Behavioral Scientist* 6, no. 10 (June 1, 1963): 11–14, https://doi.org/10.1177/000276426300601003.

3.2 Methods of Searching and Theoretical Orientation for the Study

In order to establish a theoretical framework for the investigation, previous relevant research and debate were identified. The pertinent literature for review was pinpointed within each subject area by first applying a loose framework to the study, which was developed from previous research. Relevant literature to this study exists at an intersection of education, museum studies, human information interaction, and visitor and audience studies. Beginning with PittCat+ and Google Scholar, the following sub-topics formulated the initial search*: VR, AR, Difficult history display, social history, intangible heritage, convergence, VR in education, Affect theory, and "LAMs*."

This search strategy was built upon as new literature was analyzed, allowing for a more structured theoretical framework to be constructed, highlighting gaps in current research. As difficult history representation in social history museums is currently a popular avenue of study, new literature is emerging regularly. It is therefore essential to ensure that the most recent literature within the museum studies canon is addressed in parallel with the process of data collection, leaning on the iterative nature of the literature review to inform the methodology in a flexible manner, until all data has been analyzed. Through this process, it has been possible to provide delimitations to the literature being reviewed. Within museum studies literature, only those dealing with difficult subject matters have been considered; audience and visitor studies research has been limited to those relating to museum interactions, education literature, such as those dealing with informal education settings, and studies in Human Information Interaction (HII) are included when dealing with Affect Theory and Information Behavior. This literature review provided the

theoretical sensitivity needed when engaging with both the primary and secondary data used in this study.[166]

3.3 Research Design

According to Yang, "using constructive, phenomenological, and naturalistic alternatives to the traditional empirical paradigm could provide richer, context-specific information necessary to understand the effectiveness of […] interactive media".[167] As constructivism recognizes that reality is a "product of human intelligence," it will provide a framework where both the virtual and physical environment may be evaluated as different experiences of equal value.[168] The constructivist approach to research employed for this study ensured that an iterative and responsive approach to data analysis was employed. This allowed the researcher to respond to the ongoing analysis throughout the research process.[169] When analyzing secondary data, theoretical sampling is focused around the data sources themselves, where it is "possible to move back and forth between the transcripts and to theoretically sample for emerging ideas and concepts." Although the use of secondary data in constructivist grounded theory brings challenges, it is possible to

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[166] Melanie Birks, Karen Hoare, and Jane Mills, "Grounded Theory: The FAQs," *International Journal of Qualitative Methods* 18 (January 1, 2019): 1609406919882535, https://doi.org/10.1177/1609406919882535.
[167] Shu Ching Yang, "Information Seeking as Problem-Solving Using a Qualitative Approach to Uncover the Novice Learners' Information-Seeking Processes in a Perseus Hypertext System," *Library & Information Science Research* 19, no. 1 (January 1, 1997): 71–94, https://doi.org/10.1016/S0740-8188(97)90006-2. Pp 72.
[168] David Elkind, "Response to Objectivism and Education," *The Educational Forum* 69, no. 4 (December 31, 2005): 328–34, https://doi.org/10.1080/00131720508984706.
[169] Alison Pickard and Pat Dixon, "The Applicability of Constructivist User Studies: How Can Constructivist Inquiry Inform Service Providers and Systems Designers? Constructivist Inquiry, Case Study, Systems Design, User Behaviour," text, accessed March 22, 2019, http://informationr.net/ir/9-3/paper175.html#lincoln; Yvonna Lincoln, "The Making of a Constructivist," in *The Alternative Paradim*, ed. E.G. Guba (London: Sage Publications, 1992), 67–87.

mitigate these challenges in a number of ways. Probably the most significant challenge could be seen as the extent to which the researcher can become immersed in the data and the context. In this investigation, interviews with museum professionals to understand both the purpose and nature of exhibition and the underlying goal of their primary data collection, brought the researcher closer to this context and purpose.[170]

The research questions were explored by using secondary data analysis and gathering primary data from two separate case studies where difficult histories were displayed. Allowing the researcher to gain a deeper understanding of how interactions with difficult topics in the social history museum environment are affected by the display and interpretation techniques. Insight provided by this investigation into this particular phenomenon will allow for future development of professional best practice guidelines and theoretical frameworks. The aim here was to proffer the foundations for an information behavior model which highlights the relevance of HII within the social history museum experience. Employing qualitative methods, specifically, a constructivist grounded theory approach,[171] allowed both the exhibition and information transfer medium to be analyzed, while also considering the basic defining qualities of difficult topics. This provided a discussion of what shapes this type of exhibition, rather than reflecting any one specific topic or institution. Exploring the proposed questions, this study aimed to provide insight beyond any one specific topic. Instead, focusing on how or indeed, if, methods of representation used to interpret difficult topics, change the way in which the visitor relates and interacts with the information. The two sites of study were selected as they had both represented difficult histories

[170] Whiteside, Mills, and McCalman, "Using Secondary Data for Grounded Theory Analysis."
[171] Jane Mills, Ann Bonner, and Karen Francis, "The Development of Constructivist Grounded Theory," *International Journal of Qualitative Methods* 5, no. 1 (March 1, 2006): 25–35, https://doi.org/10.1177/160940690600500103.

in technology-enhanced displays as previously defined, and had secondary data sets available for a re-focused investigation. As both exhibitions dealt with Holocaust History, representations of genocide and war within a fascist political structure were featured prevalently. It must also be considered that there are personal stories which exist within these major themes, representative of broader traumatic events. This positions the two case studies firmly within the definition of 'difficult history' provided here, as there are political, ethical, social, and personal issues presented.[172]

The results of this study provide insight into the issues and opportunities involved in HII between difficult topics and the visitor, as well as how the medium may influence these interactions. Taking a qualitative approach to this investigation allows for an open conversation to be had between curatorial staff and the researcher creating an avenue for future iterations of research into HII with difficult topics. Visitor responses provided by both curatorial staff and exhibition creators formulate the secondary data sets for analysis. A Constructivist Grounded Theory (CGT) approach was used on data collected from interviewing museum professionals and secondary survey and interview data collected and provided by the sites of study. CGT principles and procedures (iteration, constant comparison and theoretical sampling) are used to analyze and construct conceptual theoretical frameworks which will underpin professional practice guidelines for the use of VR and AR in the display of difficult histories.[173]

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[172] "What Makes Difficult History Difficult? - Magdalena H. Gross, Luke Terra, 2018," accessed April 12, 2022, https://journals.sagepub.com/doi/abs/10.1177/0031721718775680.

[173] Heidi Lauckner, Margo Paterson, and Terry Krupa, "Using Constructivist Case Study Methodology to Understand Community Development Processes: Proposed Methodological Questions to Guide the Research Process," n.d., 24; Kathy Charmaz, "'With Constructivist Grounded Theory You Can't Hide': Social Justice Research and Critical Inquiry in the Public Sphere," *Qualitative Inquiry* 26, no. 2 (February 1, 2020): 165–76, https://doi.org/10.1177/1077800419879081; Kathleen Fahy and Karey Harrison, "Constructivist Research: Methodology and Practice," ed. Gershon Tenenbaum and Marcy P. Driscoll (Oxford, U.K.: Meyer & Meyer Sport, 2005), 660–701.

3.4 Targeted Community, Sample Population and procedures

The target community is best described as the social history museum community as a whole, both professionals and visitors alike. As this study sheds light on how visitor interactions with difficult information may be impacted by the medium of information transfer, the sample selected for the study included curatorial and engagement staff, as well as visitors where secondary data sets were available for analysis. The primary data sources were comprised of a combination of feedback, unobtrusive observations, and interviews with museum professionals.

A purposive sampling method was employed in selecting exhibitions and the museum staff. This sampling technique was chosen as it allowed for the deliberate selection of case studies which satisfy the criteria of dealing with difficult and dissonant histories. As exhibition content is central to the purpose of the study, this non-random sampling technique enabled the researcher to target information-rich cases.[174] These cases provided access to visitor feedback and interviews with museum professionals. Both interviewees are research participants who can, and are, willing to provide data by virtue of knowledge and experience.[175]

> *The logic and power of purposeful sampling lies in selecting information-rich cases for study in depth. Information-rich cases are those from which one can learn a great deal*

[174] Fr Baiju Thomas, "The Role of Purposive Sampling Technique as a Tool for Informal Choices in a [check cite] Social Sciences in Research Methods," no. 5 (2022): 8; Ilker Etikan, "Comparison of Convenience Sampling and Purposive Sampling," *American Journal of Theoretical and Applied Statistics* 5, no. 1 (2016): 1, https://doi.org/10.11648/j.ajtas.20160501.11; Ilker Etikan, Sulaiman Abubakar Musa, and Rukayya Sunusi Alkassim, "How to Access Elites When Textbook Methods Fail: Challenges of Purposive Sampling and Advantages of Using Interviewees as 'Fixers'.," *American Journal of Theoretical and Applied Statistics* 5, no. 1 (2016): 1–4, https://doi.org/10.11648/j.ajtas.20160501.11.

[175] H.R Bernard, *Research Methods in Anthropology: Qualitative and Quantitative Approaches*, 3rd ed. (Walnut Creek, CA: AltaMira Press, 2002); Etikan, "Comparison of Convenience Sampling and Purposive Sampling"; Etikan, Abubakar Musa, and Alkassim, "How to Access Elites When Textbook Methods Fail: Challenges of Purposive Sampling and Advantages of Using Interviewees as 'Fixers'."

> *about issues of central importance to the purpose of the research, thus the term purposeful sampling.*[176]

Semi-structured interviews, conducted with museum staff, provided professional insight into the choices made at the point of exhibition development as well as findings which had been uncovered since installation. According to Lincoln and Guba (1985):

> *A major advantage of the interview is that it permits the respondent to move back and forth in time - to reconstruct the past, interpret the present, and predict the future, all without leaving a comfortable armchair.*[177]

Therefore, it is plausible to trust that any issues encountered would be highlighted here, and that these interviews would provide context for the visitor feedback giving the researcher "as much information as possible about the primary study so that they are familiar with the research and social context of the original study."[178] The specific instruments selected for data collection were informed by a pilot study, consisting of a Key Informant interview. This interview investigated what the most productive means of acquiring information was, taking into consideration the logistical constraints of the researcher.[179]

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[176] Michael Quinn Patton, *Qualitative Research & Evaluation Methods* (SAGE, 2002).
[177] Yvonna Lincoln and E.G. Guba, *Naturalistic Inquiry* (SAGE Publications, 1985), https://us.sagepub.com/en-us/nam/naturalistic-inquiry/book842. Cited in: Alison Jane Pickard and Susan Childs, *Research Methods in Information*, 2nd ed (Chicago: Neal-Schuman, 2013).
[178] Lorraine Andrews et al., "Classic Grounded Theory to Analyse Secondary Data: Reality and Reflections," *Grounded Theory Review* 11, no. 1 (2012), http://groundedtheoryreview.com/2012/06/01/classic-grounded-theory-to-analyse-secondary-data-reality-and-reflections/.
[179] Lincoln and Guba, *Naturalistic Inquiry*; Lauckner, Paterson, and Krupa, "Using Constructivist Case Study Methodology to Understand Community Development Processes: Proposed Methodological Questions to Guide the Research Process"; Thomas, "The Role of Purposive Sampling Technique as a Tool for Informal Choices in a Social Sciences in Research Methods."

3.5 Participant Selection

Case studies were selected to fulfill the requirements of this study. This selection criteria focused on exhibitions dealing with a difficult subject matter, as defined in the introduction. Secondly, both AR and VR must be represented in separate instances. These technologies were chosen due to their current rise in significance and use within museum professional discourse.[180] This decision was made to provide a comparison between the mediums of information transfer, consequently, providing insight into the way heightened immersion affects the visitor experience and engagement with displayed information. The final criterion for case study selection was based on the professional concerns and priorities of the researcher, selecting institutions that provided relevant data and were of similar standing within the profession at the time of data collection.

Visitor feedback was collated by both sites of study but could only be provided in its entirety by Case Study Two., Case Study One provided an interpretation of that visitor feedback through interviews with those who had collected and analyzed that data. In both instances the sites of study had employed a random method of sampling to select visitors for participation which they had done to allow for easy anonymization of that data. It is also important to state that visitor demographics play no role within this study, as the aim was to provide a comparative overview of visitor interactions within both settings, as well as a foundation for a professional standards

[180] Micheal Haley Goldman, "Holocaust Memorial Museum Uses Augmented Reality to Make History Visceral," *VentureBeat* (blog), August 31, 2018, https://venturebeat.com/2018/08/31/holocaust-memorial-museum-uses-augmented-reality-to-make-history-visceral/; Gabi Arrigoni and Areti Galani, "Recasting Witnessing in Museums: Digital Interactive Displays for Dialogic Remembering," *International Journal of Heritage Studies* 27, no. 2 (February 1, 2021): 250–64, https://doi.org/10.1080/13527258.2020.1795909; Andreea Gabriela Lupascu et al., "ARThings – Enhancing the Visitors' Experience in Museums through Collaborative AR," in *2021 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW)*, 2021, 669–70, https://doi.org/10.1109/VRW52623.2021.00217; Schofield et al., "Viking VR: Designing a Virtual Reality Experience for a Museum"; Barazzetti and Banfi, "Historic BIM for Mobile VR/AR Applications."

framework in the display of difficult histories. Specific demographic information was not taken into consideration when collecting visitor responses. This does leave room for further research to build upon this foundational study, investigating how specific demographics interactions are altered in accordance with the medium of information transfer.

3.6 Pilot Study and Key Informant Interview

As highlighted earlier, one of the key challenges of using Grounded Theory in the analysis of secondary data is that of familiarity with the context. In order to understand the data, the purpose and process of its collection and the nature of respondents, an interview was conducted to provide insight into the context. The site chosen for this pilot study was the “From Slavery to Freedom’ exhibition at Senator John Heinz History Center, Pittsburgh. The key informant at that site was Mariruth Leftwich (Ph.D.), Director of Education, Senator John Heinz History Center, in Association with the Smithsonian Institution.

This exhibition utilizes traditional methods of display with no use of VR or AR technology, to represent the history of slavery within North America. An initial appraisal of the site revealed that affect theory has been employed through the use of physical objects and life size dioramas. This site acted as an example of how the display of difficult histories can be impactful and immersive without the use of modern technologies, allowing for an assessment on whether the presence of these technologies may influence visitor responses.

This pilot study consisted of an exploration of the display and a consultation with the Key Informant. The Key Informant had previously conducted studies based on the collection of visitor

feedback in relation to their engagement with the *From Slavery to Freedom* exhibition, which is one of the case studies in this investigation. The design of her studies in visitor feedback was influenced by the lessons she had learned through her experience in this area, throughout her career. Consultation with a professional expert in this area provided valuable insight into the issues which may arise while collecting visitor feedback and it provided the researcher with a window into the context of the secondary data used here.

The consultation with Dr. Leftwich took the form of an unstructured interview with a view to guide the conversation around previous investigations into visitor behavior. Brinkmann and Kvale refer to interviews as a conversation with a structure and a purpose.,[181] Here that purpose included conversation detailing data collection methods and how useful this information was in informing further exhibition practices, as well as sharing details of any ongoing studies. Although unstructured interviews can be challenging for any researcher, having a clear focus of purpose and sufficient theoretical sensitivity as well as engaging in active listening, allow for valuable insight into the lived world of the informant.[182] This interview provided useful insight into the context of visitor feedback, how it is designed and how it is collected. This brought the researcher closer to the secondary data and provided the context and, to some extent, the internal view of visitor feedback felt by museum professionals.

[181] Svend Brinkmann and Steinar Kvale, *Doing Interviews* (1 Oliver's Yard, 55 City Road London EC1Y 1SP: SAGE Publications Ltd, 2018), https://doi.org/10.4135/9781529716665.
[182] Reuben Bihu, "Using Unstructured Interviews in Educational and Social Science Research: The Process, Opportunity and Difficulty," *Global Scientific Journals* 8, no. 10 (2020): 712–22.

3.7 Sites of Study

The research data used in this investigation was gained from two separate sites where each exhibition dealt with a difficult historical topic which falls within the parameters defined earlier. In order to allow for comparisons of different mediums of display, the sites were chosen for their differing approaches to the exhibition of difficult histories.

3.7.1 Case Study One – "Tower of Faces", Holocaust Memorial Museum, Washington, D.C.

This display features AR technology which provides additional information on the lives of Lithuanian villagers, including where they perished during the Holocaust. The aim of employing this technology is to "make Holocaust history relevant, engaging and personal for visitors, especially youth who are developing different expectations for their museum visit compared to other generations."[183] This specific example of AR technology being used to represent a difficult historical topic was chosen due to the high standing of the museum and the existence of professional research conducted by the museum on visitor responses. This provided a wealth of information which allowed for an in-depth appraisal of the exhibition and AR as a medium within this context.

- **Contact:** Director of Future Projects, United States Holocaust Memorial Museum, Washington, D.C.

[183] Goldman, "Holocaust Memorial Museum Uses Augmented Reality to Make History Visceral."

3.7.2 Case Study Two – "The Last Goodbye", Museum of Jewish Heritage, New York, New York.

The second site of study utilizes VR technology, enabling one visitor at a time to walk alongside Holocaust survivor Pinchas Gutter as he recounts his experiences in Majdanek. This allows visitors to see this experience from his personal perspective, experiencing his history along with him. As this experience is only available to one visitor at a time it provides an opportunity for a personal connection to be developed. This 20 minute "immersive virtual reality testimony experience represents unprecedented advances in storytelling through technology" and provided a unique site of study to examine how the use of VR as an exhibition medium may alter the way visitors engage with difficult topics.[184]

- **Contact:** Program Coordinator for Museum Engagement at USC Shoah Foundation

3.8 Data Collection and Methods of Analysis

During the initial planning stage of this study the aim had been to visit two case study sites and carry out primary data collection with both museum staff and visitors. The initial COVID-19 lockdown in early 2020 caused many researchers to halt all non-essential research activities.[185]

[184] "The Last Goodbye: Virtual Reality Holocaust Survivor Testimony," Museum of Jewish Heritage — A Living Memorial to the Holocaust, accessed May 19, 2019, https://mjhnyc.org/exhibitions/the-last-goodbye/.
[185] Kappel Sarah et al., "Learning from Lockdown - Assessing the Positive and Negative Experiences, and Coping Strategies of Researchers during the COVID-19 Pandemic," *Applied Animal Behaviour Science* 236 (March 1, 2021): 105269, https://doi.org/10.1016/j.applanim.2021.105269.

This disruption to research happened quickly, without advance warning, and caused many projects to be postponed entirely, or for data collection to be limited in scope.[186] These kinds of challenges have been shown to have the greatest impact on early career researchers such as PhD students, who are pressured to progress with their career development.[187] The plethora of restrictions placed on both daily and professional life during the COVID-19 lockdowns, and the aftermath, have led to a shift in data collection methods. When addressing the impact these issues have on qualitative data collection, specifically data that was intended to be collected in person, it is important to look at what remote options were available prior to the initial lockdown.[188] Data collection for this research study benefitted greatly from the reimagining of the data collection. The initial methodological approach remained as it was and by making alterations to data collection, the research questions were able to be addressed in their initial form. It was at this point that the use of secondary data analysis on visitor feedback, combined with primary data collected from interviews with museum staff, was explored as an option for this study.

Due to the restrictions put in place during the 2020 lockdown, in response to the COVID-19 pandemic, the researcher decided to alter the approach to data collection, in order to maintain the volume of data initially intended and sought. These decisions allowed for the maximum amount of information to be collected, without sacrificing the integrity of the study and research questions

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[186] Quin Denfeld et al., "COVID-19: Challenges and Lessons Learned from Early Career Investigators," *Journal of Women's Health* 29, no. 6 (June 1, 2020): 752–54, https://doi.org/10.1089/jwh.2020.8552; Jae M. Sevelius et al., "Research with Marginalized Communities: Challenges to Continuity During the COVID-19 Pandemic," *AIDS and Behavior* 24, no. 7 (July 1, 2020): 2009–12, https://doi.org/10.1007/s10461-020-02920-3.
[187] Steven W. Cranford, "I May Not Have Symptoms, but COVID-19 Is a Huge Headache," *Matter* 2, no. 5 (May 6, 2020): 1068–71, https://doi.org/10.1016/j.matt.2020.03.017; Denfeld et al., "COVID-19"; Ross L. Levine and W. Kimryn Rathmell, "COVID-19 Impact on Early Career Investigators: A Call for Action," *Nature Reviews Cancer* 20, no. 7 (July 2020): 357–58, https://doi.org/10.1038/s41568-020-0279-5; Emily Sohn, "Mental Health: Caught in a Trap," *Nature* 539, no. 7628 (November 2016): 319–21, https://doi.org/10.1038/nj7628-319a; Chris Woolston, "Pandemic Darkens Postdocs' Work and Career Hopes," *Nature* 585, no. 7824 (September 8, 2020): 309–12, https://doi.org/10.1038/d41586-020-02548-2.
[188] Denfeld et al., "COVID-19"; Sarah et al., "Learning from Lockdown - Assessing the Positive and Negative Experiences, and Coping Strategies of Researchers during the COVID-19 Pandemic."

themselves. During this reimagining of data collection techniques, additional elements were taken into consideration. The inability of the researcher to be physically present, and the lack of in-person visits to the chosen sites led to the investigation of existing data sets that would provide the insight into visitor responses needed to explore the research questions posed by this study. After consultation with staff at both case study sites it was determined that Case Study One provided the professional opinion data, and Case Study Two provided the secondary data set on visitor response.

As Case Study One, the US Holocaust Memorial Museum, had completed their own research into the implementation of AR at the *'Tower of Faces'* exhibition, arrangements were made to conduct the semi-structured interviews with the museum professionals involved with the project. Unlike the unstructured interview carried out with the Key Informant, these interviews were semi-structured with researcher guides to allow for flexibility within the conversation. It is argued that "flexibility both in designing and refining the interview guides and in actually conducting the interviews is probably the most important key to success in using this technique."[189] The primary visitor feedback data collected by USHMM was not able to be shared with the researcher directly. This was due to the privacy agreement between the museum and visitors. However, ÷ this information was able to be discussed through the aforementioned semi-structured interviews alongside observational data which was provided. Consequently, Case Study One provided the professional opinion required for a grounded theory approach.

Case Study Two centered on the exhibition created by Shoah Foundation, "*The Last Goodbye*", Museum of Jewish Heritage, New York. Rather than engaging with one site where the VR exhibition was showcased, the Shoah Foundation was contacted as the initial exhibition

[189] Joanne Horton, R. Macve, and Geert Struyven, "Qualitative Research: Experiences in Using Semi-Structured Interviews," 2004, https://doi.org/10.1016/B978-008043972-3/50022-0.

producers. The Foundation had collected data from over 2000 visitors across the US as the exhibition travelled. This greatly improved the volume of data available for analysis for this research. The questions which formulated the exit survey used by the Shoah Foundation are as follows:

1. What did the story of Pinchas Gutter make you feel? (select all that apply)
    a. Sadness
    b. Anger
    c. Inspiration
    d. Despair
    e. Hope
    f. Determination to take action
    g. Other

    Space was provided for additional comments

2. What did experiencing the story in VR format have on you? (select all that apply)
    a. Made me feel like I was visiting the site in person
    b. Helped me have a deeper understanding of the story.
    c. VR prevented me from concentrating on the story.
    d. I felt negative physical impact (dizziness, headache)
    e. I felt connected to the story of the survivor
    f. Other

    Space was provided for additional comments
3. Was the overall experience positive or negative?

a. Extremely positive

b. Somewhat positive

c. Neither positive or negative

d. Somewhat negative

e. Extremely negative

4. How likely are you to seek stories similar to the testimony of Pinchas Gutter?

    a. Extremely likely

    b. Somewhat likely

    c. Neither likely or unlikely

    d. Somewhat unlikely

    e. Extremely unlikely

5. Are you going to share your experience with others?

    a. Definitely yes

    b. Probably yes

    c. Might or might not

    d. Probably not

    e. Definitely not

6. Do you have a personal connection to the Holocaust or other genocide?

    a. Survivor

    b. Second generation survivor

    c. Third generation Survivor

    d. Fourth generation Survivor

    e. No, I don’t have a connection

f. Other

7. Please provide any other comments below.

Following the information gained from the Key Informant interview, data analysis centered around a Critical Grounded Theory (CGT) approach, employing inductive reasoning. Conclusions within this study outlined individual experiences as recognizable phenomenon occurring when visitors' interact with difficult information in the museum. The coding of the secondary data was based on the theoretical framework established earlier in the literature review. Although the use of theoretical framework is still discussed and often contested in grounded theory, Bryant & Charmaz claim it is necessary in order to "situate your work within the body of related literature".[190] An assessment was also made of how, if at all, AR and VR technologies alter these phenomena in either a negative or positive way.

Integrating case study methodology with a grounded theory approach to data analysis, under the umbrella of a constructivist research perspective, offers space for an iterative approach to the research questions.[191] Beginning with qualitative analysis of the data, a foundation for insight into the use of different display techniques within this specific context is provided. This has allowed for the exploration of "contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident."[192]

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[190] Antony Bryant and Kathy Charmaz, *The SAGE Handbook of Grounded Theory*, 2007, https://doi.org/10.4135/9781848607941. P. 123.
[191] Richard A. Swanson and Ed Holton, eds., *Research in Organizations: Foundations and Methods of Inquiry*, 1st ed (San Francisco, CA: Berrett-Koehler Publishers, 2005).
[192] Yin 2003 p.13 in: Rebecca Piekkari, Emmanuella Plakoyiannaki, and Catherine Welch, "'Good' Case Research in Industrial Marketing: Insights from Research Practice," *Industrial Marketing Management*, Case Study Research in Industrial Marketing, 39, no. 1 (January 1, 2010): 109–17, https://doi.org/10.1016/j.indmarman.2008.04.017; Lauckner, Paterson, and Krupa, "Using Constructivist Case Study Methodology to Understand Community Development Processes: Proposed Methodological Questions to Guide the Research Process."

This study focused on the rhetoric and phrasing that each participant uses within the self-reported commentary of their experience in order to gain insight into their lived experience as they themselves perceived it.[193] This is due to the importance of the individuals' expression of their experience and using self-reported data, rather than guided interviews. This approach also highlighted what stood out to the visitor, and thereby provides a means of assessment of the importance that display technique has to the visitor, alongside whether or not these immersive technologies alter interactions with information, from the visitors' perspective.[194]

3.9 The Role of the Researcher and Ethical Considerations

The sensitive nature of the information displayed has been paramount in formulating the current methodological approach to data collection. Short, simple answers are expected for the visitor response data. It is recognized that the researcher has little to no control over what data will be presented, which fits with the exploratory constructionist methodology. The role of the researcher was initially to facilitate a means for the visitor to communicate how the experience felt, and what they believe they gained on a personal level although a full appraisal of data collection methods used by the museum professionals cannot be addressed. The questions posed to visitors fall in line with the initial approach. The role of the researcher becomes slightly more involved when collecting professional opinion on the development and success of the exhibitions in question. Here, the semi-formal interview structure is employed, intending that open and

[193] Yvonna Lincoln, "Context, Lived Experience, and Qualitative Research," in *Research in Organizations: Foundations and Methods in Inquiry* (Berrett-Koehler Publishers, 2005).
[194] Robert M. Gonyea, "Self-Reported Data in Institutional Research: Review and Recommendations," *New Directions for Institutional Research* 2005, no. 127 (2005): 73–89, https://doi.org/10.1002/ir.156.

adaptive communication between the museum professional and the researcher can provide in-depth context for the visitor responses. This professional insight is invaluable when dealing with the unknown outcome of the initial data collection. Using the "human-as-instrument" approach, as detailed by Maykut and Morehouse, provided the mechanism for genuine insight into the elements which require professional level structure through policy innovation, as well as highlighting areas which demand more in-depth research. The researcher's role in data collection was to facilitate communication both directly and indirectly.[195] Major ethical concerns with this approach are both the inherent bias of the research impacting on the rhetoric (either positive or negative) within the interview scenario, as well as lack of one-on-one engagement with visitors which would provide valuable information on their personal experience. It is recognized that this particular study aims to provide a gateway and foundation for further study and present basic recommendations for professional practice which will be built upon later.

3.10 Summary

In order to address the research questions, a qualitative approach was chosen for both data collection and analysis. This decision was based around the importance of assessing information interactions with difficult histories. Topics relating to socio-politically charged topics, such as Holocaust History, demand personal experience to be considered. This consideration exists at both the point of representation and information interaction, requiring that research into this phenomenon must also include personal perspectives as data. The research design, chosen

[195] Pamela Maykut, Richard Morehouse, and Richard Morehouse, *Beginning Qualitative Research : A Philosophical and Practical Guide* (Routledge, 2002), https://doi.org/10.4324/9780203485781.

methodologies for collection, and analysis have been structured as to provide a high level of insight, into how the use of these technologies was perceived by visitors. The impact that these technologies have, if any, on information transfer and learning is provided not from a professional or expert opinion but from the experience of the visitor in first case and through the lens of museum professionals in the second. This is with the aim to provide insight into the use of different immersive technologies and how their use can potentially aid in the development of empathetic responses, reflections of self and go some way to addressing “otherness” in non-traditional learning environments dealing with difficult and dissonant topics.

4.0 Findings

4.1 Introduction

The central aim of this study is to **explore the interactions between museum visitors and Difficult and Dissonant historical information, to ascertain how, if at all, immersive technologies influence how this information is interpreted.** The following section provides a detailed description of both case studies selected for this research, and their related data sets, presenting an individual analysis for each case. In each instance, a description of the sample, presentation of the data, and summary of the findings are provided, informing the cross-case analysis which follows. Thereby providing a thorough exploration of visitor interactions with DDH information through the mediums of VR and AR.

Primary and secondary analysis of the qualitative data collected in both case studies provides commentary on how the visitor perceives the implementation of VR and AR. Specifically, what role the technology has played in that experience and how the visitors responded to these representations.

In accordance with the methodological approach outlined in Chapter 3, the qualitative analysis has been constructed through open and axial coding, to utilize grounded theory as the foundation for critical appraisal of the data.[196] Two case studies have been developed where both

[196] "Axial Coding"; Juliet M. Corbin and Anselm Strauss, "Grounded Theory Research: Procedures, Canons, and Evaluative Criteria," *Qualitative Sociology* 13, no. 1 (March 1, 1990): 3–21, https://doi.org/10.1007/BF00988593; "The Coding Manual for Qualitative Researchers," SAGE Publications Ltd, April 3, 2021, https://uk.sagepub.com/en-gb/eur/the-coding-manual-for-qualitative-researchers/book243616; Charmaz, "'With Constructivist Grounded Theory You Can't Hide.'"

AR and VR technology were employed as a means to communicate difficult information to the visitor. Therefore, each data set is coded and analyzed separately using the same methodology, allowing for a consistent analysis of the data while providing a basis for cross-case analysis exploring major themes later in Chapter 5. This provides an analytical framework within which the research questions are addressed. Consistent analysis of data collected from case studies one and two provides an avenue for comparison, in spite of the different forms of data collected.

Adhering to the grounded theory approach to analysis, within the literary framework outlined in Chapter 2, ensured that any discoveries with the potential to influence or guide professional practice are routed in HII. Although it is recognized that HCI is intertwined with HII in this context. As the visitors' relationship with the information is the focus of this study,[197] interactions with the technologies concerned will not be studied past the visitors articulated perception of the role which they play.

Case Study One data was compiled and supplied by the Shoah Foundation. The visitor survey responses that were collected are available as part of Appendix One. This data includes quantified responses to closed-ended questions and the long-form responses provided by visitors when asked to provide additional comments. As the survey was comprised of responses to both closed and open-ended questions, responses to open-ended questions were coded thematically using a grounded theory approach.

Primary interview data collected for Case Study has also been subject to the same thematic coding: in this instance, the opinion of how AR technology impacted the visitor experience is provided through the lens of the museum professional. Therefore, each level of coding is primarily

[197] Raya Fidel, *Human Information Interaction: An Ecological Approach to Information Behavior*. (Cambridge, MA: MIT Press, 2012).

represented by evidence derived from the interviews, supported by publicly available visitor quotes where possible. In conjunction with the observational data provided by USHMM, this allowed for the use of AR technology and its impact on visitor information interaction to be analyzed within the same framework.

4.2 Data Reduction

Data reduction began with an initial appraisal of data from both Case Study One and Case Study Two. At this stage, it was determined that visitor responses to the open-ended questions supplied in Case Study One. would be the initial focus of open coding. This decision was made as this secondary data provided a direct, qualitative link between researcher and visitor. Open coding resulted in the identification of eleven discrete themes, which were grouped into three overarching categories at the axial coding stage. This process informed the coding of Case Study Two interview data, allowing for a level of analytical comparison to be completed (Chapter 5). The two complementary data sets also underwent a comparable collection and reduction process, as seen in Figures 1 and 2.[198]

The data reduction process consisted of three main stages,[199] resulting in the following themes being identified, and utilized for data analysis. The overarching categories which emerged during stage 5 (axial coding) are Affective, Cognitive, and Psychomotor responses.

[198] See pages 84 and 85.
[199] See Figure 1 (Case Study One), and Figure 2 (Case Study Two): Stages 3-5, Pp 84-85.

Figure 1 "Case Study One: Data Reduction and Analysis."

Figure 2 "Case Study Two: Data Reduction and Analysis"

All categories and themes identified during data reduction are defined as follows:

Category 1: Affective Responses

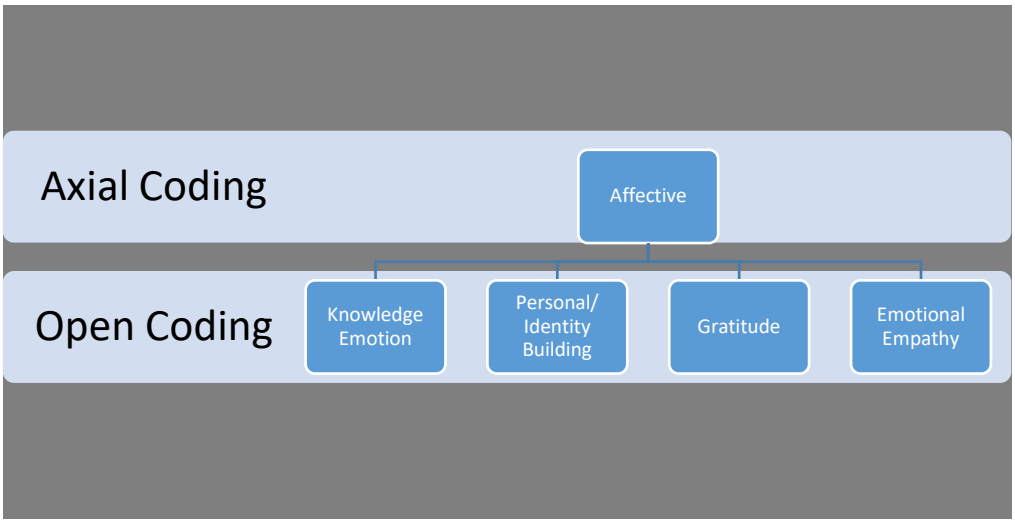

Figure 3 Affective Response Visualization

Affective responses are defined as free-form responses that indicate a relationship to emotional reactions. Distinctions have been made between the ways in which the visitors expressed Affective responses. The following four themes emerged during open coding:

Knowledge Emotions,

Personal connection/Identity Building,

Gratitude,

Emotional Empathy.

Knowledge Emotions

Expressions of emotion which have been found to indicate learning are deemed "*Knowledge Emotions*."[200] For example, responses that indicate surprise, awe, and inspiration. Examples of this within the data are responses that refer to the experience, content, and/or technology as 'Wonderful", "moving," and "amazing" (Appendix One). The foundation for this theory is developed from the notion that emotion is a process rather than a state of being. Moving through this process is a form of developed understanding and learning.[201]

Personal / identity building

These responses discuss (to differing degrees) a visitor's personal life experience or how they identify a connection to the Holocaust, and/or indication of introspection into one's actions.

Gratitude

Expressions of thanks for being able to view the exhibition within this context, through the medium, or simply thanking the museum/staff.

Emotional empathy

Responses that reflect an emotion that is likely to be similar to those depicted in the exhibition. "Sad," "fear," "loss," "hopelessness," and "hope."

[200] Paul Silvia, "Knowledge Emotions: Feelings That Foster Learning, Exploring, and Reflecting," Noba textbook series, 2021, https://nobaproject.com/modules/knowledge-emotions-feelings-that-foster-learning-exploring-and-reflecting; P. Silvia, "Confusion and Interest: The Role of Knowledge Emotions in Aesthetic Experience.," 2010, https://doi.org/10.1037/A0017081.

[201] Silvia, "Confusion and Interest," 2010; Silvia, "Knowledge Emotions"; Paul J. Silvia, "Confusion and Interest: The Role of Knowledge Emotions in Aesthetic Experience.," *Psychology of Aesthetics, Creativity, and the Arts* 4, no. 2 (May 2010): 75–80, https://doi.org/10.1037/a0017081.

Category 2: Cognitive Responses

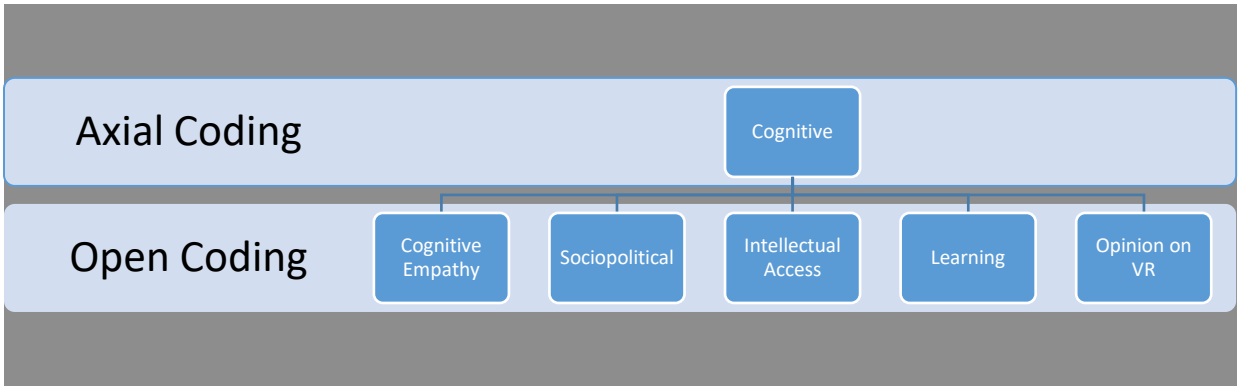

Figure 4 Cognitive Response Visualization

Cognitive responses are defined as those which indicate critical thought, draw connections between the exhibition and issues or functions outside of the exhibition experience, and/or an understanding of the information exhibited. These encompass the following:

- Cognitive empathy,
- Sociopolitical
- Intellectual Access
- Learning
- Opinion on VR

Cognitive Empathy

Recognition of increased empathy after engagement with the experience articulated in a critical manner. These responses are indicated by phrases such as: "I felt great […]" or "This experience let me […]".

Sociopolitical

Connects the experience to current affairs, whether socially or politically.

Intellectual Access

Comments on the ability to access the information by either increasing the ability of the visitor to understand the information provided or mentions a distraction/ inhibitor to information transfer.

Learning

Responses that have been categorized within this section may directly mention the application of VR as an educational tool, compare this experience to other forms of information transfer, or express a desire for others to witness this exhibition in order to further knowledge. This element can also include expressions of personal development and growth.

Opinion on VR

This category includes any direct mention of the technology, either positively or negatively, with the exemption of physical symptoms deemed as a reaction to the experience.

Category 3: Psychomotor

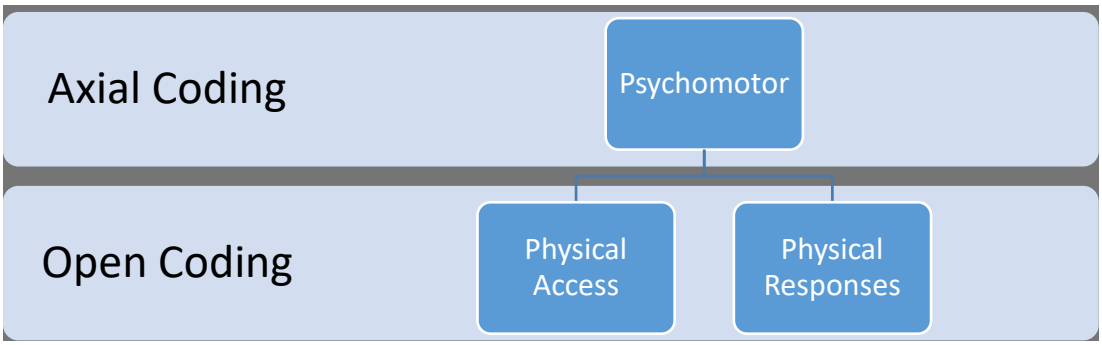

Figure 5 Psychomotor Response Visualization

Psychomotor responses are those which discuss the physicality of the exhibition and ease of use. This category includes responses that deal with either physical access or responses to the technology.

Physical Access

How the visitor navigates the technology, and whether or not the technology work with their own personal physical situations; “ease of use.”

OR

Physical Responses to VR technology

Responses that mention a physical reaction during the experience (specifically the technology); I.e., “dizziness” or feeling “unsteady.”

The themes and categories outlined above are used to describe the two data sets and the finding which are derived from analysis. Supported by the specific incidents which they represent, the following sections discuss the data for Case Study One and Case Study Two, relating all discoveries to the research questions outlined in Chapter 1.

4.3 Case Study One: “The Last Goodbye”

4.3.1 Description of Sample

The Last Goodbye transports the visitor inside the Nazi death camp Majdanek in Poland through the use of VR technology. This fully immersive experience was available in museums across North America and enabled visitors to follow Pinchas Gutter on his return to Majdanek, providing a personal account of life there during the Holocaust.

Figure 6 External View of VR Setup[202]

Data on the visitor experience was collected from over 2000 attendees, via exit surveys, from September 2018 to January 2019. This data is presented in six graphs, which represent the

[202] “The Incredible, Urgent Power of Remembering the Holocaust in VR | WIRED,” accessed February 16, 2022, https://www.wired.com/2017/04/vr-holocaust-history-preservation/.

closed responses, and approximately 1000 natural language responses to open-ended questions on the survey that have been subsequently coded by the researcher. Participating museums included the Florida Holocaust Museum, Illinois Holocaust Museum & Education Center, and Los Angeles Museum of the Holocaust, and these data sets for the three museums have been amalgamated and anonymized by the Shoah Foundation for the purposes of this study.

This amalgamated data set consists of both natural language narrative responses to open-ended questions, and closed responses to multiple-choice questions. These responses were both collected from people who experienced the fully VR exhibition; although, as the data was anonymized prior to being received by the researcher for the purposes of this study closed responses cannot be directly connected to the narrative comments.

The survey itself consisted of six multiple-choice questions, two of which also provided a space for additional comments and a section entitled “Please provide any other comments below” at the end. These spaces for additional comments are where the visitors provided the natural language responses which were used to develop the thematic coding outlined above. The six multiple-choice questions are as follows:

1. “What did the story of Pinchas Gutter Make you feel? (Select all that apply)”
2. “What impact did experiencing the story in VR format have on you?”
3. “Was the overall experience positive or negative?”
4. “How likely are you to seek stories similar to the testimony of Pinchas Gutter?”
5. “Are you going to share your experience with others?”
6. “Do you have a personal connection to the Holocaust or other genocide?”

The sample of data (collected through the survey described above), was collected and compiled by the curatorial team that developed the VR exhibition with the aim of assessing the success of this technology in communicating Pinchas Gutter's personal experience growing up in Majdanek. Providing in-depth, detailed, and personal accounts of traumatic or difficult social history is a tool that creates an access point to a difficult topic without diminishing the power of narrative.[203] The data set for Case Study One is a representation of the visitors' responses to the narrative created by a survivor, turning each visitor into a "witness" to this personal experience, representative of Holocaust history and personal trauma. The sample can consequently be described as a collection of personal views and responses from witnessing this aspect of Gutter's life. The visitors were directly asked if they had any known personal connection to the Holocaust or any other genocide (Figure 7). As the majority of respondents claimed no connection to the Holocaust, this presents a specific avenue for analysis, where the data may be examined within a framework of interactions with information from a place of "Otherness".[204]

[203] Victoria Khiterer and Erin Magee, *Aftermath of the Holocaust and Genocides* (Cambridge Scholars Publishing, 2020); Ben Paites and Emma Reeve, "After Life: Engaging Museum Visitors with the Theme of Death and Remembrance," *AP: Online Journal in Public Archaeology* 8, no. Extra 2 (2018): 127–52.
[204] Gabi Arrigoni and Areti Galani, "Recasting Witnessing in Museums: Digital Interactive Displays for Dialogic Remembering," *International Journal of Heritage Studies* 27, no. 2 (February 1, 2021): 250–64, https://doi.org/10.1080/13527258.2020.1795909; Jane Sutton and Zubin Austin, "Qualitative Research: Data Collection, Analysis, and Management," *The Canadian Journal of Hospital Pharmacy* 68, no. 3 (2015): 226–31.

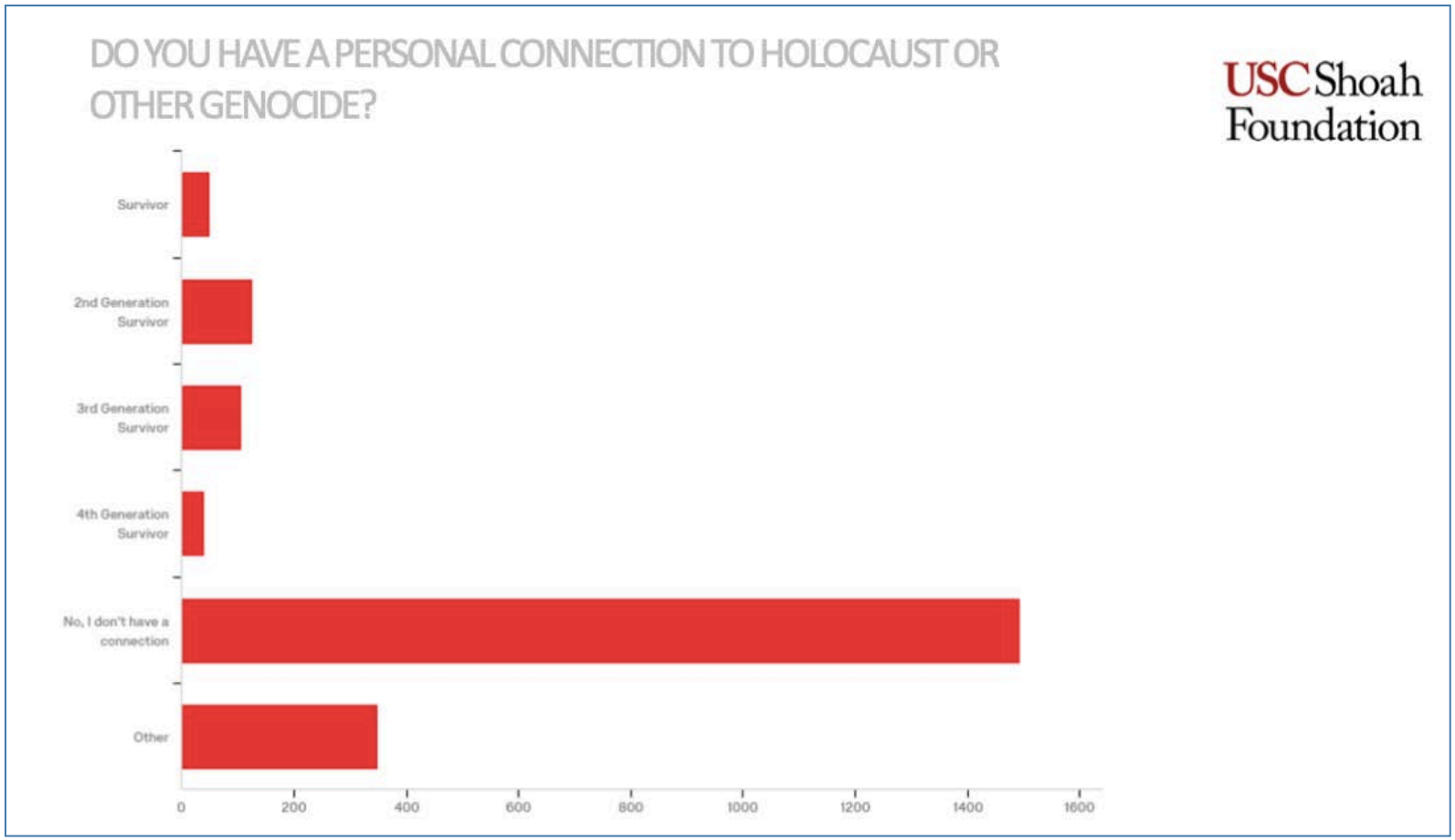

Figure 7 Responses to Question 6: "Do You Have A Personal Connection to the Holocaust or Other Genocide?" Shoah Foundation Exit Survey

The data itself is qualitative in nature, providing insight on how/if this technology has provided a deeper connection to the history it presents from the perspective of the visitor themselves. This focuses on both the Affective nature of the technology and the impact this had on the visitors' perception of their personal experience.[205] Case Study One data is comprised of both natural language discourse and close-ended questions, providing good insight into visitor responses to the information exhibited, the lens through which this information is communicated, and the means of communication. Including: how Pinchas Gutter's personal story made the visitor feel, how experiencing the story through VR format impacted the visitor, and the perceived learning experience, all of which are articulated in their own words. Rather than looking at the natural language discourse as providing context for the closed responses, an alternative approach provides a basis from which coding can begin. Open coding began with highlighting the main themes presented in the natural language responses, which allowed for closed responses to be easily categorized.

The initial themes which were highlighted can be articulated as emotive responses and practical or physical responses. Interestingly enough, not all of the responses which can be classified as emotional in nature deal with traditionally "negative" emotions (sadness, fear, despair). Many visitors used words like "hope" and rhetoric which indicated that the existence of this exhibition itself is evidence that the world is moving forward and that the use of the tools now available to us may allow for positive change and alter current perceptions in a positive manner. These narrative answers follow the closed-ended questions. This opportunity to expand provides more insight into how the exhibit may be carried forward by the visitor in their everyday life.

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[205] Sutton and Austin, "Qualitative Research."

4.3.2 Presentation of Data and Results of the Analysis[206]

Initially, the aim of this study was to categorize responses as either relating to physical or emotional components of the exhibition and to further code these on a scale from positive to negative experiences. However, while analyzing the data, such a wide range of expressions of emotions had been provided that it was found to be more useful to categorize the responses as affective, cognitive, and psychomotor. These themes have subsections relating to expressions of empathy, identity, access, learning, connections between the experience and current sociopolitical issues and success (or lack thereof), and VR technology as perceived by the visitor.

Therefore, the coding used here relies on current research and professional practice, combining learning theory and human information interaction with studies into *Affect*. At this point in the analysis, it is important to highlight that the coding has been developed through a repeated examination of the free-form answers provided by the Shoah Foundation (Appendix One). Fully thematic coding is available in Appendix One for examination. The hierarchical structure of the coding used allows for each answer to be evaluated from a number of angles and for connections between the themes to be drawn.

This relates specifically to the free form responses collected by the exit survey which the Shoah Foundation performed. The three main themes are then divided further to represent the different manner of expressions that were observed during the analysis.

Quantifying the results of the coding provides insight into the way that visitors responded to the VR experience. *Affective* responses outweigh both *Cognitive* and *Psychomotor* responses (Figure 8), indicating that the VR exhibition delivered an Affective experience as perceived by

[206] Fully coded data for Case Study One can be found in Appendix One.

the visitors. Affective responses ranged from expressions of gratitude for the development of such an exhibition to expressions of emotional empathy, Knowledge emotions, and reflective statements. Reflective statements signified that a personal connection was being drawn between visitor and information, either by the development of individual identity through engagement with the experience or noticing humanizing similarities between Pinchas Gutter and themselves.

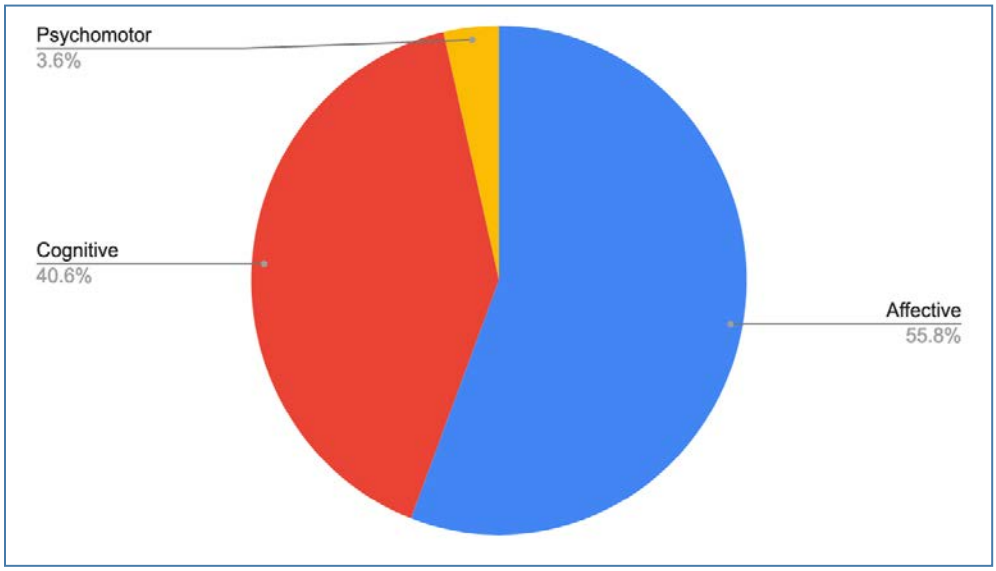

Figure 8 Axial Coded Response Distribution Visualization

Of the three types of emotional responses highlighted by open coding, two were deemed *Affective*. These expressions of emotion were reactionary rather than analytical in comparison to those categorized as *Cognitive*. *Cognitive Empathetic* responses required the visitor to acknowledge rather than express emotion. For example: "Very emotional to listen to the personal story." [207] Vs.: "Very Sad."[208]

[207] Appendix one "Additional Comments" G1.
[208] Appendix one "Additional Comments" D2.

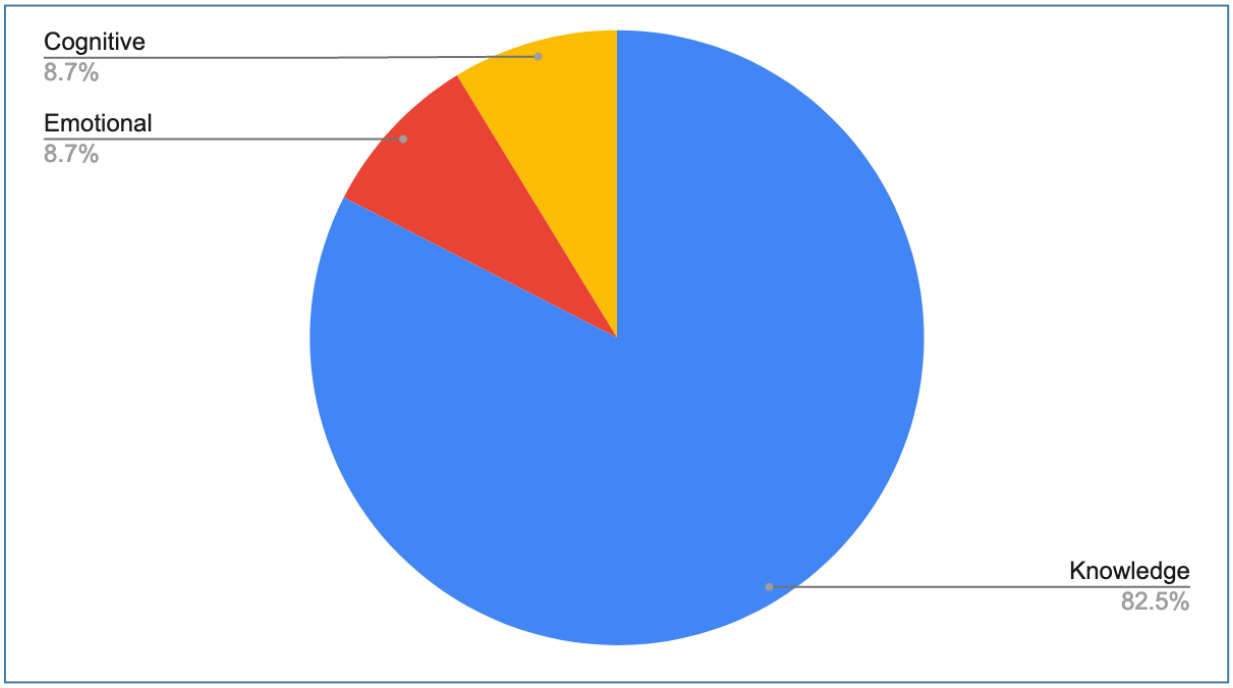

Figure 9 Empathetic Response Distribution Visualization

Responses were seen to fit within more than one category where multiple themes were present. The distribution of the three types of empathetic response (knowledge, emotional and cognitive) is shown in Figure 9. As the majority of empathetic responses (82.5%) contained expressions of *Knowledge Emotions*, such as: "Compelling"[209] and "Amazing and moving."[210] The VR experience can be seen to "foster[s] learning, exploring and reflection," as supported by Silvia (2021).[211]

[209] Appendix one "Additional Comments" A2.
[210] Appendix one "Additional Comments" A1.
[211] Paul Silvia, "Knowledge Emotions: Feelings That Foster Learning, Exploring, and Reflecting," Noba textbook series, 2021, https://nobaproject.com/modules/knowledge-emotions-feelings-that-foster-learning-exploring-and-reflecting.

Looking at empathetic responses in correlation with the distribution of all responses by discrete theme provides insight into the prevalence of these empathetic responses. Figure 10 shows that a total of 34.2% of all responses to open-ended questions contained *Knowledge Emotions*, and 3.6% were seen to contain *Cognitive* and *Emotional* empathetic responses. Meaning that a total of 41.4% of responses contained either a Cognitive or Affective presentation of empathy.

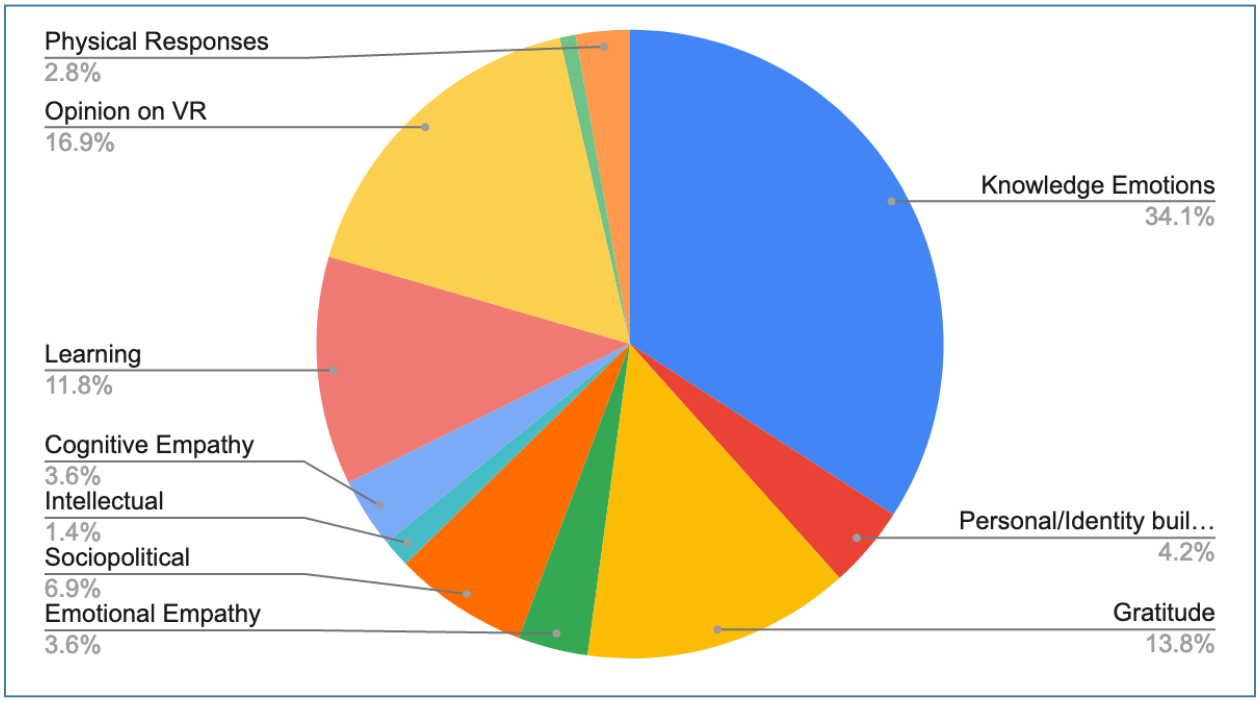

Figure 10 Response Distribution Visualization – Open Coding

The prevalence of "*Knowledge Emotions"* in visitor responses may signify a connection between empathy development and cognitive responses, such as the development of sociopolitical views by means of personal impact or "bridging the information gap." The responses indicate recognition of personal connection, ranging from a family member with a direct or indirect connection to the events portrayed to experience with another genocide. These personal or *Identity Building* focused responses indicate that there is a connection to the experience and formulation

of empathy for the subject and, more importantly, the people depicted in the exhibition. Responses that evidence *Identity Building* can be connected to information processing behavior or education as there is an indication that knowledge has been gained through the experience.

> *This virtual reality tour was very insightful and allowed me to connect personally to the survivor's story/plight. I have recently lost my grandmother on 2018 July 16th. Her name was Maxine Wilson, and though she was not Jewish, she had connected with those who were during her lifetime and had visited this museum a few times in the past. I am a Christian, as are my family and grandmother. After viewing this exhibit, I must say that this experience resonates within me on a multiplicity of levels. Thank you for sharing this magnificent opportunity with your members and my family. We look forward to a future event like this high-quality exhibit.*[212]

And

> *Saw this 2 days after the Tree of Life shootings in Pittsburgh: I have lived 5 miles from the Holocaust Museum for 4 years but didn't have the courage to come until today. I fight for justice every day in my life but now feel I must increase my reach. Thank you for this experience.*[213]

Expressions of gratitude have been categorized separately due to the wealth of responses thanking the foundation/ museum for the production of this exhibition. These responses are an indicator of the exhibition being well-received which is closely linked to discourse within the museum community regarding the ethical issues of potential trauma to visitors when "witnessing" traumatic events through immersive experiences. This concern has a foundation in the notion that having a level of separation between the event and learning allows for trauma-free learning. *"The Last Goodbye"* maintains a level of distance between the visitor and difficult history while still

[212] "Additional Comments": Appendix One B5
[213] "Additional Comments": Appendix One B15

exposing them to an immersive and tumultuous past. This is done by placing Pinchas Gutter in the role of tour guide, similar to visiting a protected heritage site. This approach does not allow for the full extent and impact of the event to be pressed upon the visitor but provides a means for them to witness it in context.

The following section provides an analysis of the data described above. This analysis is structured to address each research question and sub-question individually, providing a comprehensive critical analysis of the presented data.

4.3.2.1 RQ1: What role do immersive technologies play in the visitor experience of Difficult History Museum Exhibitions?

> *VR has the potential to support incredibly complex narratives, tailored to promote complex viewer interactions. Put simply; users feel they are present in VR; they are dropped right into a scene as if they were part of the story. Immersion and presence are terms used to describe an experience in which the line between reality and imagination is blurred.*[214]

RQ 1.1: Does the visitor find the presence of VR/AR technology useful in communicating difficult content?

When assessing what role VR technology plays in the way visitors experience and receive information, the first point to address is whether or not the visitors deemed the technology as a useful tool in the transfer of this information. The visitor survey asked, "what impact did experiencing the story in VR format" had on them. This line of questioning provides insight into

[214] Donghee Shin, "Empathy and Embodied Experience in Virtual Environment: To What Extent Can Virtual Reality Stimulate Empathy and Embodied Experience?" *Computers in Human Behavior* 78 (2018) p.65: 64–73, https://doi.org/10.1016/j.chb.2017.09.012.

how useful the visitors found the technology and in what ways. Figure 11 (below) shows the amalgamated responses to one of the multiple-choice questions. This graph shows that, when asked directly about how experiencing the story in VR impacted the visitor, three main answers were selected.

1. "Made me feel like I visited the location in person."
2. "Helped me have a deeper understanding of the story."
3. "I felt connected to the story of the survivor."

These responses fall within the boundaries of *Personal/ Identity building*, *Learning*, and *Intellectual Access* themes as defined above. This has been seen in previous work focusing on the use of immersive technologies in the museum.[215] Connections between the contextualization of information (represented by answer 1) and an increased understanding of historical information (represented by answer 2) are well documented in the museum studies field. This connection has promoted a focus in the modern museum on meaning-making and storytelling as approaches to interpretation and continuity of display.[216]

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[215] Ed Rodley, 2013, "Immersion in Museums," https://www.slideshare.net/erodley/immersion-in-museums; Lyn Robinson, "Immersive Information Behaviour: Using the Documents of the Future," *New Library World* 116, no. 3/4 (March 9, 2015): 112–21, https://doi.org/10.1108/NLW-07-2014-0093.

[216] Jens Ambrasat et al., "Unpacking the Habitus: Meaning Making Across Lifestyles," *Sociological Forum* 31, no. 4 (December 2016): 994–1017, https://doi.org/10.1111/socf.12293; Sophia Diamantopoulou, Eva Insulander, and Fredrik Lindstrand, "Making Meaning in Museum Exhibitions: Design, Agency and (Re-)Representation," *Designs for Learning* 5, no. 1–2 (December 1, 2012), https://doi.org/10.2478/dfl-2014-0002; Wendy M. Duff et al., "Contexts Built and Found: A Pilot Study on the Process of Archival Meaning-Making," *Archival Science* 12, no. 1 (March 1, 2012): 69–92, https://doi.org/10.1007/s10502-011-9145-2; Michele Lamont, "Meaning-Making in Cultural Sociology: Broadening Our Agenda," *Contemporary Sociology* 29, no. 4 (2000): 602–7, https://doi.org/10.2307/2654561; Gunther Kress and Staffan Selander, "Introduction to the Special Issue on Museum Identities, Exhibition Designs and Visitors' Meaning-Making," *Designs for Learning* 5, no. 1–2 (December 1, 2012), https://doi.org/10.2478/dfl-2014-0001; Leslie Bedford, "Storytelling: The Real Work of Museums," *Curator: The Museum Journal* 44, no. 1 (2001): 27–34, https://doi.org/10.1111/j.2151-6952.2001.tb00027.x; David B. Allison, *Living History: Effective Costumed Interpretation and Enactment at Museums and Historic Sites* (Rowman & Littlefield, 2016).

A deepening of understanding and developing a connection to portrayed events have been noted as vital in the representation of difficult histories in order to promote empathetic responses, desire for further learning, and provide an accurate perception and acceptance of traumatic pasts.[217] This can be seen as a positive reaction to the use of VR as a means to transmit difficult information. The concept of feeling like there is a physical presence in sites of trauma can become a more complex issue. As has been debated within professional circles over the last decade or so, there is a fine line between providing an avenue for people who do not identify directly or have direct connections to these histories to build relatable connections and deepening understanding intending to promote wider social understanding of the issue represented.[218] The responsibility of walking the fine line between facilitating a "safe space" to "witness" a traumatic event in a somewhat divorced setting, and forcing a visitor to actively witness the event, does not appear to lie with the technology but rather the content that it contains.

[217] Giuseppe Riva et al., "Affective Interactions Using Virtual Reality: The Link between Presence and Emotions," *CyberPsychology & Behavior* 10, no. 1 (February 1, 2007): 45–56, https://doi.org/10.1089/cpb.2006.9993.
[218] Arrigoni and Galani, "Recasting Witnessing in Museums," February 1, 2021.
Falco and Vassos, "Museum Experience Design"; Falco and Vassos.

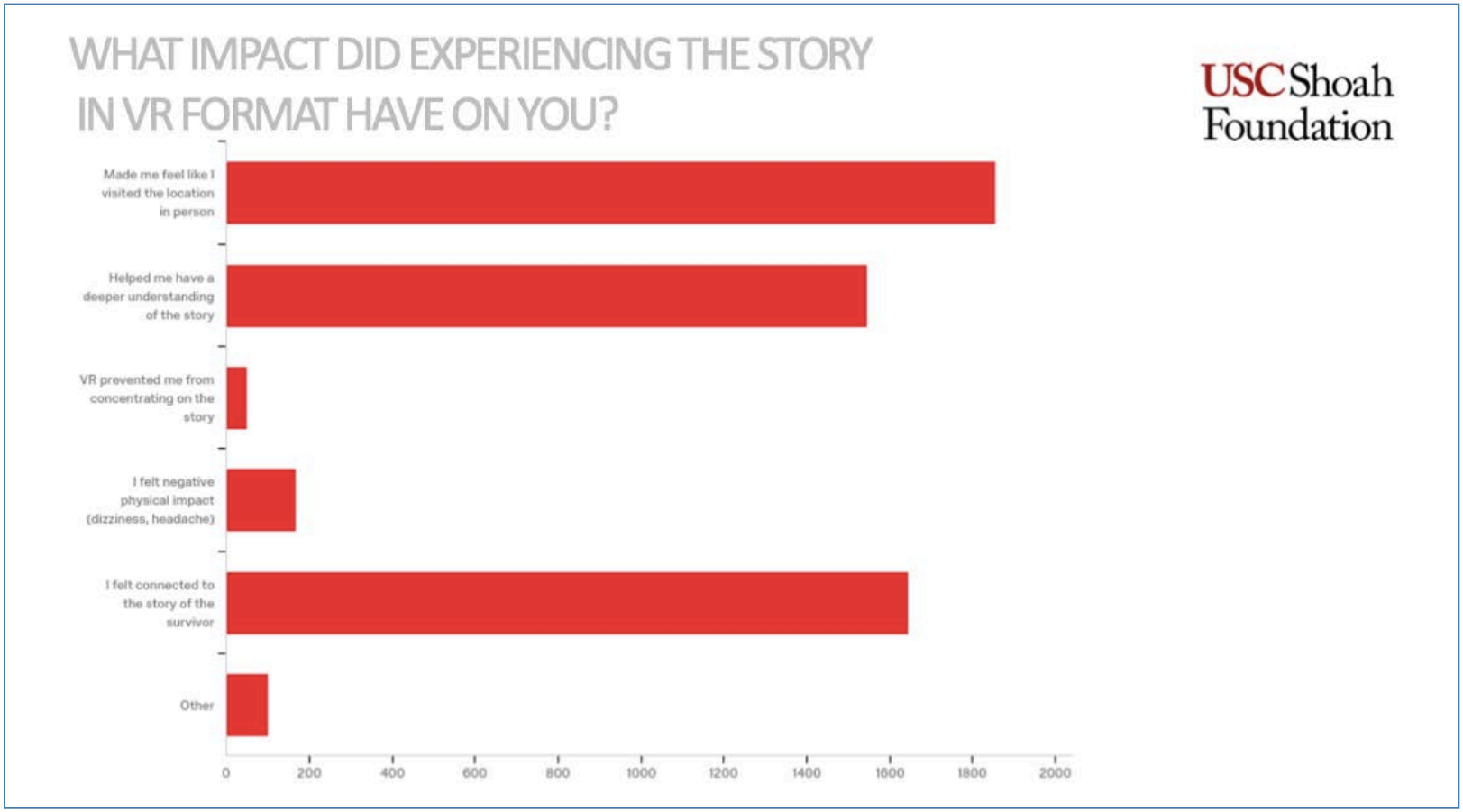

Figure 11 Responses to Question 2: "What impact did experiencing the story in VR format have on you?" Shoah Foundation Exit Survey

Some negative responses to experiencing the story in VR can be seen in Figure 11, specifically “VR prevented me from concentrating on the story” and “I felt negative physical impact (dizziness, headache).” The selection of this response draws into question both physical and intellectual access, as physical responses which could cause a barrier to intellectual access were detailed in the “other comments section.” Although only a few instances of these reactions have been recorded, it is, in fact, important to note that the use of VR is subject to unique psycho motive responses not traditionally seen in the use of other technologies. Feelings of “unsteadiness” which relate to the use of VR are present but rare, indicating that few visitors experienced negative physical impacts when dealing with the technology, which could impinge on physical and intellectual access. However, these psychomotor responses are present only in the minority, indicating that experiencing this history through VR was generally well-received and caused few negative reactions. This is also seen within responses that contain references to intellectual access, allowing us to determine that visitors perceived the VR experience as increasing their access without negative impact.

Determining “usefulness” is reliant here on the visitors’ own perception and is analyzed through the lens of currently accepted indicators of learning and access. As the data highlights the ability to connect with information through the use of technology, which is seen to increase avenues for intellectual access, therefore, understanding, it can be deduced that in this instance, visitors perceived VR to have been a conduit for learning. Referring back to Figures 8-10, it can be seen that when assessing the impact of experiencing the story through VR, most visitors communicated ‘*Knowledge Emotions*.’ This self-assessment falls in line with the closed-ended responses as evidence of the gravity and consequences of the Holocaust (through personal

connection) and therefore provides evidence of the development of critical thought mediated by the use of VR.

RQ 1.2: Does the visitor express growth of knowledge?

Growth of knowledge, as expressed by the visitor themselves, is represented in Figure 9 by the majority of visitors expressing a deepening of understanding due to the VR experience. It is at this point that the long-form answers can be drawn on to understand exactly how the visitors believed their knowledge base to grow.

Within this section of the survey, visitors expressed positive reactions to the use of VR in learning. Statements like, "Let me know what it actually looked like"[219] and "Made the story more real and present',[220] inform us that the technology allowed the visitor to move past their current knowledge base and provided information that either cemented or furthered their current knowledge. One visitor commented here that, "privileged acknowledged, heightened awareness."[221] From this statement, we can deduce that the visitor believed the use of VR aided in furthering their knowledge, both of their own place in society, and their awareness of others' history and how this impacts communities and families today.

There are also natural language responses present when visitors were asked, "What did the story of Pinchas Gutter make you feel?" This indicates that VR impacted the growth of knowledge. These were expressed as follows: "Anticipation that technology will make this better over

[219] Appendix One, "Q2 Additional Comments": F6.
[220] Appendix One, "Q2 Additional Comments": I6.
[221] Appendix One, "Q2 Additional Comments": B4.

time,"[222] "Desire to create such experiential journey through trauma for other genocides that took place in the US,"[223] and "Desire to use this in my teaching! The best way for the future!"[224] Although these responses do not directly mention a growth or deepening of knowledge, they do indicate a desire to transfer the knowledge gained. This desire is a common indicator in informal learning settings of a desire for others to develop their knowledge base. This is commonly associated with feelings of being somewhat knowledgeable on a topic. In the examples given above, it can therefore be deduced that the visitor believed themselves to be more knowledgeable after the VR experience than they were prior and that the technology used was, at least in part, responsible for this outcome.

RQ1.3: Do immersive technologies inspire engagement?

The visitors were directly asked if they were likely to seek out similar stories to the testimony of Pinchas Gutter. Figure 12 shows that the vast majority of visitors stated that they were "extremely likely" to seek out additional stories. This can be seen as a desire to learn more about the personal stories and impact of the Holocaust, past that of the knowledge level currently held by the visitor. The data presented below shows that when asked how likely the visitors were to both share the experience that they had during their visit and to seek out stories like that of Pinchas Gutter, there was an overwhelming majority who expressed a desire to do both. Initially, it can be deduced from this information that the exhibition succeeded in creating a desire for further learning on both a personal level as well as a desire to teach or help others learn.

[222] Appendix One: "Additional Comments": I1
[223] Appendix One: "Additional Comments": H6
[224] Appendix One: "Additional Comments": H5

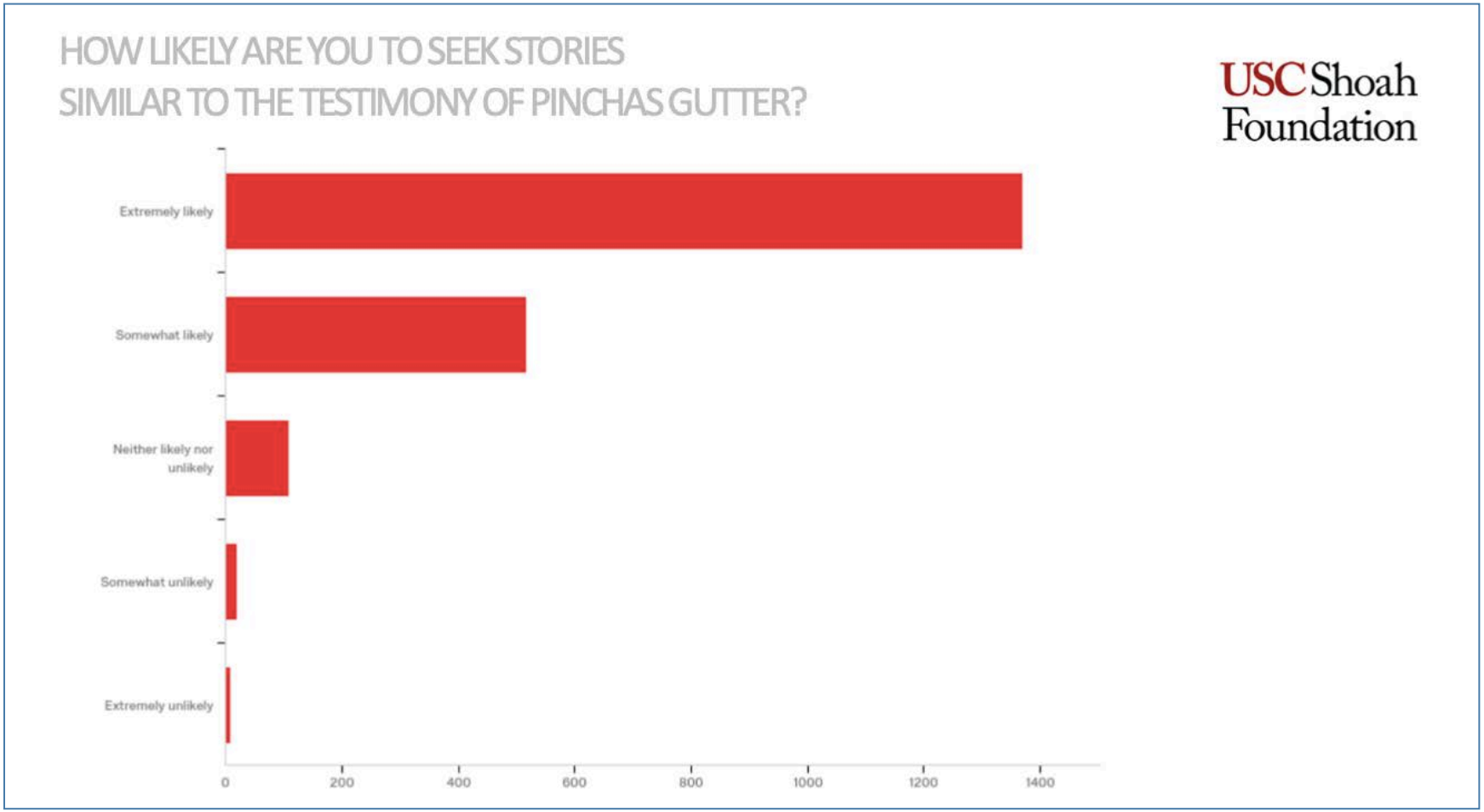

Figure 12 Responses to Question 4: "How likely are you to seek stories similar to the testimony of Pinchas Gutter?" Shoah Foundation Exit Survey

Although interest in further learning is expressed post-exhibition, the role VR technology has in this is not addressed in the specific data points represented in Figures 11 and 12. In order to address this, the natural language responses provided must be addressed in conjunction with these results. It can be seen when evaluating the additional comments provided that visitors believed that experiencing the story through VR provided a way for them to connect to the history and, therefore, a drive to share the information with others. This can be seen by looking at the answers categorized as those which signify learning. Statements such as, "educate the children" and "Presentation in this mode, VR, is very powerful and moving. I say that having been to Auschwitz-Birkenau and this presentation mode in VR" demonstrate that the technology was perceived as a tool that can benefit informal education, in a positive manner. This concept is further supported by the comments supplied at the end of the survey when visitors were given the opportunity to express any other insights or comments. At this point, a significant number of visitors supplied comments which can be linked to the benefits of VR, the desire to share the experience, the information presented, and a recognition of the importance of preserving these stories, (Figure 12).

The quote below is an example of a visitor who expresses knowledge emotion through awe by stating that the exhibit is "amazing," a desire for further interaction with the topic, and a desire to share.

"This is an amazing exhibit. I plan to return to experience it again and to encourage others to also come. Thank you for providing me with this opportunity."[225]

Visitor responses and levels of engagement are largely articulated through the concept of meaning-making;[226] evidence of this is found within the data by both the recognition of how

[225] Appendix One, Additional Comments, D14 and L14.

[226] Silverman (1995) describes the process of meaning-making in the museum as visitors making meaning "through a constant process of remembering and connecting. As educational theory has long purported, both perception and

"useful" VR is in helping the visitor connect to the history and drawing comparisons between this past and issues which a prevalent to the development of current political and social issues.

Much of social history is found not in the artifact but in the stories surrounding its creation, use, and the meaning placed on it by the owner or community which is represented.[227] Communicating these aspects leads to a contextual display containing many different elements and built with the intention of drawing upon the visitor's own memory and experience, bridging the gap between information need and satisfaction in order to cement new knowledge.[228] This development of 'meaning' can be seen in responses that demonstrate a combination of different types of *Affective* and *Cognitive* expression.

"It made me revisit sadness that there are people in our country and elsewhere who believed The Holocaust never happened or revile people of color or other ethnicity."[229]

This example shows emotional empathy and a connection drawn between current issues and the past. This indicates that, in this instance, VR was positively received, supported by Figure 13.

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learning hinge upon the accommodation of new information into existing mental structures and frameworks. In museums, people attempt to place what they encounter - be it text, object, fact, perspective - within the context of their experience."

[227] Falco and Vassos, "Museum Experience Design"; Graf et al., "A Contextualized Educational Museum Experience Connecting Objects, Places and Themes through Mobile Virtual Museums."

[228] Silverman, "Visitor Meaning-Making in Museums for a New Age"; Marty, "Meeting User Needs in the Modern Museum"; Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design."

[229] Appendix One, Additional Comments, E2, and G2

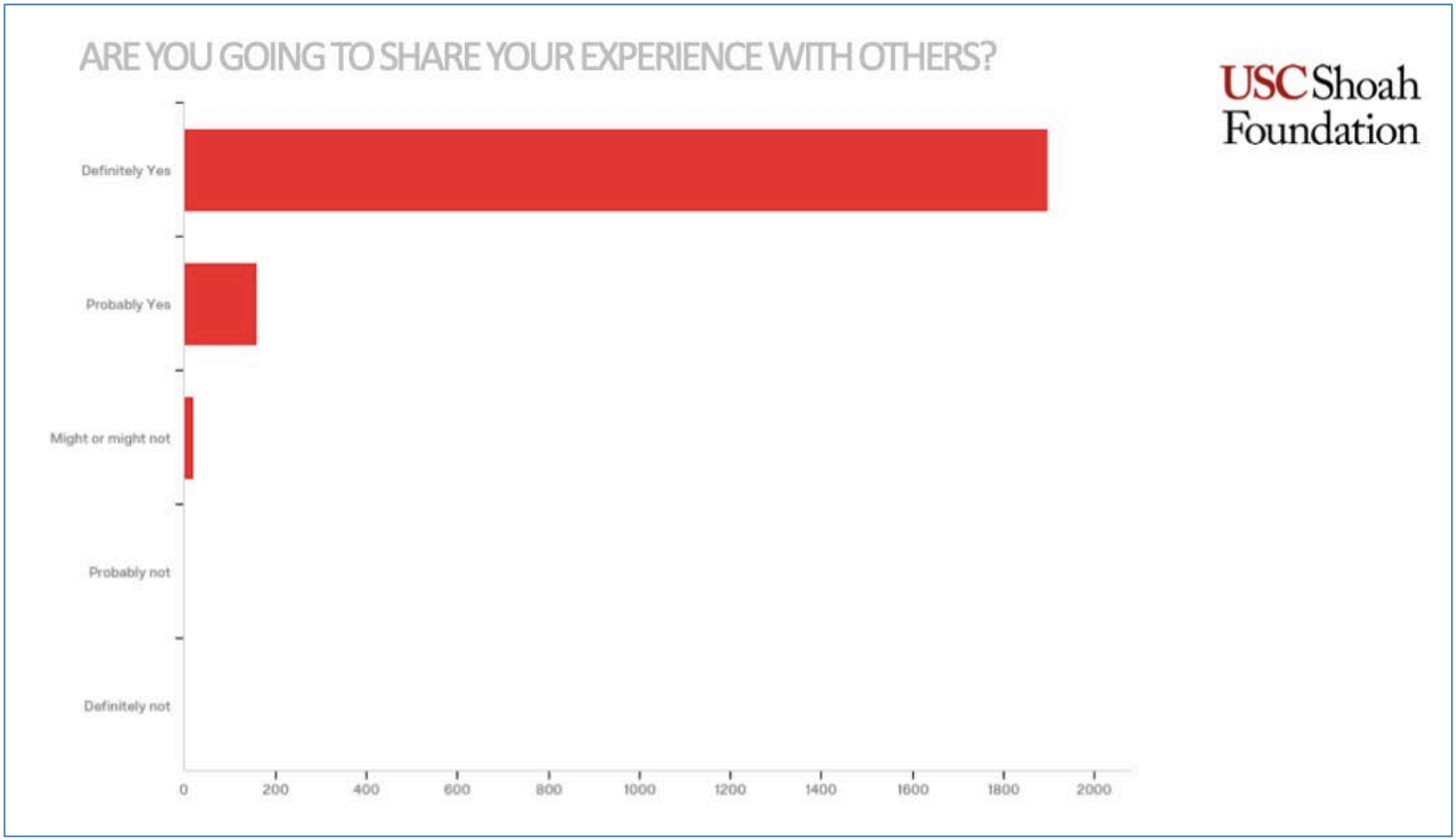

Figure 13 Responses to Question 5: "Are you going to share your experience with others?" Shoah Foundation Exit Survey

Here, all elements necessary for the interpretation of information (as outlined by Tilden (1957))[230] are considered. Every aspect of this experience provides information that helps to build a picture of a time, place, and event in the visitor's mind. Each person will experience this differently, but the same senses help to build this personal meaning. Nikonanou and Venieri (2017) and Gonzalez-Sanz, Feliu-Torruella, and Cardona-Gomez, (2017) detail the variety of approaches that can be taken to encourage information transfer.[231] Focusing mainly on how the museum can provide informative and captivating information as part of the exhibition [232]. Here, interpretation as a tool of communication between object and visitor is the medium through which meaning-making occurs.[233] Within this interaction, personal interpretations become part of the complex cognitive processes which encompass many of our senses.[234] These processes are now also seen to include emotions. Theory surrounding emotional response now discusses them in terms of a "process" rather than a "state." The prevalence of Knowledge Emotions in the responses provided supports this as an information behavior process where the visitor is inspired to explore and gains knowledge serendipitously through many sensory processes.[235]

Studies in the field of education have shown that VR environments are more successful in developing memorable experiences, emphasizing that "VR environments could create more memorable learning environments compared to other […] environments."[236] This theory supports

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[230] Tilden, *Interpreting Our Heritage*.
[231] Nikonanou and Venieri, "Interpreting Social Issues"; Gonzalez-Sanz, Feliu-Torruella, and Cardona-Gomez, "Visual Thinking Strategies from the Perspective of Museum Educators: A SWOT Analysis of the Practical Implementation of the Method."
[232] Parsons and Sedig, "Adjustable Properties of Visual Representations"; Nikonanou and Venieri, "Interpreting Social Issues"; Gonzalez-Sanz, Feliu-Torruella, and Cardona-Gomez, "Visual Thinking Strategies from the Perspective of Museum Educators: A SWOT Analysis of the Practical Implementation of the Method."
[233] Marty, "The Changing Nature of Information Work in Museums."
[234] Chalmers, "Experiencing the Multisensory Past."
[235] Chalmers; Silvia, "Knowledge Emotions."
[236] Yildirim, Elban, and Yildirim, "Analysis of Use of Virtual Reality Technologies in History Education."

the idea that VR environments support learning and information retention while also encouraging. As interactivity has been found to increase engagement and information retention, specifically in informal learning environments,[237] it can be argued that the responses to whether or not experiencing the story in VR format could shed light on this. As previously stated, positive responses to this question included mentions of VR creating an avenue for: "better understanding," a "deepening of knowledge," and comments relating to the perceived or simulated 'realness' that the technology provides. Thusly, information interactions through VR can be categorized as both Information Seeking and Information Browsing behavior at different points of the experience. The concept of creating intellectual access through interactivity and therefore increasing engagement with a topic is another well-discussed phenomenon in both museum and HII theory.[238]

The desire for further learning is an important topic in museum studies research; although hard to measure, it has been discussed in depth as a result of engagement in the museum. This is particularly relevant to oral histories and intergenerational information transfer. In the context of difficult histories, it has been seen as a method for families and communities to communicate traumatic elements of their history to younger generations as a means to cement personal identity and a sense of belonging to these communities. What is particularly interesting in this instance is that the majority of visitors who completed the survey did not identify as having a personal connection to the Holocaust or any other genocide, (shown in Figure 14).

[237] Yildirim, Elban, and Yildirim.
[238] Yildirim, Elban, and Yildirim

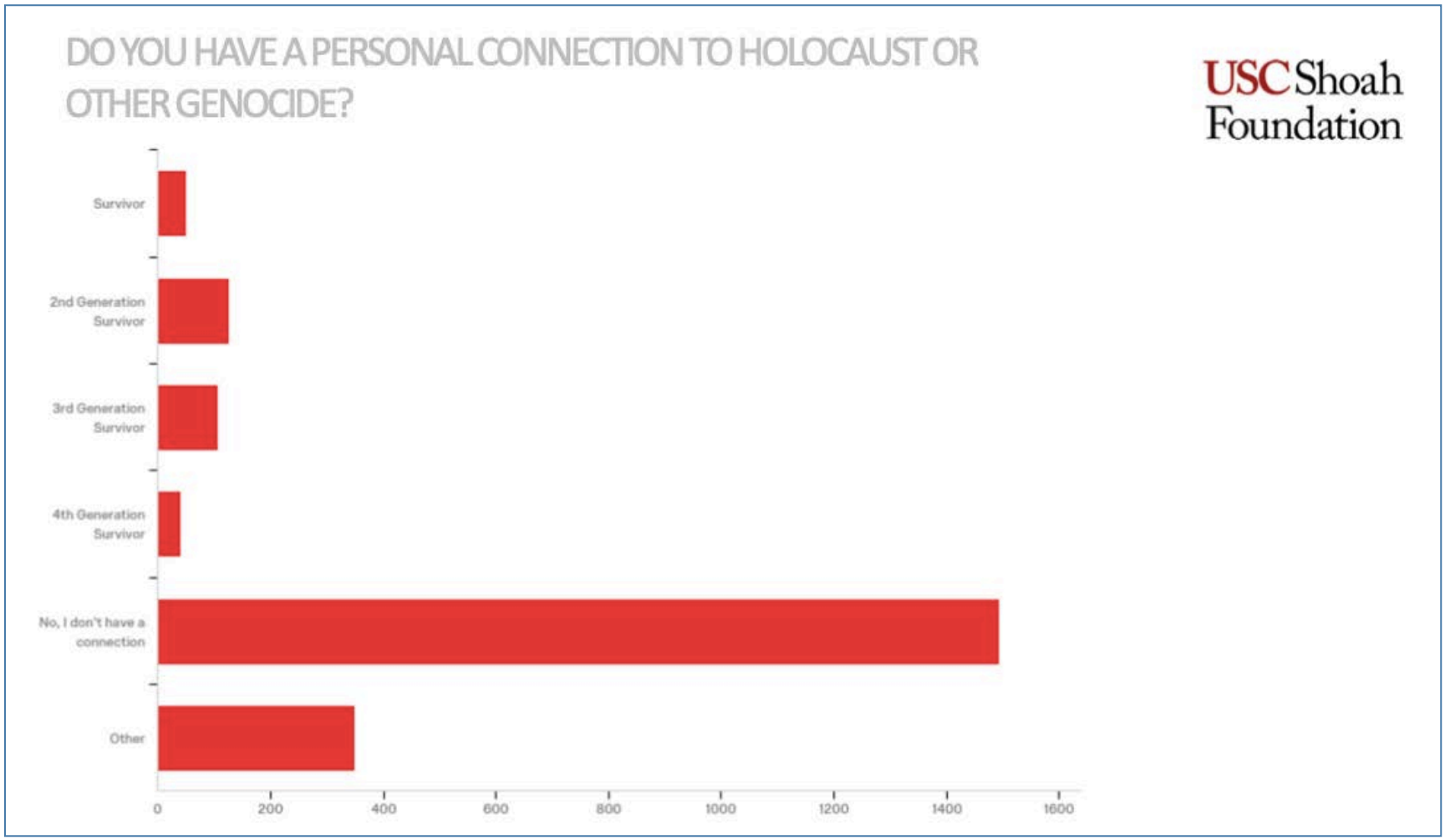

Figure 14 Responses to Question 6: "Do you have a personal connection to Holocaust or other genocide?" Shoah Foundation Exit Survey

4.3.2.2 RQ 2: How do visitors respond to immersive representations of difficult histories?

RQ 2.1: How do visitors express emotional responses to exhibition content?

Terms of impact, during the free form responses both to the initial two questions and in the space for additional comments, visitors expressed a deepening of understanding made possible by VR technology and the level of immersion that this facilitates. This is reflected in the number of responses that are directly related to the technology itself, which also include terminology which has been deemed a "positive" emotional response. The exhibition is referred to a number of times as "Powerful," "impactful," "useful," and "moving." The plethora of additional comments, (available in Appendix One), signifies that many visitors had a need to converse and engage with one another.

As seen in Figure One, the main emotion expressed is sadness; however, when looking at the options which the visitor had, it is important to consider the social pressure/s which may have directed this choice. The expression of inspiration, hope, and desire to act in some way to change. This is supported by Arrigoni and Galani's 2021 research that draws together the ideas of dialogic remembering and digitally mediated witnessing. The use of digital media as a means of mediation between the visitor and difficult histories allows for a more conversational experience. A monologic format that builds on personal meaning-making and creates a driver to communicate and instigate change.[239]

When asked, "What impact did experiencing the story in VR format have on you?" The visitor responded by selecting answers which conveyed that the immersive experience increased

[239] Arrigoni and Galani, "Recasting Witnessing in Museums," February 1, 2021.

understanding. There is a clear preference for the technology being used in this manner in Figure 5. It is also important to highlight that there were some visitors who experienced negative physical impacts from engaging with the technology. Few responses expressed dissatisfaction with engaging with VR as a method of communication.

This representation of the data is helpful in addressing the basic questions about the use of VR when exhibiting past events. The long-form answers supplied shed further light on this, with reference to both VR's role and the personal nature of the exhibition content. This expansion of insight into the visitor experience has allowed for a clearer view of the types of emotional expression and opinions which were detailed by the visitors, post-exhibition.

The categorization of the natural language responses does allow for a deeper understanding. When looking at the additional comments across the entire data set, only five of the 156 responses which explicitly mentioned an opinion on VR offered criticism of the technology.[240] There is an abundance of positive emotional responses when asked about the method of transfer of the information. The themes of connection to, and understanding of, the history is prevalent in the data, as shown by mention across all three categories of *Affective, Cognitive,* and *Psychomotor* responses.[241] This is significant when looking at how few visitors actually had a personal connection to the Holocaust. The recognition that VR can build a bridge between previously directly unexposed people and a point or event that has impacted a large group of people and both directly and indirectly shaped the world is noteworthy. It is important to note that people willing to engage with, and experience such exhibitions, may fall into certain social groups and have a level of awareness and knowledge of the topic. This connects to the concept of "cultural capital"

[240] Appendix One Table 1: Quantification of Data.
[241] Appendix One Table 1: Quantification of Data. – Responses seen in: Affective (Personal/ Identity Building), Cognitive (learning, opinion on VR) Psychomotor (Physical access).

discussed earlier.[242] That being said, there is evidence here that research into both the application and dissemination of information in this format, could potentially enact real social change. Possibly even acting as a tool for communities to build real connection with one another, and provide an avenue in which empathy and real understanding can be formed. In terms of HII this can be seen as a bridging of the information gap, where an increase in understanding is connected to education or subject knowledge. This is a highly pertinent time for research to expand in this area, focusing not only on the interaction with information but also the human interactions with the machine (HCI).

The majority of the visitors who experienced the VR exhibition had no connection to the Holocaust. When combining this fact with the overwhelming statement that the experience was positive and that the information gained would be shared with others. The use of VR to encourage further learning and present this tool as an actionable method of promoting empathy and learning when displaying difficult histories. This is not to say that the use of a personal narrative did not influence these answers in addition to the technology. However, with the emphasized level of connection provided by the method of display it is fair to suggest that the impact of VR here was sizeable. The combination of the personal experience and the immersive nature of VR turned the interaction from passive to a contextualized engagement with information which was fully human centered.

[242] Tilden, *Interpreting Our Heritage*.

RQ 2.2: How do the visitor's emotional responses relate to the technologies used to deliver the exhibit?

Visitors finding the experience both moving and powerful is to be expected to some extent given the subject matter. The role that VR plays here requires a more in depth look at the long form answers.

When asked what impact experiencing the story in VR had on the visitor the words "felt" "like" and "story" were the most used terms. It can be seen from looking at the coded answers that these words appear within the context of detailing what the experience "felt like" to them, this can be seen in Appendix One even when directly asked about the technology in a large number of cases. The prominence of emotional response is not surprising given the subject matter; however, the way the visitors related it to the exhibition medium shows a positive response to being placed in an immersive environment, which provided the visitor an increased amount of information, akin to that of visiting a heritage site and Pinchas Gutters personal emotions and connection.

4.3.3 Summary

From the analysis above, VR can be seen as a tool that aids the visitor in making connections to the history represented, in a meaningful way. The data collected in Case Study One, shows positive visitor responses to the use of VR, in this space. Visitors articulated that they perceived the technology to be a useful tool in communicating this DDH information by helping them ***connect***, and ***understand*** this story. This is also seen in the expression of *"Knowledge Emotions"* and direct statements from respondents that champion VR as an educational tool. These aspects can be connected to information seeking and information use behaviors, leading to a bridging of the information gap. Where *"Knowledge Emotions"* are believed to represent a desire

for engagement,[243] and development of knowledge is articulated as increased understanding, the "connection" which VR facilitated (according to the respondents) can be described as a means of access to information. Being able to access contextual information which brings a personal element to the story allows for meaning-making to occur. As the visitor is able to witness this oral history, the visual immersive experience that VR provides effectively fills in the gaps which could be difficult to imagine otherwise, therefore the visitor's preconceived perception of the physical space represented, is no longer the main factor in building that knowledge.

In addition to the perceived positive effect that VR had on the visitors' educational experience, emotional responses were also connected to the immersive nature of VR for the visitor. Emotions were articulated in a number of ways in the natural language responses. The ability of VR to provide access or even promote emotional responses were seen in *"Cognitive"* expressions of empathy. Recognition by the visitor of the ability that VR technology has to promote an emotive response supports the notion that the visitor perceives the experience as a point of access to these emotions which, in turn, help build and support a feeling of connection.

[243] Paul Silvia, "Knowledge Emotions: Feelings That Foster Learning, Exploring, and Reflecting," Noba textbook series, 2021, https://nobaproject.com/modules/knowledge-emotions-feelings-that-foster-learning-exploring-and-reflecting.

4.4 Case Study Two: "The Tower of Faces": United States Holocaust Memorial Museum, Washington DC.

4.4.1 Description of the Exhibition

Figure 15 Visitors in the Tower of Faces (the Yaffa Eliach Shtetl Collection), US Holocaust Memorial Museum[244]

During "The Tower of Faces" exhibition, visitors come face to face with photographs of a single Jewish village that was destroyed during the Holocaust. The exhibition features the Yaffa Eliach Shtetl Collection and spans three stories of the museum building. The collection depicts residents of Eishishok, Lithuania; a Jewish community that existed for 900 years which was

[244] Visitors in the Tower of Faces (the Yaffa Eliach Shtetl Collection), U.S. Holocaust Memorial Museum[244], Photo by Max Reid. Available at: https://collections.ushmm.org/search/catalog/pa1138417

massacred by an SS mobile killing squad in 1941.[245] The collection is comprised of images showing the residents in their everyday lives, prior to the massacre. There is little additional information provided regarding the persons featured in the photographs, with the individuals' names and stories remaining largely untold.

Figure 16 View a section of the Tower of Faces (the Yaffa Eliach Shtetl Collection), US Holocaust Memorial Museum[246]

[245] *United States Holocaust Memorial Museum on Facebook Watch*, accessed April 17, 2022, https://www.facebook.com/holocaustmuseum/videos/spanning-three-stories-the-tower-of-faces-is-an-iconic-museum-display-that-featu/10153231518587677/.

[246]

Figure 17 A detail from the Tower of Faces (the Yaffa Eliach Shtetl Collection), US Holocaust Memorial Museum[247]

AR was implemented through a smartphone application, enabling the visitors to use their own devices to reveal more information about the individuals, and how the Holocaust impacted their lives. The USHMM (United States Holocaust Memorial Museum) states that the purpose of implementing AR is as follows:

"This test project is part of the Museum's commitment to helping people connect to and understand this history in ways that are relevant to them."[248]

The Holocaust Museum decided to use AR after collecting feedback from the visitors regarding what visitors stated would aid in processing and understanding the material exhibited. Prior to the addition of AR, the curatorial staff decided to include little to no text, focusing on the volume of available photographs, representing and emphasizing the scale of people affected by the Holocaust while still endeavoring to humanize the victims. The implementation of AR

[247] "A Detail from the Tower of Faces (the Yaffa Eliach Shtetl Collection) in the Permanent Exhibition at the U.S. Holocaust Memorial Museum. - Collections Search - United States Holocaust Memorial Museum," accessed April 17, 2022, https://collections.ushmm.org/search/catalog/pa1159471.
[248] https://www.facebook.com/watch/?v=559679607795060

enabled visitors to view and learn more in-depth and personal information about the people depicted within the exhibition.

Figure 18 Visitor using the AR technology in The Tower of Faces Exhibition[249]

This data set consisted of two semi-structured interviews with Key Informants: *Interviewee 1*, the Director of Future Projects, and *Interviewee 2*, Prototype Developer and Researcher on the Future Projects team. The interviews focused on the museum professionals' findings when

[249] *United States Holocaust Memorial Museum on Facebook Watch.*

assessing the visitor feedback data, which was collected post-exhibition, observations of visitors during their time within the exhibition, and focus groups held at later dates.

Professionals were chosen based on their involvement in the development of the exhibition, the implementation of AR in the exhibition, and the collection of feedback from visitors. Interviews were used to gain insight into the museum professionals' interpretation of the visitor feedback which they collected.

4.4.2 Process of data collection within the museum

The data discussed during the interviews with Director of Future Projects and the Prototype Developer, was initially collected by USHMM, during a series of focus groups and surveys completed by visitors, and observations conducted during the museum experience. The survey template and findings can be found in Appendix Two. The focus groups explored what the visitors would like to see in the exhibition in order to make them feel more connected with the people depicted and the history surrounding the display. This supported the addition of AR as a means to engage with the exhibition. Surveys were completed post-exhibition, which were also complemented by focus groups held at a later date. These were expanded upon at a later date, which enabled the visitors to fully process and articulate their responses. Due to the museum's restrictions on sharing personal data, this sample consists of visitor feedback as communicated by both interviewees. This has been analyzed as secondary data in a manner which provides context to the responses discussed during the interviews and how this data was interpreted by the museum staff.

4.4.3 Presentation of Data and Results of the Analysis

Five points of data collection were implemented by the Future Projects team. Initial data collection followed a snowball sampling methodology. This was sparked by previous visitors expressing a desire, to gain more information regarding the people depicted. As the majority of the original visitors' suggestions and questions pertained to this aspect, a focus group was formed with the aim of assessing how visitors believed that the "*Tower of Faces*" exhibition could be built upon, and leveraged in order to increase visitors' engagement. Feedback supported the idea of AR implementation providing additional information. These initial points of data collection influenced the decision to evaluate how AR potentially changed visitor interactions. The initial points of data collection, completed by USHMM, were discussed during the semi-structured interviews, through the lens of the research questions detailed in this study. These five areas of focus allowed for secondary analysis, hinging on the museum professionals' interpretation of the data they collected.

4.4.3.1 RQ1: What role do immersive technologies play in the visitor experience of Difficult History Museum Exhibitions?

RQ1.1: Did the visitor find the exhibition useful in communicating difficult content?

The visitors gave overwhelmingly positive feedback on the AR technology. Statements such as "helped me connect" and "helped me understand" were used repeatedly by the visitors, ostensibly indicating that the ability to engage with the exhibit was increased through AR implementation. The quantitative data collected by the Future Projects team during the exploration phase shows that 75% of visitors engaged with three or more of the ten photographs which utilized

AR and that 25% viewed six or more. This showed a high level of interaction and supported the further development of AR within the exhibition.

When this issue was discussed with the Director of Future projects, he noted that during the prototype testing, visitors viewed "the majority" of the photographs with the AR component. During this interaction, there appeared to be increased discussion between visitors, which led to a longer period of time within the exhibition itself. This was also supported by the Prototype Developer, who commented that visitors, on the whole, spent more time within the exhibition overall as well as practicing intergenerational information transfer between guests, which appeared to be more in-depth than what had been previously seen before the implementation of AR. The Prototype Developer specifically commented that:

> *We saw visitors engage and share devices with each other and move through the exhibition by themselves. It was what they talked about when they were together which changed.*[250]

This begins to address the concepts of collaborative learning, shared understanding, and discovery. These information interactions have been shown to increase information retention, as well as to encourage greater levels of interest in the subject matter.[251]

RQ1.2: Does the visitor express growth of knowledge?

Creating collaborative spaces for discussion has been seen to increase the ability to learn in informal environments.[252] When dealing with information that is primarily focused on personal,

[250] Prototype Developer for Future Projects, Interview Two. (time stamp)
[251] Robinson, "Immersive Information Behaviour."
[252] Jari Hirvikoski, "How AR Content Can Bring Value to Museums : Concept Design for an Educational AR Game about the Fire of Tampere in 1865," fi=AMK-opinnäytetyö|sv=YH-examensarbete|en=Bachelor's thesis|, 2021, http://www.theseus.fi/handle/10024/493813.

social, and political events, this can be seen to spark discussion, and collaborative thinking, and therefore lead to connections being drawn between historical and current events. This was seen during observations of the visitors. Prototype Developer commented that both collaborative and individual experiences were seen, similar to that which was observed prior to AR implementation.

> *[…] That being said that when people were using it as an individual, they would often share the AR with their family members. So even though we were giving the phone to one person, one of the things that we saw was that people wanted to share the stories with the people that came with. So we didn't see any problems specifically, but we did see some ways that people seem to want to share it back in to the larger experience that they were having.*[253]

One of the significant differences noted by the interviewees was that of increased internalization of the exhibition content, providing a more immersive experience. Visitors were reported to comment on reflections of their own lives, not just with reference to the nature of the "family photograph"-type images but also in the way the people depicted had similar lives up to the moment the community was destroyed.

"When asked, visitors reported that they saw similarities and reflections of their own families in the content provided through AR."[254]

Within the themes outlined during data reduction,[255] these collaborative information experiences can be described as *"Cognitive responses,"* specifically those containing elements of *'cognitive empathy,'* and recognition of current '*sociopolitical*' relevance. As discussions of the similarities between visitors' home lives and the day-to-day lives of the persons depicted were observed by museum staff, it is also possible to categorize these responses as having an Affective

[253] Prototype Developer for Future Projects, Appendix Two. "Interview Two".
[254] Prototype Developer for Future Projects, Appendix Two. Interview Two.
[255] Section 4.2

element. As the visitors were discussed as having reported seeing reflections of their own families within the exhibition content these responses also fit the *"Personal/ Identity building"* category.

The use of AR can increase engagement and spark the senses in a way that aids in information transfer and allows for meaning-making to be encouraged in a more adaptable and personal manner.[256] This increased engagement with both the information and other visitors signifies the importance of curiosity, novelty, and fun in serendipitous information behavior. Comparing exhibitions that deal with difficult histories through the use of different mediums provides an opportunity to engage directly with visitors regarding how they believe the technology has impacted how they understand the information presented.

The immersive nature of AR provided a more engaging experience, therefore making it more likely to be internalized and retained by the visitor. The use of AR in education highlights its ability to provide gateways to the formation of new knowledge in people holding a wide range of prior knowledge, literacy levels, and cultural capital. The concept of cultural capital is well known in museum studies and has been developed since Pierre Bourdieu's pioneering visitor-focused research in the 1960s.[257] Despite being revisited by a number of different scholars since its initial publication, the basic concepts which Bourdieu outlines have remained fundamentally unchanged. This was seen by USHMM in the avenue which AR provided for inter-generational information sharing. When asked if this was witnessed in relation to the use of AR the Director of Future Projects stated:

> *I think so, and it went both ways. We saw people who wanted to show what they were looking at to their children, and we saw people who were younger showing it with sharing it with other people as well. So, we weren't really focusing on that, but it was definitely*

[256] Jung et al., "Effects of Virtual Reality and Augmented Reality on Visitor Experiences in Museum."
[257] Fyfe and University, "Reproductions, Cultural Capital and Museums: Aspects of the Culture of Copies."

> *a kind of an emergent kind of question about how people were sharing it among the groups and who their groups were. And those kinds of things were certainly really interesting and worth more time. […] It's become a bit of a theme, actually, a, the idea of people reading to each other, and what does that mean when you have that moment and sharing it with someone else. So, this was something we so totally saw with augmented reality.*[258]

The inter-generational transmission of knowledge provides a framework within which visitors situate themselves. This framework or level of personal awareness is the bias that the visitor brings with them to the museum. The designing of interpretation that can reach across these socially-constructed identities and boundaries has been an ongoing challenge for the museum professional. These levels of cultural capital function on a scale and can be mapped to levels of comfort in the museum environment and informal learning environments. When looking at AR as an educational tool that has the ability to reach across these boundaries, it is useful to visit research produced by the field of education.[259]

'Emotional empathy' (as described in Case Study One) was not the focus of visitor responses within the evaluation of AR. According to the Director of Future Projects, "the difference between responses to the exhibition with and without using AR was more related to the connection and ability to comprehend the events."[260] This was supported by the Prototype Developer when they noted that, "Visitors focused on how the technology helped them, not really what the history made them feel. There were some visitors who commented on how upsetting the event was, but it wasn't different from what we had seen before AR."[261]

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[258] Director of Future Projects, Appendix Two: "Interview One".
[259] Tesolin and Tsinakos, "Opening Real Doors: Strategies for Using Mobile Augmented Reality to Create Inclusive Distance Education for Learners with Different-Abilities."
[260] Director of Future Projects. Appendix Two: "Interview One".
[261] Prototype Developer for Future Projects, Appendix Two: "Interview Two".

The ability of AR to engage visitors was the primary focus of the focus groups and surveys. This led to the visitors expressing more *"Knowledge Emotions"*, and *"Cognitive Empathetic Responses,"* through the lens of the opportunities which AR technology provided. Specifically, these were reported to pertain directly to the ability of AR to aid in information transfer, and promote visitor learning through novelty, curiosity, and serendipitous interactions.[262] The positive reaction to the use of AR and the consistency with which the technology was engaged with allows for the conclusion that AR (in this case) provided more points of interaction between the information depicted and therefore promoted a higher level of understanding. Both the Director of Future Projects and the Prototype Developer commented that they did not receive any negative feedback on the technology or the information which was depicted. Empathy, in general, was shown, as it had been in the past, although greater time was spent in the exhibition, which created more opportunity for connection with the presented history.

RQ1.3: Does the visitor express an interest in further learning post-exhibition?

"Further learning" has been defined in this study as seeking out other exhibitions or knowledge on the subject showcased in the exhibition chosen for analysis. As it was reported that the visitors did not communicate a desire for this, and there is no way for the museum to examine the existence of this behavior within the bounds of their research, this cannot be analyzed thoroughly at present. However, it is possible to discuss the reported enthusiasm, expressed for accessing the information via AR.

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[262] Naresh Kumar Agarwal Agarwal Naresh, "Towards a Definition of Serendipity in Information Behaviour," *Information Research* 20, no. 3 (September 15, 2015), http://www.informationr.net/ir/20-3/paper675.html#.WmIfBiOZO9Y; Tesolin and Tsinakos, "Opening Real Doors: Strategies for Using Mobile Augmented Reality to Create Inclusive Distance Education for Learners with Different-Abilities."

Although the expression of an interest in further learning was not directly addressed by USHMM during their research, some of the responses which they reported can be analyzed, within the emergent theoretical framework, for the existence of an interest in further learning post-exhibition. USHMM reported that expressions of connection to the history, and enthusiasm for the technology were vocalized. The Prototype Developer commented that "the word powerful came up a lot."[263] The existence of *'knowledge emotions'* is also seen in a promotional which was video[264] discussed with the Director of Future Projects:

> *We asked for permission from some of the student groups to record on video. […] Our marketing department did a little kind of blurb about this project early on, and there was a really great quote from a student trying to describe how the augmented reality helped them connect to the individual story and the person in a different way.*[265]

This video shows evidence of the expression of *"Knowledge Emotion,"* as well as the ability of AR to increase the perceived connection between visitor, and information. [266]

[263] Prototype Developer for Future Projects, Appendix Two. "Interview Two".
[264] *Augmented Reality: Tower of Faces*, accessed April 20, 2022, https://www.facebook.com/holocaustmuseum/videos/559679607795060/.
[265] Director of Future Projects, Appendix Two. "Interview Two".
[266] *Augmented Reality*.

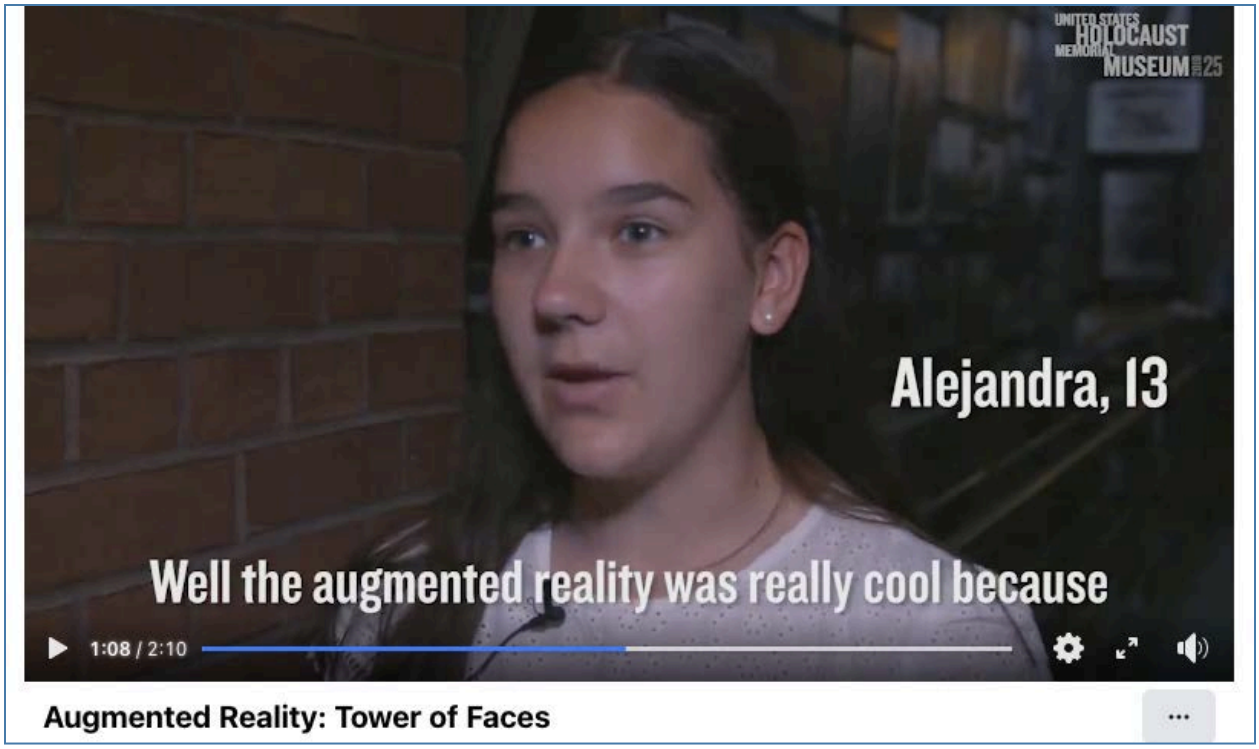

Figure 19 Still from a promotional video showing student responses to AR

The use of the word "cool" is described by Silvia as one of the indicators that knowledge emotions are present.[267] Therefore, it can be deduced that *"Knowledge Emotions"* were articulated in these instances. As *"Knowledge Emotions"* have been linked to a desire or drive to seek out more information, these responses do have implications for further learning.[268] This is specifically in relation to experiences with AR and does not speak to how actively these experiences would be sought out.

[267] Silvia, "Knowledge Emotions"; P. Silvia, "Confusion and Interest: The Role of Knowledge Emotions in Aesthetic Experience.," 2010, https://doi.org/10.1037/A0017081.
[268] Silvia, "Knowledge Emotions"; Silvia, "Confusion and Interest," 2010.

4.4.3.2 RQ2: How do visitors respond to immersive representations of difficult histories?

RQ2.1: How do visitors express emotional responses to exhibition content?

This was not directly addressed by USHMM in the exit survey or interviews with visitors, however, it is possible to deduce from both interviews that emotional responses were communicated and observed in, but not limited to, the AR experience within the *"Tower of Faces"* exhibition.

> *I mean, people are having a pretty emotional experience to begin with, and so […] anytime we talk to audiences within the space, sometimes people don't seem to be having a very emotional experience, but when you stop and you ask them and they start to think about it, then they will have a very emotional response. So just the opportunity to reflect in an interview is something that shows some of that emotion to come out. So, it's hard to detect an increase in that because it's very emotional to begin with. But the responses are very emotional, and people do seem to be expressing connection to these photographs, as people and thinking about them as individuals and thinking about them as victims of the Holocaust.*[269]

This is not attributed solely to AR in this case. Rather, the emotional nature is present throughout the museum. What was seen was a greater understanding of the event and the outcome for the people depicted.

> *And the AR was specifically trying to provide that information for some of the people. […] So that suggests that we were enhancing the kinds of experiences we were having, because it was answering the kind of questions they were already asking without it. And that people would talk about specific photos in a slightly different way.*[270]

When emotional responses were discussed by USHMM and visitors, they were expressed as emotional empathetic responses, (as defined in case study one).

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[269] Director of Future Projects, Appendix Two. "Interview One".
[270] Prototype Developer and Researcher for Future Projects, "Interview Two", Appendix Two.

> *Overall. It was very positive, but I mean, people were experiencing sadness, you know, and they were having an emotional response and I think they, they did, they, they were very appreciative of being able to have that experience, but it, you know, Brought out emotions. There are some people who we, we talked to who, you know, had tears in their eyes as we were talking to them about what they had had experienced with the AR which is, you know, it's difficult to know that you're, I guess, putting somebody into an emotional situation and you, you never know how much it's going to affect somebody, but I think people were still overall, glad that they were able to have that experience and to know more about the people in the photos, the 10 positive in this context, very much more about like, did the exhibition do the thing that you wanted it to like, feedback about wanting to know more about this, like feeling more connected to the history of it. Isn't part of their own family life, that sort of thing.*[271]

The expression of these emotions was reported to be influenced by the external prompts given by the museum staff. This is not to say that emotional responses do not occur across the museum unprompted, merely that emotions relating the AR content was communicated due to these prompts. During the interviews USHMM discussed that although they did not witness an increase in the emotional responses of the visitors, there was self-reported increase in the depth of understanding and connection. This was communicated in ways which includes evidence of "*Knowledge Emotions*." According to the Prototype Developer for Future Projects, "the word 'powerful' came up a lot, a sense that it was some, it was a more emotional way of experiencing that space."[272] This was seen to be followed by detail of increased connection to history presented on an intimate level with the specific person depicted.

> *So it seemed to be enriching. Like they would talk, instead of talking about: 'oh, well, this photo was, interesting to me because it was a picture of a baby, and I have a child, and*

[271] Prototype Developer and Researcher for Future Projects, "Interview Two", Appendix Two.
[272] Prototype Developer and Researcher for Future Projects, "Interview Two", Appendix Two.

that's important to me.' They would talk about the specifics of a story, of an individual. So they were remembering that this is a person, who was an actor, and she owned a hotel, and they would talk about that part; the particulars of the story, in a way that suggested they were, they were going deeper into the stories.[273]

The deeper connection expressed by visitors is not evidenced to encourage a drive for further learning specifically. However, it can be deduced, through the presence of '*knowledge emotions'* in visitor responses, and the observed increased time spent engaging with the exhibition, that there is a drive to engage with AR technology. This drive to seek out other AR experiences consequently fosters the transfer of information which can promote personal connection to difficult historical topics.

RQ2.2: How do the visitor's emotional responses relate to the technologies used to deliver the exhibit?

The USHMM recorded a number of positive reactions associated with the application of AR, to the exhibition. This was reported to be seen mostly in relation to the ability of the technology to help the visitors form a connection to the history presented.

Two things suggested that AR was enhancing the experience. One was that, one of the questions people would ask without AR was: 'I wish I knew more about the history.' [Without AR] There's nothing that tells you, who they are. […]. So, in some sense, the AR content was being driven by the questions people were asking outside of AR. So: 'who is this person? What happened to them?' and the AR was specifically trying to provide that information for some of the people. And so, the idea suggests that we were enhancing the kinds of experiences visitors were having, because it was answering the kind of

[273] Prototype Developer and Researcher for Future Projects, "Interview Two", Appendix Two.

questions they were already asking without it. And that people would talk about specific photos in a slightly different way. So, it seemed to be enriching"[274]

As discussed, there appeared to be little difference between the specific emotions expressed by visitors pre and post AR implementation. The lack of alteration in the emotions expressed by visitors does not denote a lack of any of the aforementioned Affective response types, rather; AR was observed to provide a way for the visitors to connect personally with the people represented in the exhibition. As the implementation served to aid increased engagement and personal connection it can be viewed as a ***conduit*** to Affective response in this instance. The exhibition was described by the Prototype Developer as an already *"visually arresting place"* the sheer scale of the exhibition presents the scale of the Holocaust to the visitor in a visceral manner with the intention of creating Affective response prior to the implementation of AR.

The still below (Figure 20), shows the beginning of a quote where the student reported: "The augmented reality definitely helped me understand because a picture says a lot of things, but having the words to go with the picture just made the experience ten times better."

[274] Director of Future Projects, "Interview One", Appendix Two.

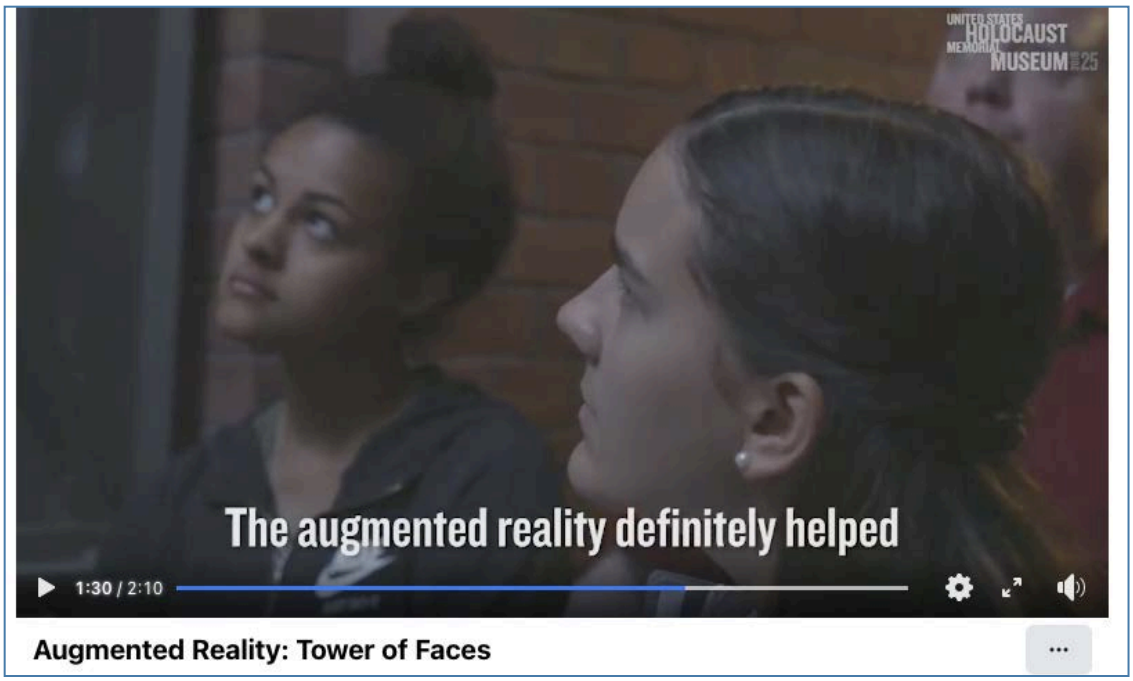

Figure 20 Still from a promotional video showing student responses to AR[275]

Although the importance of interpretation in museum display is by no means a modern, innovative or exciting revelation. The role that AR played in the interpretive aspect of display is something unique to the representation of difficult and dissonant social histories. The addition of information which fosters connection between visitor and victim was able to be provided without impeding the Affective approach to representation of scale effectively creating an information rich, accessible and engaging experience.

[275] *Augmented Reality*.

4.4.4 Summary

As AR can be seen to grant a visitor an opportunity to examine further information, it can be seen from the study completed by the Future Projects team at USHMM to have increased the ability of the visitor to ***understand*** and ***connect*** with the history, which are vital aspects in informal learning environments. This was reported and observed to be evident in two prominent ways. Firstly, the element of engagement that the application of AR technology fostered. As the majority of visitors who were given the opportunity to use AR did so with an element of enthusiasm, (according to USHMM staff), AR can be seen, in this case, to promote information interactions between exhibition and visitor. Secondly, the ability of AR to facilitate the addition of more in-depth information, without altering important elements of the physical exhibition. Therefore, within this case study, AR technology is seen as a faciliatory tool for additional information, which in turn, allowed visitors to connect more with the stories told.

Within the context of the themes and categories that emerged during data reduction, these two factors are expressed as *"Sociopolitical", "Personal/Identity Building," "Knowledge Emotions'* and to some extent, "*Cognitive Empathy*." These changes were perceived by the interviewees, to be related to the increased time spent in the exhibition, encouraged by AR. This highlights the reported expression of *"Knowledge Emotions"* as the primary Affective response connected to increased information interaction and knowledge transfer. The overall positive response to the addition of AR, and the apparent success of this project, positions AR as a practical means for the museum to influence information interactions and behaviors. Providing a way for visitors to bridge the information gap, and contend with "otherness", by witnessing and reporting personal connections to histories which are not their own.

5.0 Cross-case Analysis and Discussion

5.1 Introduction

'This section will discuss both the data set from Case Study One and that of Case Study two in conjunction with one another. Providing a critical analysis of the data as it relates to the research question, working toward satisfying the main aim of this study. This will be approached by first addressing the research questions, then discussing the themes which are seen to have arisen in both case studies. A comparison of the two case studies will allow for some insight to be gained into how AR and VR are received as conduits of information transfer and consumption, as well as the visitor and museum professionals' views on the suitability of AR and VR in the display of DDH.

5.2 Discussion of the Research Questions

5.2.1 RQ 1 What role do immersive technologies play in the visitor experience of difficult history museum exhibitions?

Tilden (1957) expressed the importance of personal perception, stating that "the individual is present in his interpretation by means of coherence".[276] This text, now considered a cornerstone in the interpretation of social history, and articulates the importance of the personal experience

[276] Tilden, *Interpreting Our Heritage*.

within information interactions.[277] According to Tilden "any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile."[278]

The idea that interpretation is a personal experience, which defines itself regardless of the mode of transmission, is building upon meaning-making theory.[279] This terminology is used regularly throughout museum studies literature and can be connected to Pierre Bourdieu's early work on the concept of cultural capital.[280] The concepts highlighted here are reflected in studies completed by Dervin in relation to Information Behavior, specifically "sense-making".[281] Data from both case studies supports the notion of sense-making as a perceived benefit of both VR and AR technology. As visitors in the Case Study One data set expressed themselves both *Cognitively* and *Affectively* there is evidence within the openly coded themes of: "*Personal Connection/Identity Building"*, *"Sociopolitical*" connections, and *"Cognitive Empathetic"* expressions, that there is a consensus that the technology itself is aiding in information transfer and consequently increased understanding and knowledge.[282] Figure 11[283] shows that out of the 5489 responses, (where the visitors were allowed to select more than one response), approximately 5140 signified that VR aiding in sense-making through a perceived increase in connection and understanding. Out of 5140, 1900 selected the option stating that VR allowed them to feel like they visited the location,

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[277] Dumbraveanu, Cracun, and Tudoricu, "Principles of Interpretation, Tourism and Heritage Interpretation – the Experience of Romanian Museums."
[278] Tilden, *Interpreting Our Heritage p.18*.
[279] Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design"; Diamantopoulou, Insulander, and Lindstrand, "Making Meaning in Museum Exhibitions."
[280] Jo-Anne Dillabough, "Class, Culture and the 'Predicaments of Masculine Domination': Encountering Pierre Bourdieu," *British Journal of Sociology of Education* 25, no. 4 (September 1, 2004): 489–506, https://doi.org/10.1080/0142569042000236970.
[281] Brenda Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design," in *Information Design*, by Robert Jacobson (Cambridge, MA: MIT Press, 1999).
[282] Figure 10: "*Question Two: What impact did experiencing the story in VR format have on you?*"
[283] Figure 11, Chapter 4.

1650 that VR made them feel connected to the story, and 1590 that VR helped them gain a deeper understanding of the story. This is further supported through quantification of the long-form answers to both survey Question 2 and the "Additional Comments" section. Figure 21 shows that the majority of responses fit into the axial coded themes of *"Affective"* and "*Cognitive*".

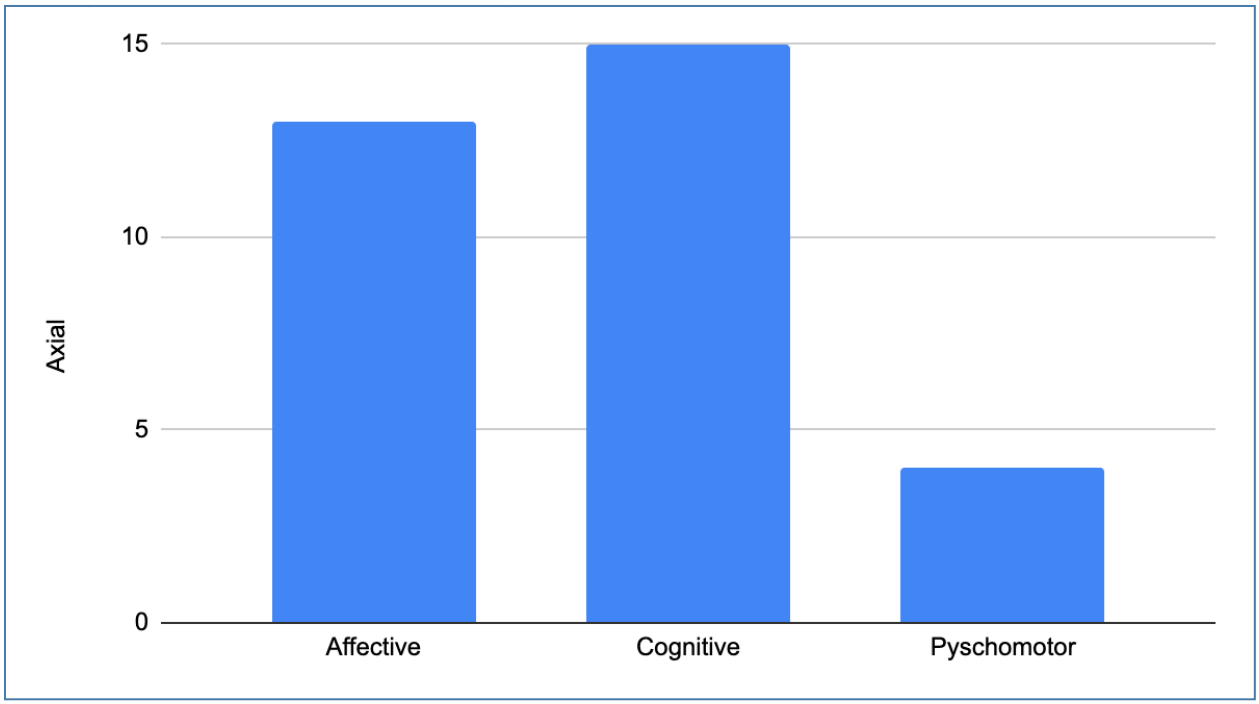

Figure 21 Axial Coding of Natural Language Responses to Question 2

Figure 22 shows how the *"Affective"* and "*Cognitive*" responses are distributed at the open level of coding shows that long-form answers to *Q2: "What did experiencing the story in VR format have on you?"* 42.8% of respondents discussed intellectual access and presented an opinion on the technology, (21.4% each). As the visitors were asked directly about the technology, the responses being focused on VR is not a particularly noteworthy element in itself. The nature of these comments does offer insight into how visitors perceived the role of VR in this instance. Statements such as, "It deepened the intensity of the message", "presentation in this mode, VR, is

very powerful and moving", and "made the story more real and present" suggest that the visitors believed that using VR in this context was beneficial to their experience.[284] When discussing *"Intellectual Access"* visitors reported that: "[VR] grabbed my attention and made me focus", "a 3D visualization was incredibly helpful", and gave them: "a greater understanding of VR as a way to preserve digital memory".[285]

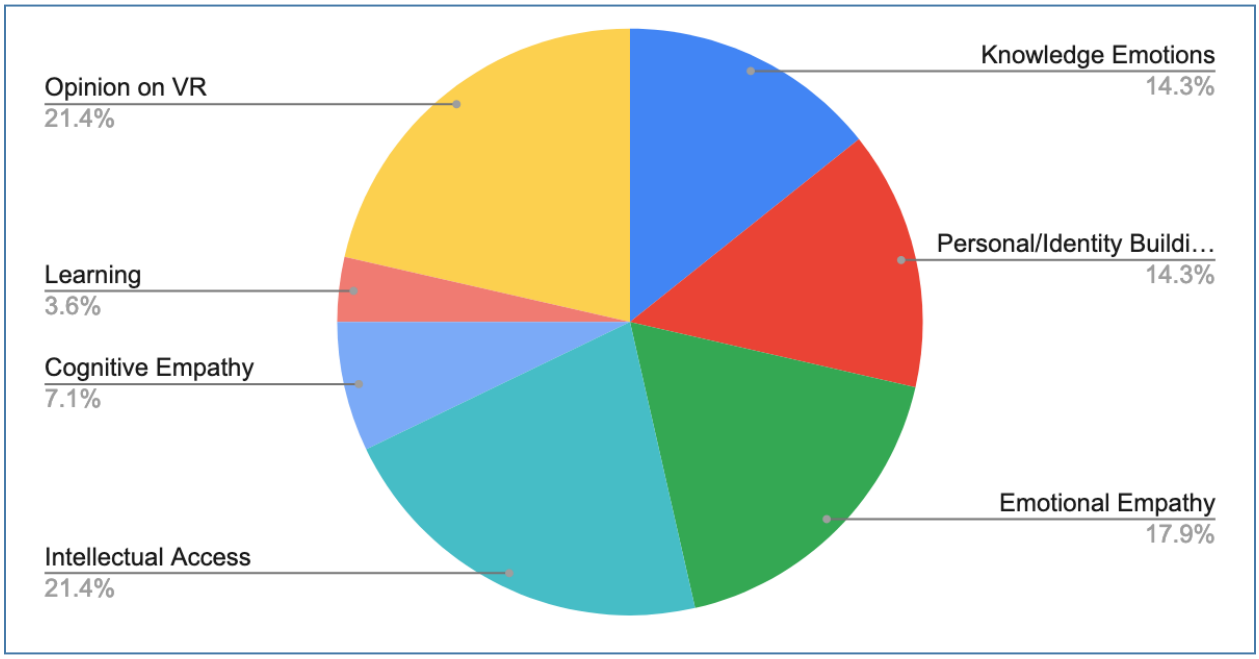

Figure 22 Distribution of Affective and Cognitive Responses to Question 2 –Visualization of Open Coding

In Case Study One visitors discussed how VR made them feel like they were there and that they were able to visualize the events and experiences of Pinchas Gutter. This is also supported within the "Additional Comments" section at the end of the exit survey. Here respondents

[284] Appendix Two: "Q2 Additional Comments". I1, I3 & I6.
[285] Appendix Two: "Q2 Additional Comments". F1-3

articulate all three types of emotional response (*Knowledge Emotions, Emotional Empathy* and *Cognitive Empathy*) and connect it to their evaluation of the technology used. For example:

> *That was the most EXTRAORDINARY thing I have ever seen! I felt like I was really there! It is an experience that I will never forget! I felt his sadness and pain. Thank you for providing this opportunity to see this.*[286]

And:

> *I would like to thank Mr Gutter for his sharing and production team to do this project. But I think VR technology is an interesting format to present the past and it should be used for more ppl to see and it should also be complemented with different forms of presentation […].*[287]

The latter example is representative of many direct evaluations of the use of VR, within the display of Difficult and Dissonant social histories. Providing a level of access to the vital objective, sensory and environmental information, is seen to encourage deep understanding of the subjective experience. These connections are also reported to be experienced by visitors in Case Study Two. USHMM reported that there was an "overwhelmingly positive reaction" to the addition of AR and that visitors reported that its ability to communicate the additional information "helped them understand and relate"[288] to the history more closely.

The concept of sense-making is based on the knowledge that each person relates to information on an individual basis, in order to 'build bridges' which satisfy information need by drawing connections to current knowledge, knowledge gained and experience.[289] This is

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[286] Appendix One: "Additional Comments" D1, C31 and A41.
[287] Appendix One: "Additional Comments" K12 and C15.
[288] Prototype Developer and Researcher for Future Projects: "Interview Two" .pp
[289] Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design"; Brenda Dervin and Patricia Dewdney, "Neutral Questioning: A New Approach to the Reference Interview," *RQ* 25, no. 4 (1986): 506–13.

particularly relevant when dealing with DDH. As these politically charged topics tend to create polarizing divides at the extremes and a lack of interest when people do not view themselves as part of the issue or how it relates to their own life. Bridging this gap can be approached as an information behavioral problem. As cognitive dissonance is defined as: "psychological conflict resulting from incongruous beliefs and attitudes simultaneously."[290]

The term, which is more commonly used in the field of psychology, is directly connected with receiving new information, when that information is at odds with the receiver's personal views or beliefs. Within the context of DDH this could take the form of challenging the visitor's personal views on politics, social dynamics, or previously taught historical information from what was believed to be a reliable source. As story-telling or meaning-making are prominent principles used in the creation and design of interpretation and display in museums, personal accounts are commonly used to portray events, with the intent of providing the visitor with an access point to factual information. This is specifically relevant when presenting social histories as they are human-centered realities with a heavy focus on oral history.

For the purpose of this study, the idea of cognitive dissonance is of particular interest when considering "otherness". In both case studies, the majority of visitors reported that they had no connection to the Holocaust (or any other genocide: Case Study One). As the visitor is coming from a place where they do not believe to be represented in the exhibition, what is represented can be defined as "other" to the visitors' perception of self.

[290] Merriam-Webster, "Cognitive Dissonance Definition & Meaning -," n.d., https://www.merriam-webster.com/dictionary/cognitive%20dissonance.

The existence of parallel lines in HII and museum-focused academic thought is evidence of the role which Information Use Behavior has on knowledge development and its place within the analysis of the data.[291]

Connecting this back to HII theory, Kundu (2017) describes Dervin's theory "as a set of assumptions, a theoretic perspective, a methodological approach, a set of research methods, and a practice' designed to cope with information perceived as a human tool designed for making sense of a reality assumed to be both chaotic and orderly."[292] Sense-making can be described in the context of this study as 'transformative'. As assumptions brought to both exhibitions by each visitor's lived experience and subsequent biases are reported as being actively built upon, it is possible to discern that the data shows development of knowledge as a result of the implementation of both AR and VR technology.

5.2.2 RQ 2: How do visitors respond to immersive representations of difficult histories?

The discrete themes and overarching categories that where initially developed during the coding of Case Study One data and revealed that VR was well received and successful in providing an emotive and reflective experience. This is supported by the way in which more immersive experiences provide a more information rich environments.[293] As previously stated the affordances

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[291] Lyn Robinson, "Immersive Information Behaviour: Using the Documents of the Future," *New Library World* 116, no. 3/4 (March 9, 2015): 112–21, https://doi.org/10.1108/NLW-07-2014-0093.
[292] Dipak Kumar Kundu, "Models of Information Seeking Behaviour: A Comparative Study.," *Methodology* 7, no. 4 (2017): 393–405.
[293] Maria Roussou, "Immersive Interactive Virtual Reality and Informal Education," in *Proceedings of User Interfaces for All: Interactive Learning Environments for Children*, 2000, 1–9; Bian Wu, Xiaoxue Yu, and Xiaoqing Gu, "Effectiveness of Immersive Virtual Reality Using Head-Mounted Displays on Learning Performance: A Meta-Analysis," *British Journal of Educational Technology* 51, no. 6 (2020): 1991–2005, https://doi.org/10.1111/bjet.13023; Matt Dunleavy, Chris Dede, and Rebecca Mitchell, "Affordances and Limitations of Immersive Participatory Augmented Reality Simulations for Teaching and Learning," *Journal of Science Education and Technology* 18, no. 1 (February 1, 2009): 7–22, https://doi.org/10.1007/s10956-008-9119-1;

of VR to provide contextual, sensory and environmental information situates the visitor "in the history". Starting the 'conversation' from outside of their own reality. Beginning the conversation within the perceived 'real' space where the represented events occurred, can be seen to cause the visitor to connect emotionally, (evidenced by the emotional empathetic responses), and evaluate those responses, (shown by cognitive empathetic responses). This differs when evaluating AR. Here, visitor engagement begins outside of direct interactions with the medium of information transfer (AR). As reported by USHMM, emotional reactions were expressed when the visitors were asked directly how they felt. All variations of emotional expression were still present; however, this occurred after the conversation had been initiated. These conversations took on two different forms: observed conversations and interactions between visitors and those initiated by museum staff.

As stated above visitors responded well to the implementation and use of both VR and AR technology. Overall, the information interactions are relativel7y similar. Visitors articulated how the implementation allowed them to gain a better understanding of the history.

Dumbraveanu et al. (2016) discusses interpretation as part of a process which begins with a relationship to external stimuli. The model above falls in line with this, as different stimuli are provided by each experience. This can also be related research as far back as 2004 when Coren et.al. stated that: "along with sensation, perception and representation, interpretation too is an important step in processing information as part of the communication process." [294]

Robinson, "Immersive Information Behaviour"; George E. Raptis, Christos Fidas, and Nikolaos Avouris, "Effects of Mixed-Reality on Players' Behaviour and Immersion in a Cultural Tourism Game: A Cognitive Processing Perspective," *International Journal of Human-Computer Studies* 114 (June 2018): 69–79, https://doi.org/10.1016/j.ijhcs.2018.02.003.

[294] Coren, "Sensation and Perception."

Processing information is reliant on a number of factors which impact upon interpretation. External stimuli, namely the environment in which the information is presented, and personal perception of the information impact reliance upon how information is interpreted or 'translated' to each individual. [295] Dumbraveanu et al. (2016) further developed Coren's concept, postulating that in order for the interpretation process to take place three important segments are required: first is the "Addresser", secondly the material subject to interpretation (text, object, etc.), and finally the "recipient". This can be seen across both case studies: VR facilitating guidance of the visitor in moving through these elements organically, as one would move through daily life; as opposed to AR, which provides opportunities for the visitor to further engage in this process at whatever level they desire or prefer. The different levels of mediation involved in these exhibitions changes the transfer of information, and consequently can be seen to have different roles within the interpretation of difficult historical content.[296]

Cognitive rigidity (the inability to mentally adapt to new demands or information),[297] has been reported to play a significant role in the ability of people to see expressions and reflections of themselves in presented information.[298] This is not evident in the data, but it is important to

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[295] Dumbraveanu, Cracun, and Tudoricu, "Principles of Interpretation, Tourism and Heritage Interpretation – the Experience of Romanian Museums."

[296] Nils Tallerås and Kim Pharo, "Mediation Machines: How Principles from Traditional Knowledge Organization Have Evolved into Digital Mediation Systems," *Information Research* 22, no. 1 (March 15, 2017), http://www.informationr.net/ir/22-1/colis/colis1654.html.
Tallerås, K. & Pharo, N. 2017. Mediation machines: how principles from traditional knowledge organization have evolved into digital mediation systems. *Information Research*, *22*(1), CoLIS paper 1654. Retrieved from http://InformationR.net/ir/22-1/colis/colis1654.html (Archived by WebCite® at http://www.webcitation.org/6oTPowyn2)

[297] Shuki J. Cohen, "Cognitive Rigidity, Overgeneralization and Fanaticism," in *Encyclopedia of Personality and Individual Differences*, ed. Virgil Zeigler-Hill and Todd K. Shackelford (Cham: Springer International Publishing, 2017), 1–7, https://doi.org/10.1007/978-3-319-28099-8_834-1.

[298] Matteo Cristofaro, "'I Feel and Think, Therefore I Am': An Affect-Cognitive Theory of Management Decisions," *European Management Journal* 38, no. 2 (April 1, 2020): 344–55, https://doi.org/10.1016/j.emj.2019.09.003; Ayşegül Engin, "The Cognitive Ability and Working Memory Framework: Interpreting Cognitive Reflection Test Results in the Domain of the Cognitive Experiential Theory," *Central European Journal of Operations Research* 29, no. 1 (March 2021): 227–45, https://doi.org/10.1007/s10100-020-00721-6; Paweł Jemioło et al., "Emotion

recognize that attendance at either experience signifies an openness to the subject matter on display. This concept is also reflected in Dumbraveanu et al.'s assessment that: "[the] human mind does not process all the information received from the outside, instead it makes a selection, depending on the individual's personal motivations." [299] This fundamental principal that interpretation is fluid and available to everybody is one of the elements in museum interpretation which is played upon frequently in order to curate specific responses.[300] The concept that interpretation itself takes on additional roles, at different points in an exhibition, has special importance when the intent behind it is to trigger certain attitudes or states, among those receiving the message. [301]

In order to understand, memorize and critically analyze a received message, the visitor must feel involved, so that the information provided complements the experience and knowledge which the visitor already holds. Visitors do not want to "listen to words", they want to be "spoken with."[302] This is evident mostly through the data collected pertaining to the VR experience but is still present within the AR environment. It can therefore be concluded that both VR and AR technology, in the opinion of the visitor, allow the visitor to connect to the information in a more meaningful way. Promoting development of the ways in which their own lives, and current affairs

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Elicitation with Stimuli Datasets in Automatic Affect Recognition Studies – Umbrella Review," in *Human-Computer Interaction – INTERACT 2021*, ed. Carmelo Ardito et al., Lecture Notes in Computer Science (Cham: Springer International Publishing, 2021), 248–69, https://doi.org/10.1007/978-3-030-85613-7_18.

[299] Dumbraveanu, Cracun, and Tudoricu, "Principles of Interpretation, Tourism and Heritage Interpretation – the Experience of Romanian Museums." P.60.

[300] Fisher, "Visual Representations and Interaction Technologies"; Kress and Selander, "Introduction to the Special Issue on Museum Identities, Exhibition Designs and Visitors' Meaning-Making"; Mckay, "Affective Communication"; Meyer et al., "From Visualization to Visually Enabled Reasoning."

[301] Dumbraveanu, Cracun, and Tudoricu, "Principles of Interpretation, Tourism and Heritage Interpretation – the Experience of Romanian Museums."

[302] Tilden, *Interpreting Our Heritage*.

can relate to the past; through the provision of contextual sensory information, which trigger emotional expression in a positive manner, despite the traumatic content depicted.

5.3 Interpretation of the Results

It can be seen from the previous analysis that both VR and AR technology was positively received by visitors as a means of communicating additional information which would otherwise be missing from the exhibitions.

Affect studies provides theoretical context for the collected data. In order to do this the following section will refer back to the literature review and draw on specific incidents from across both data sets. This will provide an opportunity to compare how AR and VR changed the interactions between visitor and information. The visual representation below shows how these themes can be seen to relate to one another across the data set.

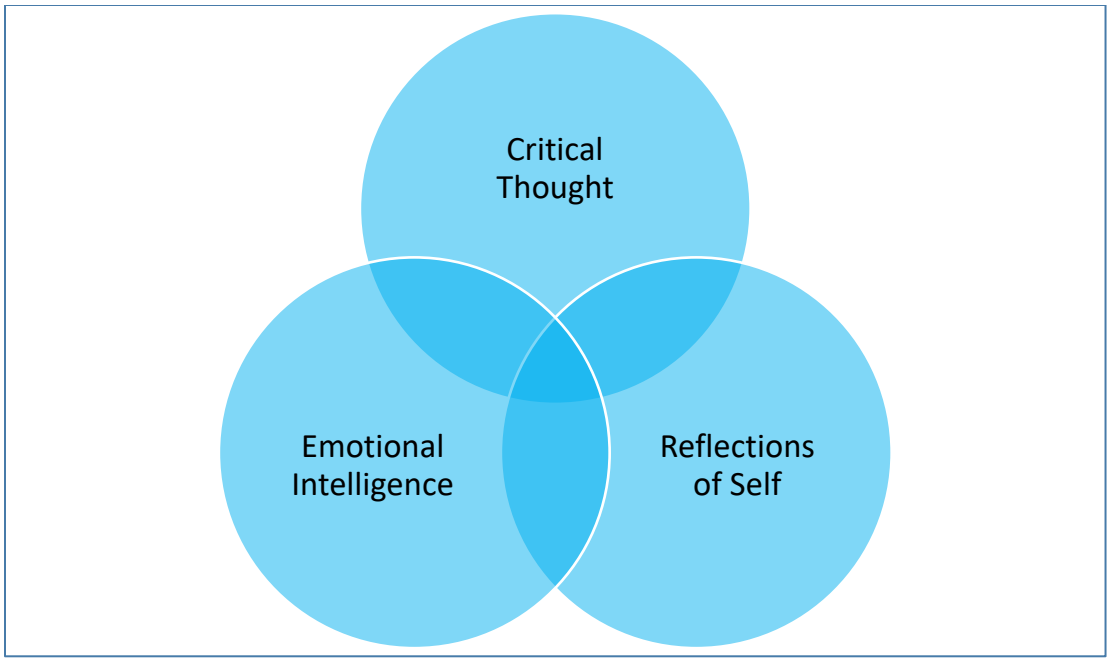

Figure 23 Relationship between themes and main concepts

5.3.1 Reflections of Self

It was found that across both data sets visitors commented that the use of both AR and VR technology helped them connect to the people who were depicted in the exhibition. This is particularly evident in the responses reported in Case Study Two. As *The Tower of Faces* exhibition initially held little interpretation, the photographs which had the addition of AR content provided more personal information on the victims depicted. Visitors responded with comments such as: *"they were just like my family"*, *"it was just a normal day"*, and *"on the first day of school we[…]"* These responses, were observed and discussed with the museum staff, show that the visitors were connecting in a way that humanized the victims further, rather than viewing them through the lens of difference. This is often seen when people are sensemaking in an environment

which emphasizes a marginalized group of people: the visitors, focused on what made them similar, leading to a more empathetic response. This finding is supported in Case Study One through the articulation of how the events depicted in VR can be seen in the visitors' society today. This is also articulated across the three themes presented in Appendix One; namely, affective responses which support the impression that VR promotes the ability of the visitor to see reflections of their own life. Evidence of personal connections being made was expressed in the additional comments, free form response section of the visitor survey. The following examples show how visitors related the content to their own life and identity:

> *I am from South Korea and our country had [a] similar story from Japan. I am sure that I am deeply understand[ing] of those sorry and how they feel. Plus, using [the] VR thing was so nice to emphasize to what they have got.*[303]

From this comment, it is evident that the visitor directly connected the events depicted in the exhibit to their own lived experience. This finding can be seen via responses from other visitors, which presents further evidence in support of the conclusion that a connection has been developed which had not been instigated by other methods of information transfer.

> *Very moving, very real, and sad. It made me reflect and think. I came because I will be visiting Russia and Poland soon. It made the history I have learned more real and personal.*[304]

There are also direct recognitions of the ability of VR to make the experience more personal. This shows that the visitors believed that the technology itself played a vital role in their ability to connect with the information on a personal level, this is also reported by USHMM personnel with the addition of AR.

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[303] Appendix One: "Additional Comments" B2
[304] Appendix One: "Additional Comments" B3, B3, H3, D5 and A 138.

This virtual reality tour was very insightful and allowed me to connect personally to the survivor's story/plight. I have recently lost my grandmother in 2018 July 16th her name was Maxine Wilson and though she was not Jewish she had connected with those who were during her lifetime and had visited this museum a few times in the past. I am a Christian as are my family and grandmother. After viewing this exhibit I must say that this experience resonates within me on a multiplicity of levels. Thank you for sharing this magnificent opportunity with your members and my family we look forward to future event like this high-quality exhibit.[305]

5.3.2 Emotional Intelligence

Emotional intelligence will be defined as expressions of traditional emotion in relation to the viewed past, including but not limited to, recognition of emotional connection to the subject and persons displayed as well as empathetic emotional responses, (those which the victims depicted may have experienced.[306] The discovery of different types of emotional expression became evident through open coding elements of case study one data. The response provided below shows the three types of emotion which were highlighted during open coding which was discussed and introduced in Chapter 4. This model expresses the different types of emotion which provide insight into an individual's affective experience and how it relates to cognitive processes, such as learning, information behaviors, and knowledge production. The example response below includes knowledge emotions and emotional empathy; the way in which the emotional empathy is expressed also allows this response to be categorized as a cognitive empathetic response, (as previously defined in Chapter 4).

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[305] Appendix One: "Additional Comments" B5, and H8.
[306] Peter Salovey and Daisy Grewal, "The Science of Emotional Intelligence," *Current Directions in Psychological Science* 14, no. 6 (December 1, 2005): 281–85, https://doi.org/10.1111/j.0963-7214.2005.00381.x.

That was the most EXTRAORDINARY thing I have ever seen! I felt like I was really there! It is an experience that I will never forget! I felt his sadness and pain. Thank you for providing this opportunity to see this.[307]

This is one aspect which appears to be different within Case Study Two. Emotional response in this case was not observed by USHMM to have been significantly altered by the implementation of AR. Although, it was stated in both Interview One and Two that AR did not appear to hinder emotional engagement and expressions of emotion were observed and communicated when visitors were asked directly to reflect on the content. Emotional responses were reported to include all of the above but the connection to the technology was not seen to increase the intensity of the reaction.

[…]It's hard to detect an increase in that because it's very emotional to begin with. But the responses are very emotional, and people do seem to be expressing connection into these photographs as people, and thinking about them as individuals and thinking about them as victims of the Holocaust. In that way, something that we also noticed is that people, even without the AR already were tuning into the idea that these were victims. They assume that these are people who died in the Holocaust. Although often they don't have a very clear sense of how they might've died in the Holocaust, which is something that the AR also is trying to give them, a little bit more of a clear sense of […] So for example, without AR there are a number of people who are confused, they might assume that they died in concentration camps and in killing centers, because that's kind of the general sense of how people died in the Holocaust.[308]

This reported observation indicates that "conversation" is an important aspect to increased levels of intellectual engagement, emotional response and recognition of emotional response (*Cognitive Empathy*). The observed difference between the ability of AR and VR in relation to

[307] Appendix One: "Additional Comments" D1, C31 and A41.
[308] Director of Future Projects Interview One. Appendix Two

emotional intelligence can be linked to the way in which conversation is derived from use of each technology. Within the context of these two case studies, AR is providing a conversational aspect to the visitor, inciting different types of affective response, leading to critical engagement with the topic and current affairs, and, in some cases, self-assessment and articulation need for change. AR on the other hand is providing a way to display further information which allows the visitors to connect more deeply and understand the events which occurred without taking away from the current, very impactful display. Both of these methods are arguably cultivating increased engagement with difficult topics and providing a way to advance understanding of these events.

5.3.3 Critical Thought

Critical thought has been seen to be facilitated through the technology used. Here, "critical thought" is defined specifically as a process where the visitor moves past a voyeuristic encounter, and exhibits evidence of an analytical appraisal of the violence displayed, connecting the history to personal experience or current events. Thus, removing the information from the intended context and drawing conclusions on the meaning behind the depicted events.[309] The responses which contain an element of critical thought have been categorized mainly within the "Cognitive" theme and its subthemes within the Case Study One data set. The response below is one example of a response which deals with the emotional experience in a cognitive manner, relating it to current

[309] Brad Evans, Terrell Carver, and Inc ebrary, *Histories of Violence: Post-War Critical Thought* (London: Zed Books, 2017); Nikonanou and Venieri, "Interpreting Social Issues"; Charmaz, "'With Constructivist Grounded Theory You Can't Hide'"; "Bourdieu Recontextualized: Redefinitions of Western Critical Thought in the Periphery - Tomasz Warczok, Tomasz Zarycki, 2014," accessed March 14, 2022, https://journals.sagepub.com/doi/abs/10.1177/0011392114523974.

sociopolitical issues, evaluation of the technology chosen and its ability to communicate this history in a more efficient and impactful way than more traditional methods.

> *Although it is hard to walk through this experience, it was incomparable to any other story, movie, or retelling I've ever experienced. Thank you for creating this experience. The whole world should experience this especially the current occupant of the Oval Office.*[310]

Reponses including elements of critical thought, also draw connections between personal belief systems. This is in conjunction with statements which have sociopolitical implications, and articulate a desire for social change. The response below is a particularly interesting example of this. As it sets the personal connection within the visitor's own belief system, in a manner which infers a recognition of similarities between differing religious practices. Instead, it focuses on the space within personal systems of belief, to connect to difficult topics in which direct reflections of the visitors experience and beliefs are not seen. Thusly leading to the expression of a desire for change.

> *It doesn't seem like we are doing much better with the affairs of the world but I believe that we are heading for a God ordained end and I am endeavoring to spread the gospel of Jesus Christ through my words and actions until that day arrives.*[311]

Critical thought with the addition of a desire to inspire change is also seen in the following response which provides an example of inductive reasoning with a view for change, linking back to the role which conversation plays in tackling sociopolitical issues.

> *This exhibit is an imperative experience for everyone. It is an emotionally powerful experience that will forever encourage one to be open to the truth of and deadly impact*

[310] Appendix One: "Additional Comments" C2 and E1.
[311] Appendix One: "Additional Comments" E6.

> *emotionally, psychologically, and physically of racism and of not speaking up and taking action.*[312]

Furthermore, there is evidence of the technology being evaluated as a successful and important method which can spark this conversation and provide an accessible point to begin conversations which otherwise may be deemed as difficult. The response below is one example which provides a visitor's evaluation of VR to provide this aspect.

> *In view of the current president's underlying hate agenda, many times not so hidden, I think it's more important than ever for people to experience this. Today's administration does not inspire empathy, understanding or tzedakah. Most importantly it does not inspire KINDNESS. People need to understand when these traits are missing from a society what the outcome can be...a holocaust.*[313]

Critical evaluation of the technology itself and its potential to create access to difficult historical topics is also presented within the context of "learning". The below examples show that visitors believed that the technology used is a useful tool in communicating this information in a way which allows the visitor to connect more deeply and increases understanding of issues which arise during these experiences.

> *Provided me with a better understanding of the experience. Very emotional. My prayer is for this to never happen again.*[314]

And:

> *Very powerful. Helped to visualize so much. Gave a bit of an understanding of the experience. Can never truly know what it was like, but helped to understand so much of what survivors and esp my parents went through.*[315]

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[312] Appendix One: "Additional Comments" E7 and A108.
[313] Appendix One: "Additional Comments" E10.
[314] Appendix One: "Additional Comments" H2.
[315] Appendix One: "Additional Comments" H10, B14, E24, and K61.

In the case of AR, critical thought through understanding was seen as the main benefit of implementation. This is tightly connected to the ability of the technology to provide access to further and more personal information regarding the people depicted, (as presented above). The element of conversation with the use of AR technology was also seen in conversations between visitors, as it altered the information environment, creating a more collaborative experience. This was discussed in Interview Two where the Prototype Developer for Future Projects reported the following:

> *People had to read the text as it appeared on screen. And people were sharing, you know, like crowding around the phone. We would hand it to somebody, you know, who's part of a family group or a pairing. And they would share it with their companions and sometimes read out loud to the people that they're with. And so in that it created, more of a shared experience within the space itself.*[316]

The importance of conversation and collaborative experience can be seen to be facilitated in different ways by both VR and AR technology. Assessing the data as a complete set highlights a number of similarities between the use of VR and AR in the representation of difficult and dissonant histories. The responses indicate largely positive effects on the information transfer of this type of information in relation to increasing general understanding of the larger implications, through heightened reflections of self and promotion of affective responses.

[316] Prototype Developer for Future Projects. “Interview Two”. Appendix Two

5.4 Situating Results within Human Information Interaction Theory

From the analysis of the data presented above, it is possible to pinpoint "conversation" as an important factor within knowledge development, specifically in relation to critical thought processes specifically in the case of AR.[317] This is reflective of how the relationship between people and knowledge has shifted within the museum environment. The museum has become a place for intellectual debate, learning and knowledge exchange in contrast to its former focus as a place to present knowledge.[318] Highlighting the relevance of HII research, specifically IB, ISeB and IUB has on the development of museum display techniques as well as the role which research from the information sciences can have on creating new conceptual knowledge frameworks within the museum.

The term ***'Information'*** has therefore encompassed semantic, mathematical, physical, biological and economic influencers on both human cognitive processes and behaviors.[319] Furthermore, within this analysis the concept of information has been addressed from a holistic and inclusive perspective, including: factual, analytical, subjective and objective information. Objective information has been viewed in relation to environmental and sensory information

[317]Trevor Owens, *Collaboration, Empathy and Change: Perspectives on Leadership in Libaries and Archives in 2020* (Creative Commons, 2021), https://osf.io/preprints/socarxiv/3gnds/download; S Becerra-Licha, et al., "Collective Wisdom: An Exploration of Library, Archives and Museum Cultures" (Coalition to Advance Learning in Archives, Libraries and Museums., 2017), https://www.oclc.org/research/publications/2017/oclcresearch-collective-wisdom-lam-culture.html; Benjamin Gleason and Nadia Jaramillo Cherrez, "Design Thinking Approach to Global Collaboration and Empowered Learning: Virtual Exchange as Innovation in a Teacher Education Course," *TechTrends* 65, no. 3 (May 1, 2021): 348–58, https://doi.org/10.1007/s11528-020-00573-6; Brown et al., "Lessons from the Lighthouse."

[318]Peter E. Sidorko and Tina T. Yang, "Knowledge Exchange and Community Engagement: An Academic Library Perspective," *Library Management* 32, no. 6/7 (January 1, 2011): 385–97, https://doi.org/10.1108/01435121111158538; Becerra-Licha, et al., "Collective Wisdom"; Antón, Camarero, and Garrido, "Exploring the Experience Value of Museum Visitors as a Co-Creation Process."

[319] Floridi, *Information*.

which impact on the information environment, (both within the VR/AR exhibition experience and within the wider context of the museum as a whole).

The broad nature of HII research and its inter-disciplinary relevance, not only requires a consistent reworking of the defining qualities of information but also an ontology which allows for specific types of interaction to be investigated within specific contexts. The adaptive definitions for the subfields of HII have been largely accepted for the last two decades.[320] These are seen as: Information Behavior, Information Seeking Behavior, Information Searching Behavior and Information Use Behavior, all of which are active areas of research.[321] Defining these terms is useful in evaluating the differences between information interactions through the use of AR and VR, while situating the themes presented above firmly within HII research, and therefore drawing connections to its prevalence in the modern museum experience.

'Information Behavior (IB)' here refers to the "totality of human behavior in relation to sources and channels of information, including both active and passive information seeking, and information use."[322] This includes face-to-face communication and the passive reception of information, including interactions void of intent to act on the information given.

'Information Seeking Behavior (ISeB)' concerns "the purposive seeking for information as a consequence of a need to satisfy some goal [or need]."[323] For the purpose of this discussion, the definition encompasses interactions with all types of information through all mediums.

'Information Use Behavior (IUB)' here "consists of the physical and mental acts involved in incorporating the information found into the person's existing knowledge base."[324] Acts such as

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[320] Wilson, "Human Information Behavior."
[321] Wilson; Fidel, *Human Information Interaction: An Ecological Approach to Information Behavior*.
[322] Wilson, "Human Information Behavior."
[323] Wilson.
[324] Wilson.

communicating new knowledge through face-to-face communication, increased social engagement due to the knowledge obtained, note taking and mental acts, such as comparison of new information with existing information.

'Information Searching Behavior (IScB)' is defined as "the 'micro-level' of behavior employed by the searcher in interacting with information systems of all kinds."[325] This consists of all the interactions with the system, whether at the level of human computer interaction (HCI) or at the intellectual level including searching strategies and mental acts, such as judging the relevance of data or information retrieved.[326]

Interpretation is, in effect, part of the information interaction process. Dumbraveanu, Cracun and Tudoricu (2016) discuss the role of interpretation in the cognitive process of interacting with information. This study deals with the process of how people interact with information, highlighting the role of interpretation as part of the interaction process. Interaction is defined here as: "[…] the cognitive process underlying the composition of reality, as each person perceives it."[327] This definition of interpretation is formulated from a cross-disciplinary point of view and there are clear similarities to the definitions provided above detailing the study of IB and IUB. [328]

In relation to the presented data, it must be noted that each response is provided from inside each visitor's formulated, personal reality, inclusive of their own biases. It is arguable that the level of consistency seen within the themes and higher-level concepts previously outlined, indicate that

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[325] Wilson.
[326] Wilson.
[327] Daniela Dumbraveanu, Ana Cracun, and Anca Tudoricu, "Principles of Interpretation, Tourism and Heritage Interpretation – the Experience of Romanian Museums," *Human Geographies – Journal of Studies and Research in Human Geographies* 10, no. 1 (2016): 51–63 p.59, https://doi.or g/10.5719/hgeo.2016.101.4.
[328] Kamran Sedig and Paul Parsons, "Human–Information Interaction—A Special Issue of the Journal of Informatics," *Informatics* 2, no. 1 (March 24, 2015): 1–3, https://doi.org/10.3390/informatics2010001.

the IUB experience had by each visitor leads to strikingly similar responses. Although demographic details have not been included across the entire data set (particularly in the case of the AR experience), there is evidence provided by visitors to the VR experience, which indicate a number of different personal backgrounds, cultures, and age ranges.

5.5 Summary of the Results.

The main themes which can be seen in both data sets tend to focus on the ability of both AR and VR technology to provide an avenue for deeper understanding of difficult topics through increase engagement and a perceived personal connection or reflection of self. Overall the data presented in Chapter 4 highlighted the ability of these technologies to increase levels of immersion into the events depicted, resulting in greater understanding and connection to the events depicted. The depth provided by both methods appears to begin to spark information seeking and browsing behavior, with novelty as an instigator or access point.

Physical and intellectual access can be seen to be addressed with the use of AR and VR by creating an element of novelty or introducing “play” to the experience. Intellectual access through these methods has been studied with relevance to the intersection of HII theory and museum/ visitor studies. Viewing this through the lens of frameworks used within the study of HII allows for the main themes of Psycho motor responses, (specifically Physical Access and Opinion on VR), Cognitive responses (specifically Understanding, Education, Sociopolitical and Cognitive empathy), and Affective responses, (specifically Knowledge emotions) to be addressed in accordance with the presented research questions.

As this research is primarily concerned with the ability of AR and VR technology to promote connection between visitor and difficult historical information, the case studies presented in Chapter 4 can be seen to contain three emergent themes: “Reflections of Self”, “Emotional Intelligence”, and “Critical Thought”. These emergent themes were seen in Case Study One across responses which were classified as affective, cognitive and psycho-motive, coinciding with the reported responses formulating the Case Study Two data set. Cognitive responses can be seen to provide insight into what the visitors themselves believed the role that technology played during the information exploration process and evaluation of the technology itself.

Overall secondary analysis of data collected by the Shoah Foundation and primary analysis of interviews with representatives of USHMM reported result of AR implementation by USHMM, feature major reoccurring themes. These themes formulate the following cross-case analysis, and discussion of the results. Looking at the data as a whole, it is suggested that the implementation of both technologies altered the way in which visitors interacted with difficult histories exhibited.

6.0 Conclusion and Recommendations

6.1 Summary of the project

The representation of Difficult and Dissonant Histories is a vital part of recognizing and acknowledging the diversity and complexity of the human experience. As the development of the postindustrial, modern world has been built its foundations upon ethically, morally, and politically questionable events, working towards a postcolonial perspective relies heavily on recognizing the past that has created our current reality. The opportunity that museums have to provide a space for discussion and learning regarding these complex and often traumatic histories is unique. The addition of technologies that provide more immersive experiences allows participants to "witness" these histories from differing perspectives and develop an Affective response, evidenced to increase understanding and empathy.[329]

Within the context of this study, there is evidence to suggest a connection between immersion and empathy. Visitors across both cases articulated this as an impactful, memorable, and educational experience. Furthermore, the ability of AR and VR technology to provide an avenue for additional information was seen to impact learning through increased engagement in both case studies positively, as the emotionally and politically charged nature of these topics makes them the perfect candidates for the use of AR and VR due to the intricacies and nuanced representation they require. Therefore, it is reasonable to conclude that the addition of these

[329] Jennifer Fisher and Helena Reckitt, "Museums and Affect," Edited Journal, Journal of Curatorial Studies, October 1, 2015, http://www.intellectbooks.co.uk/journals/view-issue,id=3005/; Riva et al., "Affective Interactions Using Virtual Reality"; Mckay, "Affective Communication."

technologies within the museum environment will aid in the representation of Difficult and Dissonant Histories specifically, as they allow for these histories to be humanized and personalized. In addition, connecting with complex sociopolitical issues through the perceived reflection of self, formed through these technologies, provides a way to more firmly situate the issues within a modern context.

6.2 Review of key findings

6.2.1 Ethical Display Practice: Witnessing the Past

The issues connected to the display of Difficult and Dissonant Histories (DDH) are multi-factored and discussed at length. Compared to the display of other elements of social history, such as daily life, these topics carry a weight to them, which can have current social implications and effects. DDH primarily represent either a specific event that has impacted society on a global, national or regional level or is a depiction of a marginalized community and their lived experience. Here, the sensitive nature of the history displayed demands a high level of critique and analysis across every minute detail of the subject. This is reflected in professional debates across the entire spectrum of DDH and the broader notion of Dark Tourism, as seen with the discussion of displaying the Enola Gay with the bomb doors open or closed and what that would represent for the people impacted by this event in Hiroshima.[330] As the communities depicted are often not part of the curatorial team, there is a great need for continued discussion regarding decisions in methods

[330] "Controversy over the Enola Gay Exhibition," Atomic Heritage Foundation, accessed March 14, 2022, https://www.atomicheritage.org/history/controversy-over-enola-gay-exhibition.

of display and interpretation, as well as decisions on what elements to include. Decisions regarding interpretation can drastically alter how an event or community is perceived. This has never been more prevalent in the current sociopolitical climate, where gaps in education have changed the historical narrative taught in schools.[331] This can be linked back to sources of funding and public perception of funding bodies, including but not limited to the government, private donors, and companies. As the company/family names are attached to the exhibition, there is a need to thoroughly evaluate the background of funding bodies to accurately assess bias within design choices. Considering not only how each element is represented but also what has been left out and the implication of how each element has been interpreted becomes a vital part of any analysis of DDH exhibitions.

Consideration of these issues featured heavily in the selection of the case studies in this research. As both the Shoah Foundation and the USHMM are representatives of the Jewish community and deal directly with their own community's history, it is fair to assume that the history displayed is an accurate representation of Holocaust history and the specific events depicted within the two exhibitions. As both exhibitions have community input and control over their own representation, there is potential for sensationalism to be present with a view to pushing an affective agenda to emphasize the impact of these events and experiences. The case studies used for this research have mitigated these issues by providing a personal experience of a survivor (Case Study One) and including minimal interpretation (Case Study Two).

As the Shoah Foundation (Case Study One) publicizes the personal aspect of its content, the visitor is aware that this is a representation of Pinchas Gutter's journey through his personal account. This aspect does not take away from the history but provides an avenue for connection

[331] CRT "white washing"

between those who have no connection to this traumatic past and those whose lives are still impacted by it today, effectively bridging the information gap. Case Study Two, on the other hand, initially mitigated this ethical issue by including minimal interpretation. The exhibition is comprised solely of photographs depicting the people of the Lithuanian town of Eisiskes, all of whom were massacred on 25th and 26th September 1941. All information added with the use of AR technology shares personal details of the family and the moments captured. Although there is always a level of information communicated through photographic evidence which may not accurately portray the emotions or connections of the subjects, the details provided have been kept to information such as family background/connections, the activity engaged in, and location/date/time.

As these exhibitions aim to connect the visitor to the events and experiences depicted with a view to educate, the central ethical debate with reference to immersive technologies moves past representation and interpretation, focusing on the possible effects of creating deep connections with traumatic pasts. This has been discussed in relation to sensationalist representations in the past but now takes a more prominent position within professional debate due to the level of immersion possible. Visitors in Case Study Two did not report any negative effects from creating this link. In the case of AR technology, the increased level of immersion does not go as far as to place the visitor in a simulated environment, focusing more on improving the transfer of knowledge in an engaging manner. In contrast, VR technology is used to accurately simulate a past event and environment to represent historical information in the broader context. The contextual information that places the visitor "in" the location provides an experience more akin to those seen when visiting sites of Dark Tourism than that of the traditional museum exhibition. With this in mind, consent within the experience becomes a more fluid notion, which in Case Study

One cannot be revoked during the VR exhibition without removing oneself entirely. As there was only one singular response that commented on this issue, it is fair to assume that although this element must be part of the conversation when developing an immersive experience, Cast Study One did not report a perceived issue with consent. Visitors did not respond in a manner that indicates the existence of a traumatic experience beyond emotional empathy (VR) and greater levels of understanding (AR). VR can therefore be seen in the case presented as a feasible method of creating a “witness” to DDH without taking the visitor to the point of experiencing the trauma for themselves.

6.2.2 Affective Information Behavior: Experiencing Information

AR and VR technology were seen to impact the visitor's IuB (Information Use Behavior). In the case of AR, the visitors were encouraged by the technology to engage in a broader range of active information behaviors and appeared to encourage the visitors to spend more time within the exhibition space. This increased time and engagement leads to the reported increased understanding and communicated recognition of the personal similarities to the victims depicted. This was seen to increase understanding by igniting a general sense of wonder for the technology and its affordances. As expressions of *Knowledge Emotions* are known to encourage explorative IsB, it can be deduced that this sparked a level of reflection which allowed the visitor to assess their experience on a more personal and critical level. This was expressed in a number of different ways, but possibly one of the most exciting pieces of data can be seen as the number of responses which included all variations of emotional response, an element of impact on identity, and the way in which visitors expressed connections between current sociopolitical issues.

6.2.3 Digital Representation: Humanizing Digital Experiences

Representing the human experience through digital media has been dealt with in a number of different ways. Issues have been highlighted from the inherent and systemic bias ingrained in coding. The development of these technologies is also something that should be continually assessed; specifically, where support and funding for the development of these technologies could be impacted by hidden political and/or social agendas. Given the complex and controversial nature of the issues, these technologies would represent such context that may influence representation and access and would need to be continually addressed to maintain an objective yet humanized perspective.

6.3 Responding to the Research Questions

6.3.1 [RQ 1] What role do immersive technologies play in the visitor experience of Difficult History museum exhibitions?

[RQ 1.1] Does the visitor find the presence of VR/AR technology useful in communicating difficult content?

Evidence was seen across all analyzed data of AR and VR technology being found as "useful" by the visitors who engaged. This was demonstrated by the visitor responses vocalizing an increased understanding of, and interest in, the topics presented, due to being more engaged with and immersed in the history provided.

The differences seen between the technologies largely stem from the differing capacities for immersion. VR provided the visitor with the ability to "witness" Pinchas Gutter's experience by creating an opportunity for them to effectively "visit" the camp where he grew up. This provides not only an immersive and personal account but also the ability to see the reality of his experience through the space in which it occurred. This opportunity combines contextual information, which can be challenging to communicate through a traditional exhibition environment. The opportunity for visitors to walk through the camp was reported to be one of the main benefits of VR in this instance. As this situational information communicated a more holistic exhibition experience, visitors reported that they felt a "true" connection and expressed Knowledge, Emotional and Cognitive empathetic responses. This level of affective response removes boundaries and provides an avenue for the visitor to connect with history where they are not personally represented.

In the case of AR, the ability for additional information to be provided without removing the impactful scale of *"The Tower of Faces"* exhibition piece was seen in addition to the increased engagement between visitors and with the photographs displayed. The sheer number and nature of the images within this exhibition are designed to communicate both the scale of people impacted by the Holocaust and the similarities between the people represented and the visitor's own life. The aspect of scale here, with the exhibition spanning multiple floors, between already weighted and information-rich displays, was highlighted as an issue with engagement in this space. The addition of AR gave the visitor a means to move through the space while engaging with personal stories. Technology was seen, in this instance, to encourage engagement in a way that included a physical aspect. Simply using the technology provided a short reprieve from the intensity of the information without trivializing the history. In fact, it was reported to encourage interaction with

the information and promote the initial aim of the space; to communicate the "normalcy" of life within this village up until the moment of the event.

As visitors in both instances reported positive experiences with the technology in addition to more profound interest and connection, it can be summarized that in these instances, the visitors did find the addition of immersive technologies useful. Specifically, the technology promoted personal understanding and connection to the issues. This was demonstrated and observed across both sites of study and specifically linked to the potentially problematic information represented. The ability of VR to communicate this information was directly commented on in a number of cases, with responses that directly compared VR's ability to communicate this information in comparison to other methods of information transfer. Both the VR and AR experiences were viewed as "learning environments" by visitors, a critical factor in IuSB.[332]

[RQ 1.2] Does the depth of immersion influence that experience?

Growth of knowledge was expressed across both sites of study. Visitors communicated and were observed discussing learning. However, this was expressed in different ways in each case study, and the belief that the individual technologies aided in learning can be seen as a positive aspect. Within the boundaries of this study, these expressions are taken at face value. It is crucial at this point to highlight a limitation in the use of the self-reported data discussed. The ability to measure the growth of knowledge is not included in the results of this study. The visitor's

[332] Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design"; John H. Falk and Lynn D. Dierking, *Learning from Museums: Visitor Experiences and the Making of Meaning* (AltaMira Press, 2000).

perceived growth of knowledge is significant in its own right as it functions as a seed for future desire to engage.[333]

As task features are significant in the occurrence of information-seeking intentions, the existence of variety at this point of interaction has been shown to produce detectable behavioral measures.[334] Viewing the use of VR and AR through this lens shows that the variety in information-seeking and browsing behavior that they provide is connected to a bridged information gap.[335] Therefore, the expressions of growth of knowledge can be tied to a proven bridging of the information gap.

[RQ 1.3] Do immersive technologies inspire engagement?

An expressed desire to engage in further learning was reported in Case Study One. When the visitors were asked: "How likely are you to seek stories similar to the testimony of Pinchas Gutter?" the overwhelming response was "Extremely likely."[336] Although this is clear communication of intent for further learning, it is specific to the context of both this story and may even include the stipulation of VR content. This in itself can be seen as a positive outcome for the

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[333] N. J. Belkin, "Cognitive Models and Information Transfer," *Social Science Information Studies*, Special Issue Seminar on the Psychological Aspects of Information Searching, 4, no. 2 (April 1, 1984): 111–29, https://doi.org/10.1016/0143-6236(84)90070-X; Jiqun Liu et al., "Task, Information Seeking Intentions, and User Behavior | Proceedings of the 2019 Conference on Human Information Interaction and Retrieval," in *CHIIR '19: Proceedings of the 2019 Conference on Human Information Interaction and Retrieval*, 2019, 123–13, https://dl.acm.org/doi/abs/10.1145/3295750.3298922; Dervin, "Chaos, Order and Sense-Making: A Proposed Theory for Information Design"; Emil Badilescu-Buga, "Knowledge Behaviour and Social Adoption of Innovation," *Information Processing & Management* 49, no. 4 (July 1, 2013): 902–11, https://doi.org/10.1016/j.ipm.2013.02.001; Reijo Savolainen, "Information Use as Gap-Bridging: The Viewpoint of Sense-Making Methodology," *Journal of the American Society for Information Science and Technology* 57, no. 8 (2006): 1116–25, https://doi.org/10.1002/asi.20400; Brenda Dervin, "Sense-making Theory and Practice: An Overview of User Interests in Knowledge Seeking and Use," *Journal of Knowledge Management* 2, no. 2 (January 1, 1998): 36–46, https://doi.org/10.1108/13673279810249369.

[334] Liu et al., "Task, Information Seeking Intentions, and User Behavior | Proceedings of the 2019 Conference on Human Information Interaction and Retrieval."

[335] Savolainen, "Information Use as Gap-Bridging."

[336] Figure 2.

implementation of VR in the representation of personal testimony. Beyond that, however, this data cannot provide insight into the drive to engage in further learning, generally speaking. This poses an opportunity for further research focused on driving factors to seek information. Combining this with research into motivation to engage with museum spaces will shed a more nuanced light on what triggers this interest within the specific case of Difficult History representation through immersive technology.

For the purpose of this study, it is fair to conclude that in the case of VR, there was an expressed desire to engage further with information reflective of this experience. This conclusion is also supported by the visitor responses when asked: "How likely are you to share your experience with others?".[337] This shows a desire to discuss and recount an information interaction where there was perceived growth of knowledge, as this has been discussed in terms of collaborative learning, cross-generational information sharing, and user behavior.[338] It can be concluded that there is a positive correlation between this experience and a perceived desire to learn more.

It is also important to note the existence of many "further comments" which discuss the potential that VR presents for use in different types of learning environments. A considerable number of visitors communicated that, in their opinion, there is a place for this technology in schools and even within their own curriculums. These supportive statements further support success in promoting learning in the case of difficult-to-navigate topics.

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[337] Figure 3

[338] Brenda M. Trofanenko, "On Difficult History Displayed: The Pedagogical Challenges of Interminable Learning," *Museum Management and Curatorship* 26, no. 5 (December 1, 2011): 481–95, https://doi.org/10.1080/09647775.2011.621733.A. Pena Rios, "Exploring Mixed Reality in Distributed Collaborative Learning Environments" (phd, 2015), http://repository.essex.ac.uk/16172/; Raya Fidel et al., "A Multidimensional Approach to the Study of Human-Information Interaction: A Case Study of Collaborative Information Retrieval," *Journal of the American Society for Information Science and Technology* 55, no. 11 (September 1, 2004): 939–53, https://doi.org/10.1002/asi.20041.

Comparing exhibitions that deal with Difficult Histories through the use of different mediums provided an opportunity to engage directly with visitors, specifically regarding how they believe the technology has impacted how they understand the information presented. Visitors reported that VR allowed them to connect with the history. The terminology which they used included Affective elements as well as self-assessment in relation to knowledge growth. This expression of Affect, further interest, and a connection was seen across the board. Although there is a differing amount of detail provided by the visitor, at least one of these elements was present. In the case of AR, self-assessment was reported to be evident more passively. It is possible to conclude, from this comparison, that more immersive technologies direct the visitor toward a more reflective and analytical information interaction. This more detailed and direct expression of learning and self-analysis can be connected to the ability of VR to include the contextual information which is consumed passively by the visitor. Hearing the personal account in conjunction with the setting in which it happened presented a more holistic information experience.

As both exhibitions deal with DDH, it is surprising to see that (with one exception) visitors did not comment on issues of ethical consent related to what they were shown. The acceptance of being taken through a concentration camp while being informed of a personal experience did not spark expressed tensions or statements routed in “otherness.” Instead, the noticeable trend was to draw connections to current sociopolitical issues and the need for education based on critical grounded theory. This evidence can be seen as a positive reflection on the use of VR in displaying complex and emotionally charged topics. Although this does go some way to ease the professional concern of placing the visitor in the shoes of an affected party, it must be acknowledged that this VR exhibition did provide a level of separation between the visitor and affected party. As this was

constructed in the context of a guided tour, the visitor was provided with space between the events and experiences discussed, maintaining the position of "witness" rather than the victim. Focusing on discussion within an immersive experience rather than trying to place the visitor in the shoes of the represented parties directly appeared to allow the visitor to have an Affective, educational experience without crossing the line into a potentially traumatic experience.

6.3.2 [RQ 2] How do visitors respond to immersive representations of Difficult Histories?

[RQ2.1] How do visitors express emotional responses to exhibition content?

Visitor responses were overwhelmingly positive to the use of both VR and AR technology in the representation of DDH. The way in which the specific emotions are expressed post-exhibition does differ between the technologies. In the case of AR, emotions were inferred by expression of reflections of self, increased understanding, and increased connection through recognition of similarities in social norms and community. This is supported by statements made in both interviews with USHMM professionals and the reactions from visitors as communicated by them. AR technology creates an access point through engagement, leading to a perceived increase in understanding through a cognitive recognition of emotion and/or empathy. VR technology, on the other hand, was reported to predominantly create an access point through emotion, leading to critical connections being drawn to current sociopolitical climates. This distinction is important to highlight as it presents a reflection of how each immersive technology promotes connection to complex content in a manner that ignites information use behavior through personal experience and identity building narratives, effectively humanizing factual content.

The additional contextual information which simulates "presence" in a space or the ability to provide individualistic information in a manner that still allows for the scale of an event to be

depicted provides an opportunity for the visitor to explore the totality of a subject which is hard to navigate emotionally, ethically and politically. Omission of this information can occur in the traditional exhibition environment, which leads to dilemmas both in the curatorial design and representation of marginalized communities when decisions have to be made in relation to interpretation. AR and VR can be seen within this study to offer a way in which additional information (AR) can be added to an emotive and impactful display without taking away from the curated atmosphere, whereas VR can alleviate the ethical issues of third-party interpretation. Allowing for DDH to be viewed within the museum as if it were a site of dark tourism, interpreted for you (in this case) by a victim of the traumatic situation depicted.

[RQ2.2] How do the visitor's emotional responses relate to the technologies used to deliver the exhibit?

There was an overwhelmingly positive response to the use of both VR and AR technology. Visitors can be seen to enjoy the experience and novelty of the technology itself. This is something that was reported by USHMM and evidenced in the data collected regarding Case Study One. In Case Study One this is evidenced by both the 34.2% of long-form responses containing expressions of *Knowledge Emotions* and responses to Question Two on the survey stated that visitors found the technology useful in understanding and connecting to the information. From the data, it is evident that there are a number of ways in which these technologies can provide avenues for visitors to engage with topics that might feel daunting, create personal connections to historical events which may have previously been inaccessible, and interact with the information in a more meaningful and critical manner.

6.4 Reflections on the methodology

The initial methodological approach included primary data collection to be completed by the researcher using a constructivist, iterative approach. It was intended to produce a short exit survey for visitors to complete after experiencing both sites of study. This would have been provided in the form of a physical comment card which visitors were encouraged to complete. This was intended to be supplemented by interviews with museum professionals. As this was no longer practical due to COVID- 19 travel and lockdown restrictions, adjustments were made. These adjustments included a reimagining of the approach to data collection and liaising with the two sites of study to assess what data would be accessible and appropriate for use. Moving to previously collected data provided a considerably more extensive data set in the case of Case Study One. The open discussion based upon the initial semi-structured interview during data collection for the second site of study allowed the researcher to gain insight into the museum's data collection process as well as the results. Overall this approach provided an extensive amount of primary data, which could be compared to the long-term, iterative research completed by the museum, consequently, providing a more comprehensive dataset. Furthermore, as the interviews were remote, video recording has allowed the researcher to revisit the interviews on multiple occasions, ensuring that the maximum amount of information has been collected and transcribed from both verbal and non-verbal clues in the discussion.

6.5 Limitations

The limitations of this study can be described as falling into four main categories: logistical data collection methods, analytical approach, research focus, and the nature of the data itself. Certain aspects of the data collection methods were altered to fit within the restrictions imposed during the COVID-19 pandemic. These restrictions, although allowing access to a greater quantity of visitor responses, lead to a different methodological approach. This has meant that there are some aspects of the research questions which have not been addressed in depth. As discussed in the recommendations for further research, this study does not investigate the long-term effects of AR and VR representing challenging content. Although there were expressions of intent to learn more about the topics discussed in each case study, ascertaining the existence of this would require ethnographic studies investigating how different communities receive and use the presented information. In addition to this, working with the communities whose past is featured within the exhibitions during the envisioning process will also allow for a critical approach to the design of any further research.

The limitations of this study are focused on the self-reported nature of the data. The dataset proved to be overwhelmingly positive which does not provide a well-rounded critique of the technology used. One aspect which needs to be addressed is the potential for these technologies to be used to convey disinformation. The successfully affective nature has the potential to be used to convey inaccurate information and that could be commercially available to the public in their own homes thereby exacerbating the current battle to promote critical appraisal of information sources for legitimacy on an individual level. With the experience feeling informative as well as creating an Affective response which, according to the data collected in this study, promotes connection to the information, there is the consideration that this technology could be used as a tool for

propaganda. Although the personal perception of these experiences is vital in the assessment of the research questions, it is recognized that there is a limit to the use of this data. Overall this study is explorative and as such has set a foundation for further research which can take advantage of quantitative and mixed methods approaches. The limitations which COVID-19 restrictions placed on data collection meant that interactions between the visitor and researcher did not occur. Although this aided in the ability of the researcher to address their own bias and evaluate the existence of their own perceptions and assumptions throughout the analysis, these interactions would allow for more in-depth and open conversations, which would expand upon the issues addressed.

6.6 Contributions of the study (e.g., to the body of knowledge/theory in the field, development of methodology and/or practice in the area

The link between HII and museum practice can be seen as visitors are becoming more reflective as an "information user." The introduction of technologies such as AR and VR has altered the museum experience as the visitor is asked to engage directly with the exhibition in a practical, and cognitive manner. Here the information interactions are now seen through the broad definition of "information" provided at the beginning of this paper to encompass the museum space. Through the process of analysis of data and current literature, it can be deduced that HII theory and research provide a foundation for research into visitor (user) experience and information behavior. This review of the literature supports the data analysis presented in this study. Using this theory allows for new insight to be shed on the ways in which visitors interact with information within the museum environment. This new approach to analysis has allowed for

the development of new theoretical frameworks which provide a structure for the ethical display of DDH, specifically when the use of immersive technologies is applied.

This new approach to visitor analysis has allowed for the examination of the role which VR and AR play in communicating difficult and dissonant topics. The contribution provided in terms of historical representation centers on the affective nature of the exhibition. As previously argued, the need for displays that represent the more macabre elements of social history has been professionally recognized.[339] Finding appropriate methods of displaying these histories without crossing ethical boundaries or falling into sensationalist representations has been part of professional debate since the addition of the annex to the National Air and Space Museum in 1988.[340] The development of VR and AR have been shown by this study to provide the ability to communicate lost contextual knowledge vital for understanding and empathetic response.[341] Although it can only be related to the specific case studies presented, it is clear from the analysis of the data that, from both visitor and professional perspectives, the application of these technologies allowed the visitor to connect more intimately with the issues, and people presented. This goes some way toward easing the professional concerns of creating potentially traumatic environments for visitors. It is therefore possible to create an immersive environment that places

[339] Philip Stone, "A Dark Tourism Spectrum"; Laurajane Smith, Margaret Wetherell, and Gary Campbell, "Constructing Heritage through Subjectivity: Museum of Broken Relationships ŽELJKA MIKLOšEVIć AND DARKO BABIć," Emotion, Affective Practices, and the Past in the Present, June 14, 2018, https://doi.org/10.4324/9781351250962-14; Philip R. Stone, "Dark Tourism – an Old Concept in a New World" Quarter IV, no. 125 (2005), https://works.bepress.com/philip_stone/26/; Strange and Kempa, "Shades of Dark Tourism"; Bonnell and Simon, "'Difficult' Exhibitions and Intimate Encounters"; Trofanenko, "On Difficult History Displayed"; Rose, *Interpreting Difficult History at Museums and Historic Sites*.
[340] "Controversy over the Enola Gay Exhibition."
[341] Riva et al., "Affective Interactions Using Virtual Reality"; Cristofaro, "'I Feel and Think, Therefore I Am'"; Jemioło et al., "Emotion Elicitation with Stimuli Datasets in Automatic Affect Recognition Studies – Umbrella Review."

the visitor as a ‘witness’ to the past without crossing the threshold into active participant; therefore, showing a connection between affective information transfer and levels of immersion.

Differing methods of immersion have also been shown to produce different presentations of affective response. Enthusiastic engagement was observed in both cases; however, as discussed, the more immersive VR experience led to feedback that was more closely linked to in-depth, detailed expressions of learning and reports of the successful information interactions which bridge the knowledge gap. This study has shown that these technologies provide different means of encouraging learning in an informal setting. Rather than being two options for integrating technology into the museum experience, each one has its own unique yet positive effect on the learning experience. As both technologies were well received by visitors, despite representing complex, emotional content, they can be viewed within the context of this study as a valuable means of promoting engagement with histories that might otherwise be avoided. This was accomplished without sensationalizing the people and history represented, elevating the story from factual content to holistic and moving personal accounts, which, in turn, allowed the visitors to connect and learn.

The suggested link between immersion, affect, and learning shown by this study sets a foundation for further research into the display of Difficult Histories and the unique opportunity to “experience” these pasts in a “safe” manner. The introduction of AR and use of VR did not trivialize the content and the affective responses which were encouraged proved to be beneficial in the eyes of the visitor rather than a distraction from the educational goal of both exhibitions. It can be seen that promoting empathetic responses when presenting DDHs is key to bridging the information gap without crossing ethical boundaries.

6.7 Recommendations and Suggested Ways Forward

6.7.1 Future Research

This study highlights a number of opportunities for further research. While addressing the research questions outlined above, a number of further questions were raised. To further address the ability of immersive technologies to facilitate interactions with difficult information, it would be useful to look at how different VR representations could exhibit the same stories or events. This would require the development of two VR experiences, one of which moves the visitor from a witness to an active participatory role. This would allow for research addressing how the structure of VR experiences can be utilized in order to maximize the emotional connection evidenced in this study.

More generally, the themes which arose while completing this study present exciting opportunities for research into the existence of long-term benefits connected to displaying Difficult Histories. Investigating how these displays can impact and reflect current social issues by promoting learning in more accessible ways, could lead to development in both formal and informal educational practices. Allowing VR and AR experiences to become freely available online and even through console gaming platforms could allow for accurate depictions of events to reach demographics that may not engage with a museum. As this study provides evidence of immersive technologies bridging the knowledge gap and working against the construct of "otherness," it could be beneficial to investigate how these experiences can be used to provide life experiences from different perspectives.

Furthermore, the ability of VR to communicate contextual and emotional information within a simulated experience could provide opportunities for the development of empathy

training. Given the current hyper-politicized conversations around institutions of power, and personal bias playing a critical role in individual actions in socially prevalent events, this potential use presents an interesting avenue for further work. Specifically, the research could begin with how VR experiences can allow people of different demographics and communities to “live” in each other’s shoes.

These areas for further research are focused on the extent to which Affective responses can be used to promote the desire for further learning and cross-generational, cross-community gap bridging information interactions. Ethnographic studies focused on how exhibits like those used in this study may provide insight into a potential opportunity for addressing current postcolonial and sociopolitical issues.

6.7.2 Professional Policy and Practice

Within a professional context, this study has provided evidence that VR and AR can be used in an ethical manner to promote feelings of connection to complicated social histories where the visitor is not directly represented. With this in mind, it is recommended that a general increase in representations of DDH (Difficult and Dissonant Histories) could be helpful in dealing with the social divides which have become increasingly more publicly visible. Building on the momentum provided by the increase in Dark Tourism and the general increase in public discussion surrounding these issues would prime the museum as a space for these discussions. Furthermore, this may go some way in promoting feelings of belonging within this space which may not currently exist within marginalized communities. From a practical perspective, this could help museums and other information institutions provide access to their collections and maintain their prevalence in the community. Extension of the subjects which are displayed and drawing

connections between historical events and discussion surrounding current issues within the community and presenting an opportunity for visitors to see reflections of their personal experiences and those of other communities.

From an information professional standpoint, there should be considerable time spent on the topic of Affective information transfer as the rise of such technologies begins to permeate the daily information world of the public. Ensuring that the benefits of the technology do not overshadow the ethical pitfalls which are highly likely to arise, as these technologies move from the high-end gaming sphere into that of more purposeful information transfer. It is therefore vital that future information professionals fully understand the implications of immersive technologies and are well equipped to aid the public in the navigation of these information transfer tools. Furthermore, the application of VR as a tool for learning in formal learning environments (as championed within the Case Study One dataset), should be accompanied by education surrounding critical appraisal of information sources and disinformation.

6.8 Implications of the Study and Parting Thoughts

This study shows how the display of Difficult and Dissonant Histories can be used to promote critical thinking about current sociopolitical issues. Using history to address social injustices within a postmodern, postcolonial era could aid in the way people perceive histories and the inherently cyclical nature of self-perception. It has been shown that Affective responses provide an avenue for visitors to draw connections between past events and current political issues. Increased, and more importantly, educated discussion surrounding gaps within the formal education system such as critical race theory, the intricacies of democracy, human rights, and

effectively combating disinformation. As the technologies discussed here become more readily available, specifically with the release of Meta by Facebook, there is an opportunity for informal education institutions to reach communities that would not usually readily engage. It is recognized that this new way of viewing public engagement would have to navigate ethical and practical hurdles related to funding and potential friction between curators and external stakeholders. This being said, the opportunity to have an educational and social impact while maintaining the purpose and prevalence of these institutions should be investigated to its fullest.

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Appendix A Thematically Coded Visitor Responses, (Case Study One)

Coded Natural Language Response Data

Due to the number of responses within this data set, the spreadsheets could not be directly appended. Visitor responses received from the Shoah Foundation have been thematically coded using Google Sheets and can be accessed here.

Quantification of Natural Language Responses

Quantification of data								
		Question 1	Question 2	Additional Comments	Total by Axial		Percentage by Open	Percentage by Axial
Affective Responses	Knowledge Emotions	15	4	312	331		34.27%	
	Personal/Identity building	2	3	36	41		4.24%	
	Gratitude	0	0	134	134		13.87%	
	Emotional Empathy	9	9	17	35		3.62%	
	Total	26	16	499	541			56.00%
Cognitive Responses	Sociopolitical	8	0	59	67		6.94%	
	Intellectual	0	6	4	10		1.04%	
	Cognitive Empathy	11	2	22	35		3.62%	
	Learning	10	1	103	114		11.80%	
	Opinion on VR	2	6	156	164		16.98%	
	Total	31	15	344	390			40.37%
Psychomotor	Physical Access	0	2	6	8		0.83%	
	Physical Responses	1	2	24	27		2.80%	
	Total	1	4	30	35			3.62%
Total Number of Responses						966		

Appendix B Interview Transcriptions, (Case Study Two)

Interview One: Director of Future Projects.

Interviewer: Is it ok if I record, just in case I miss anything while I'm writing?

Interviewee: Yep. Totally understand.

Interviewer: Great. I just want to start by asking you about the development of AR and what prompted you to use this in the first place?

Interviewee: So, I mean, I think the way that we approach developing AR was based around a kind of our role within the institution. So, the job of 'Future Projects' as a team is to be looking at new opportunities that are presented by new technologies new techniques or approaches, that the museum hasn't had available in the past.

So, it's not that augmented reality is entirely new, it dropped several years ago. A lot of phone-based AR as something that was not only affordable but there were a decent number of tools out there that allowed you to use it which meant that we were really looking at it again, as one of the different ways that we could consider how technology could change the experiences that we're creating inside and outside of the museum.

So, we were doing, actually a number of different projects around… Well, I think we referred to them at the time as "virtual environments", whether it was augmented reality or virtual reality or 360 video, and the different types of tools that were now available. And we were trying to create small projects that gave us a glimpse into what kind of experiences they created for different audiences.

So augmented reality was something we tried out around the same time we were doing 360 video. I think that was the other big project we were doing at the same time. And the first area that we started exploring and using AR was around the experience on the floor of the museum within galleries.

And that itself was complicated just because what we were trying to figure out, what we could do that would be bringing added benefit. And, and what would, you know, what would it mean to layer on different kinds of content into an experience within our galleries. So that's how we ended up in the space that we've talked most about.

Although we've got, a few other small experiments as well. The space within, the Holocaust museum has a few different galleries, but 70% of the space within the museum as a single exhibition. That's the history of the Holocaust from 1933 to 1945, roughly. And we were

really looking at that main space which is, you know, the main thing that people would experience when they're in the museum.

And the idea was that if you're going to be providing additional content, we're already a very, very content, heavy experience. There's a lot of photographs. There's a lot of video. And there are a lot of objects throughout the exhibits. So, we gravitated toward the tower of faces, which is a three-story structure within the main exhibition that has photographs from a single community.

It's visually a very stunning space to begin with. Content-wise actually fairly low. There are about a thousand images in it, but they're not individually labeled. There is no additional video. There's no additional audio provided with that content. So it seems like an area where something else could be brought in without overloading already heavy material at that point in time.

Just that it goes the sheer amount of people involved as well.

Interviewer: Without taking away from how that [size of the collection] represents the sheer amount people involved. How that [volume] represents that [the breadth of impact].

Interviewee: Right. So we were trying to figure out why the the idea that there was a lot of story that wasn't being told in that space. There wasn't a lot of additional interpretation already happening in that space. So it seems like an opportunity.

Interviewer: Brilliant. Generally, did you see that if there was an increase in foot traffic you're your observations?

Interviewee: Well, and that's also an interesting thing about the kind of exhibits that we have, right. Is that. It's the, the entire exhibit is one movement in space. You don't really have a lot of visitor-selected movement. So everybody goes through the same rough path and the tower itself is something that everybody must cross to get to the end of the exhibit.

So, you can't, you can't really miss it. But what we did in, in the course of over, it was really the three or four main prototypes that we did using the same basic principle, using augmented reality, and within the tower; although, at different locations within the tower. Because the tower is really, first experience on the fourth floor of the museum. Then you experienced again on the third floor of the museum before you go into the final sections of the exhibit. So we moved it at one point in our testing from fourth floor to third floor. And some of our testing was around how long do people spend in the tower and not anecdotally based on earlier exhibition evaluations that have been done over the years.

People don't spend a lot of time in the towers to begin with. You know, usually it's, it's a matter of 30 seconds or less within the tower. Although sometimes people will stop to take photographs in the tower. Sometimes they will stop and look at several photographs in that time, it's not a space that encourages long dwell time.

When you first crossed the tower on the fourth floor, you were on a very narrow bridge. So you're able to look down and see the experience the photographs on the third floor,

you're able to look up. To the fifth floor space of the tower. So it really spans all of this, but it constricts you.

So you're not really encouraged to spend a long time in that space. What we discovered is that you could increase the number of the amount of time people were spending and the number of photographs we definitely looked at while they were there. And that was something that we were able to document within in our testing of the space.

So people, if they use the augmented reality they would often look at. Between three average of about three or four images that they would look at through augmented reality. And they would look at those for, you know, another 20 to 30 seconds each at least that's the amount of time that the, the kind of sequence of, of information that would be given to you would be.

And so that's increasing from 30 seconds to several minutes within the tower.

Interviewer: That's impressive.

Interviewee: Yeah. And, and again, that was a range, right? So, the number of people who on average would look at three or four images. There were some people who looked at all 10 images, so they were spending considerably longer within the space.

And actually, a decent number of people watched four or more in terms of the number of images seen through augmented reality. Now there is an intervention that's caveated with the fact that there's an intervention. You actually have to have somebody who would give you the device so that you could see it.

So, you were being, being asked to look at something specifically as part of the testing. So if you were doing it in self-selection, would that be the same?

Interviewee: We don't know for sure. Although, what was interesting when we moved down to the third floor as part of our testing. So the, the fourth forest constricted and for our busy season, that became problematic. So if you're going to stop on this bridge and really look at, you know, three or four images and really spend much more time, you are actually creating a bottleneck in the flow of people through the space. So in the last one to two versions of the prototypes, depending on how you count them, they all kind of flow would flow together in terms of versioning. But third floor space is much broader. So there is much more room for people to spend time with the photographs on the third floor. And it's also a point where people would spend less time anyway, because by that point, people are often getting pretty tired. So it's average of oh two and a half to three hours of time within that exhibition. And so by the time you've gone through all of the fourth floor, the really heavy sections of the third floor. So that includes. The ghettoization deportation camps killing centers before you actually get to the space on the third floor with the tower continuing. So you've seen very, very complex and difficult material at that stage.

So people were not spending a lot of time in the tower, but the amount of time that they spent with AR in that space was about the same as on the fourth floor. So we were seeing the holding power to be fairly similar. We also tried I would refer to as a tactile version of

augmented reality. So it's not using a phone, it's not actually augmented reality, but as we're using the same content from the augmented reality in a small alcove in the third floor space of the. Where we use the same images on a box printed on a box. And on the reverse side of the box was the same text that you would have gotten through the augmented reality. And we had those photos that were available in this small alcove. And we discovered that people looked at roughly the same number of images for around the same amount of time [as AR].

So people had the similar response and that wasn't prompted by handing you a device. That was something where people were encouraged by a small sign to pick up and look at it. These, these physical versions of the augmented reality experience. And what we were finding was that people were doing it in a similar way so that it felt encouraging that if we had devices easily available and easily usable, that they could also.

Interviewer: So how did you actually gather the visitor feedback for this, what was the process that you used?

Interviewee: We used observation and brief semi-structured interviews at the end. So we had a team that would do counts and observations, kind of watching people on how many they picked up. And then we did follow up interviews with a certain number of those people.

I think we interviewed. About a hundred people in the space over the course of several months.

Interviewer: Would I be able to get ahold of the copy of the questions that you use for the semi-structured interviews”

Interviewee: So I can, I can share the questions. Yeah, we there's, there is, there are some questions about how much we can share the visitor data. This wasn't done being done. This was being done as an internal, non IRB based piece. And so there's hesitancy to do that, but the questions are totally easy to share. Right.

Interviewer: I understand, if I could get a hold of the questions, that would be great. Just I can do my own coding with what I've already gotten from a VR exhibition that I’m using.

Interviewee: Yeah. And we can share kind of rough, rough results from it, but we feel like we tend to, we didn't do this as a full IRB. It was really more of a formative discovery kind of project that we can't share out the information on the individual.

Interviewer: Do you believe that AR played a role in the way people responded to the exhibition? Did you see a change in the sort of responses that you got?

Interviewee: No, actually it in some sense it re, it emphasized some of the things we were also hearing. So one of the things that we were asking about with the

Was, if we're going to understand how AR is changing the experience in this space, then we really should do more work on what's the experience without AR in this space. And what we heard from people with AR was very similar in tone to what we were hearing from

people, which is making a personal connection that, that people were *seeing* the people in the photographs. The visitors were seeing people in the photographs like themselves. As everyday people, with everyday lives. Those were, that was a recurring theme that we heard both with AR without AR.

And that, so that part didn't change. But what we did here was I think two things that suggested the AR was enhancing the experience. One was that one of the questions people would ask without AR was: "I wish I knew more about the individuals.'

There's nothing that tells you, they are. We tell you the names of people in some of their stories. So, in some sense, the AR content was being driven by the questions people were asking outside of AR. So, 'who is this person, and what happened to them?' Was the most frequent type of question. And the AR was specifically trying to provide that information for some of the people.

So that suggests that we were enhancing the kinds of experiences people were having because it was answering the kind of questions they were already asking without it.

[Secondly] And that people would talk about specific photos in a slightly different way.

So, it seemed to be enriching. Like they would talk instead of talking about: 'oh, well, this photo was interesting to me because of... It was a picture of a baby, and I have a child and that's important to me.' They would talk about the specifics of a story of an individual. So, they were remembering that: this is a person who was an actor and she owned a hotel, and they would talk about that part - the particulars of the story, in a way that suggested they were going deeper into the stories.

Interviewer: From your observations, do you think that [greater depth] increased emotional responses or do you think there was anybody emoting more obviously throughout that?

Interviewee: I think so. I mean, people are having a pretty emotional experience to begin with.

And so any time, this is something I guess, observation wise any time we talk to audiences within the space, sometimes people don't seem to be having a very emotional experience, but when you stop and you ask them and they start to think about it, then they will have a very emotional response.

So just the opportunity to reflect in an interview is something that chews some of that emotion to come out. So it's hard to detect an increase in that because it's very emotional, to begin with.

But the responses are very emotional, and people do seem to be expressing connection to these photographs as *people* and thinking about them as individuals, and thinking about them as victims of the Holocaust in that way.

It is something that we also noticed is that people, even without the AR, already were tuning into the idea that these were victims, they assume that these are people who died in the Holocaust. Although often they don't have a very clear sense of how they might've died

in the Holocaust, which is something that the AR also is trying to give them a little bit more of a clear sense of how they might've died… for the ones that did die. Not all of the people in the photographs died. So, for example, without AR there are a number of people who are confused. They might assume that they [people represented] died in concentration camps and in killing centers because that's kind of the general sense of how people died in the Holocaust.

Most of the people in these photographs that were victims would not have died that way. They were probably killed by mobile killing squads as part of the way that this town was destroyed. So that's a detail that people are getting, that's going to be different. But the emotional connection certainly there already, but certainly they're still feeling those emotional connections.

Interviewer: Did you see any hugely negative responses to the use of the technology, like a reticence to use it? Or people who didn't want to know more about the people represented?

Interviewee: We didn't, we didn't really witness any of that. I mean, we certainly had people who would sometimes not want to participate. And, and we don't know the reasons for that, whether they felt like the, the using the phone for AR wasn't something that they felt like was appropriate, which is certainly something, you know, we've seen some discussions around in other places, the idea that using a phone feels awkward in this place that has kind of a sacred feel to it.

That being said that when people were using it as an individual, they would often share the AR with their family members. So even though we were giving the phone to one person, one of the things that we saw was that people wanted to share the stories with the people that they came with. So, we didn't see any problems specifically. But, we did see some ways that people seem to want to share it back in to the larger experience that they were having.

Interviewer: Do you think that [interaction] had an impact on like an increase in it and generational like concert information and like you see a much more cross-generational conversation?

Interviewee: I think so, and it went both ways. We saw people who wanted to show what they were looking at to their children, and we saw people who were younger showing it with sharing it with other people as well. So, we weren't really focusing on that, but it was definitely a kind of an emergent kind of question about how people were sharing it among the groups and who their groups were. And those kinds of things were certainly really interesting and worth more time.

It's become a bit of a theme, actually, the idea of people reading to each other, and what does that mean when you have that moment and sharing it with someone else. So, this was something we so totally saw with augmented reality.

We did another project, which was really paper-based. We gave out an ID card of an actual person who was a victim or survivor of the Holocaust. As you start the tour in general, that's like a, it's been something we did since the opening. It was originally supposed to be a technology supported kind of experience. But that didn't work. And then at opening, they

switched over to paper printed cards that give you an individual story that are ‘tabbed’, more or less, to the different floors of the museum. So one's kind of about pre-war life and the start of the war. One's about wartime experience and one's about what happened to them at the end, whether that was survival or, or death.

And so these were researched on individuals and we were doing a project which was doing the same kind of thing, but it had stops where instead of giving, giving you a full booklet, you could collect pages of the story at different locations throughout where you would get on, get an update as you would come through and you would physically actually take the paper with you and put it into your booklet. And what we discovered is people would come up to the individual pages and you would see family groups where the children would often be asked to read aloud what was on the paper. It was a really interesting kind of interaction that was going on with that project as well. So those were two projects.

And then we did a third where it was about reading perspectives of people in history and reading them out loud. So, it was kind of an after you did the exhibit experience, where this was one of my colleagues really was the main person on that. So, I only saw it in action. I didn't really get involved with the way it was developed, but you more or less were given a point of view to read. So, you would have one person that would read a law that was being enacted during the Holocaust in Germany, and then other people who had read how that law impact had an impact based on, on diaries and other kinds of testimony.

And so, this was another thing where people reading out loud was kind of thematically something that had people sharing this information in a very different way.

I think there's something really interesting there about the intergenerational and, and just. Dynamics that you can get through people reading with each other.

Interviewer: It becomes something completely different when you're looking at a social history-based museum, especially with difficult histories because you don't see it a lot in places like a natural history museum. And that, that there's so much intangible. Like history and heritage that when you were talking about like the history of society and people that it, it becomes like a much more fulfilling sort of experience when there is that big amount of conversation. When there is that cross generational element there.

Obviously, we've talked about like the level and depth of personal connection there.

Was there a lot of like enthusiasm? Did you see any evidence of triggers with any of this that didn’t have experience or don't have family who've been through this?

Interviewee: Yeah, it's interesting. That's a really good question about triggers. We did not see anything like that. And we did not test with survivors. The survivor community, that's connected to the museum at all, which we do with some projects. So, we're doing a virtual reality project that, that we did have a couple of survivors who volunteered for the museum experience, but it was in a very rough stage at the sense, but they, they didn't have a problem with being in it. But that they also chose to, to step into it. So, you know, I, that's not particularly conclusive

The AR we did see enthusiasm about it. Right. We did some really early testing with students. And then we moved to testing with the more general public. And there were comments from both about the idea that this helped them kind of step into thinking about these as individuals.

That was, those were the kinds of comments they had. So moving beyond thinking about this as a picture on the wall and thinking about these, these people, as people was a bit of a theme that we got here and this was the bulk of people, but, but when we ask people just generally, you know, we, we tried to ask very open-ended questions and, and we did frequently get kind of comments about the idea that the augmented reality helped them kind of bridge into these photographs in a different way.

One of the quotes that usually comes back was one that was recorded. We asked for permission from some of the student groups to record on video. And so, the marketing department did a little kind of blurb about this project early on. And there was a really great quote from a student talking about how they, It's a very much a marketing video, but it was really interesting what they captured because they really captured the student trying to describe how the augmented reality helped them connect to the individual story and the person in a different way.

Interviewer: In general, what were your impressions of the project they overall? Like, what were your main takeaways about it? And do you feel like it was a success?

Interviewee: Yeah, so I mean, we, we basically, we basically feel it's successful enough as a an, an exploration of augmented reality that we are turning it into more of a long-term piece of, of that exhibit.

So. You know, we, we feel like I've been augmented reality, the technology, is changing so quickly that anything we build now will only be good for a few years anyway. But that we will. We will be looking for a company that can help us turn it into an experience that's available to all of the visitors that are walking through that space.

So we don't know exactly what shape that will look like. Some of our thinking was really around the idea of, of having museum-provided devices so that you didn't have to get out anything and download anything you were able to pick up a device and look at the images and just leave the device afterward.

With COVID I don't know whether museum-provided devices are a good idea or not. Right. So, we would obviously have to figure out ways to keep them clean and we'd have to do more on that, but we don't even know if the public will be comfortable.

The Renwick gallery here did an augmented reality thing where it was very simple, you picked up an iPad in a, in a case and you use it to look at things and then you left it on the other side. But as that's something, people will be comfortable with post-COVID, I don't know.

But despite that, we are moving ahead and we will be putting out an RFP for companies to help us translate what we've seen as a successful way of telling stories of individuals using

AR in a way that is, is really beneficial for the audience. Is something we're moving forward with. So, we will figure out a way to do that under whatever the new circumstances are, I guess.

Interviewer: Okay. That's all the questions I have at the moment.

Interviewee: Totally. That's totally good.

Interviewer: Thank you so much. And if you could just shoot me an email with this recording and the interview questions.

Interviewee: I will, I will send those on to you and if I have no idea how big the recording will be, I might have to stick it on a drive somewhere, and then I'll just send you a link to it.

Interviewer: That would be wonderful. Alright, great to talk to you. Glad it finally worked out timing wise and we'll talk to you soon.

Interviewee: Take care. Bye-bye.

Interview Two: Prototype Developer and Researcher for "Future Projects"

Interviewer: I just want to go through a little bit about the data collection methods that you use to get responses about, like implementation of AR in the Tower of Faces aces and I've got a couple of questions about like the responses since like you provide me with the actual data.

So let's start off with like the questions like what sort of responses that you did get from the exit interviews and surveys.

So did you get any sort of response about what the personal stories provided the visitors with? Like how the application of AR kind of like gave them that [information].

Interviewee: Yeah. I, I think it would be helpful just to back up a little bit and tell you a little bit about the data collection we did without AR. So, when we decided to experiment with AR just in the museum in general the Tower of Faces was a great place to do it because it has very little text already. So, it spans multiple floors. So visitors first encounter it on the first floor of the exhibit, which is the fourth floor technically. So visitors go up in an elevator and then they kind of wind their way down through three floors as they go through the exhibit. And then they encounter it again at the end of the next floor, the third floor, which is really kind of covers the history of the Holocaust itself. So not just the Nazi rise to power and, you know, life before the war, but the war and the Holocaust is really that the core of the third-floor experience and at the very end of that floor is where visitors get to the Tower of Faces again and find out what happened to the community.

We had a couple of prototypes that we tried on the fourth floor which is a really kind of visually arresting place. I think, you know, a lot of visitors will walk in and look up and just kind of get a sense of the scale of the space in a different way than happens on the third floor, because there's a bridge that kind of blocks that view all the way up to the top. And we tested a few different things there and talk to visitors, and once we realized that, you know, AR was a kind of compelling way to engage visitors in that space. We realized that we wanted to learn more about what people are even getting out of the space without any kind of technology.

So we started by asking just some very broad open-ended questions about, you know, what does this space represent to you? That kind of thing. And, we did that on both the fourth floor and the third floor, because the third floor has a lot more space. It's just like kind of a wider space to walk through. And it was something that, it made more sense ultimately to do some kind of AR experience. If we were going to scale it up into something that all visitors could do potentially the third floor is just a much better space for that, especially when we have high visitation in the spring and the summertime.

So anyway, we wanted to get a sense of what people were thinking about as they go through the tower without any kind of technology. So, we talked to visitors on both floors in both spaces. It was kind of surprising to us, but even without any kind of technology, people are getting a lot out of that experience, not just technology, but text or more information about the photos themselves.

They are already thinking about, you know, these kinds of general themes of family and family life in a familiar setting. So, you know, there are photos of people sitting at the kitchen table, all together and just like, or having, you know, a birthday party, celebrations, that kind of thing.

Interviewer: The reflection of their lives in these pictures?

Interviewee: Exactly. Yeah. And just the sense of people, you know, live living their everyday life, ordinary people, living their everyday life.

People will talk about, you know, these photos look like something that I would see in my grandparents' living room, that kind of thing. And we definitely got similar responses with the AR.

So, one of the things though that was really important, that we didn't expect was that. People really wanted to know what happened to the people in the photographs. Visitors were kind of speculating about it on the first, the first place that they encountered the tower. Because there isn't any information about what happened. It's not revealed until they go through the next floor. And even on the next floor, there are still, you know, a lot of questions about what happened to this person specifically or what happened, what, you know, what was their experience, what was their ultimate fate? And With the AR that was something that visitors really responded to.

They really appreciated being able to understand what had happened to the people in the photographs, but also get a sense of the variety of fates, because most of the people in the

town. Were killed in a mass shooting action, but there are some people who immigrated to the U.S. or to Palestine or just other, you know, there there's a variety of fates that the photos represent in the Tower.

And so I think people appreciated having an answer to that question because before it was just kind of a mystery and something that they were speculating about. So that was one concrete thing that people really responded to with the AR. But then I think just in general, there's you know, people talking about the same things that they did without the AR, but also a sense that like the word powerful came up a lot, a sense that it was some, it was a more emotional way of experiencing that space than without knowing anything about the people.

Interviewer: I mean, like, yeah, that's it at the fact that people already wanted that information, like sense how like emotive the experiences already. And I think that's probably partly to do with the way that it's been designed. Like it's like this summative of experience after everything that you experienced on each floor.

I think that's like pretty humbling anyway, but being able to access that information. Like how this technology can be used in a healthy way - because obviously there's this huge ethical concern about taking it too far and it being too immersive. It's a bit of a balancing act like being a witness rather than like, feeling traumatized by it.

So you would say there was a positive response to the application of AR?

Interviewee: Yeah. And I think there were a lot of people that we interviewed who, who talked about, you know, I wish I could find out more about every photo because in our prototype it was nine, nine of the photos that are on the walls within the tower.

And then on the third floor, there's also a Memorial alcove that has, just kind of a concrete memorial that has a photo of the town and the name of the town. And so we had AR for that photo and then others around the space, nine others. So there are 10 experiences that visitors could have if they did the AR the average was about three to four photos. So not everybody, you know, did all 10 of the photos, but People, you know, said, I wish, you know, I wish this was possible for all of the photos. Not that they would do that and spend the time to do that.

But yeah, I think there's definitely an appreciation for being able to find out more. And also I think After going through that particular section of the permanent exhibit in the hallway, leading to the tower of faces there's the shoes in one space and then there's a crematorium set up and then you get to the tower faces.

So, as you're walking through that space in the hallway It's a lot about the scale again, it's more anonymized and it's more the experience of the camps. And when you get to the Tower of Faces, you see individuals again, you see people's faces and people who look like you and your family.

So it's kind of a space where people are already, you know, grateful to see individuals again. And the AR just allowed us to actually tell individual stories in a, in a space that, you know, you're coming off of something where that isn't possible.

Interviewer: It's really difficult to sort of present this type of history, It's really easy to gloss over it as an entire event. And like the entire point is this is like actually a super prominent, like social aspect to history. Like this is about the way people treat each other the way people interact and how like trends, and rhetorics can be sort of produced from these sorts of events. And I think like personalizing these things is like how you ensure that these things do not happen again. Well, you can't neglect the entire overall impact of it either is or it's it's like, yeah, I think that's pretty evident. That is super impactful way to do it and very important.

Did you find that the overall experience was of the visitor was like articulated as positive or negative?

Interviewee: Yeah, I think. Overall. It was very positive, but I mean, people were experiencing sadness, you know, and they were having an emotional response and I think they, they did, they, they were very appreciative of being able to have that experience, but it, you know, brought out emotions.

There are some people who we, we talked to who, you know, had tears in their eyes as we were talking to them about what they had experienced with the AR. Which is, you know, it's difficult to know that you're, I guess, putting somebody into an emotional situation and you, you never know how much it's going to affect somebody, but I think people were still overall glad that they were able to have that experience and to know more about the people in the photos, the 10

Interviewer: Sorry, 'positive' in this context, very much more about the exhibition do the thing that you wanted it to like, feedback about wanting to know more about this, like feeling more connected to the history of it. That Isn't part of their own family life, that sort of thing. Right. That's a good point.

Did you ask anything about personal connections to the Holocaust?

Interviewee: Did, you know, if we, I would say it was, it would be pretty rare to have that kind of response. So, the vast majority of our visitors are not Jewish and don't have a personal connection to the Holocaust.

So, I can't remember specifically if anybody. I think maybe a couple of people had worked, you know, first or second-generation within their families. But I actually, I think I, I do now remember there's one young man who did it. He and a couple of other people, family members, that he was visiting with. There is there one of the photos that we were using was of a very young child.

And when I asked, like, if any of the photos stood out to them he like very quickly mentioned that because it was the child had the same name as him. And you know, that was something that was like a family name that, yeah, it definitely had more of an impact.

Interviewer: I feel like the fact that a lot of your visitors aren't necessarily Jewish or don't have any sort of connection to the Holocaust, like are getting an emotive response, speaks to how powerful this sort of history can be.

And if it's represented delicately and with like a lot of forethought. And I think the fact that you mentioned that having these personal stories provided through AR, builds that connection is a very positive effect rather than necessarily a negative one.

Did anybody have anything negative to say about the use of the technology, like just on a very practical basis, like they didn't enjoy using it, they would have preferred to have it represented to them in another way, anything like that?

Interviewee: Not necessarily. I think there were some people who we approached to test it with and they, you know, They were interested, you know, as part of the museum experience and trying something new or you know, they just said yes, maybe because out of politeness, like they didn't want to turn us down. And I think there, there were some responses, but very few along the lines of like, I probably wouldn't normally do something like this in the museum. Like if it was offered to me You know, without anybody standing there, a museum staff member, there was somebody who said, you know, 'I probably wouldn't do this. It's probably not something that I would normally look for in my museum experience. But yeah. Yeah. It's always hard when you're testing something like that. Hard to know, you know, how people are actually authentically going to respond to it to, to that offering with that. Being able to set it up that way, where it's, they can just like go and pick something up and try it.

I will say this is sort of along those lines, but kind of a different thing.

One thing that we were really struck by is, you know, as a team we've been looking at AR for a while, and we'd tried different examples of it in other museums and places, but we were really surprised by how much the novelty of AR, like added to the experience for people. It's still not something that is so widespread. And if people are familiar with that kind of technology, it's usually like through a QR code or something, but just the ability to hold up a device. And we were using image recognition to have it, you know, like recognize an image and then something just like kind of fade onto the screen. Something as simple as that, because it was the most simple, the simplest implementation of AR that we could have done. We were using like a free version of software and all of that. It was still something that, you know, had a novelty and a little felt, I think a little bit like magic to people. So yeah, and that was, that was definitely something that we hadn't really thought about going into it.

Interviewer: So, did you find that there was much difference between the responses you got, with and without AR? Like, did it change the way people talked about the history? Did it change the way people talk about the exhibition itself? Their overall experience?

Interviewee: I think a lot of the same themes I came up without AR were in people's responses with the AR. I think the biggest difference though, is probably just people had more details to talk about. And so when we were asking them questions after they had experienced AR

they were, they had more specific things to talk about, like the ‘the actress’, you know, referring to people by the content that they had seen on the AR you know, the actress or ‘the milkman’ and all of these different things. The roles that people played within the community, they had much more. Specific details to talk about, so it, wasn't just kind of an abstract: ‘that looks like my family,’ or ‘I'm a school teacher and seeing that photo, that school photo resonates with me.’ They had, you know, more specific details about that person and the role that they played in their community or in their family.

Interviewer: Great. Did you hear anything or get any feedback on people talking about the exhibition and sharing that experience and that knowledge that they gained with other people? Maybe bringing people back to the museum. Maybe saying that they would do further research and just talking to people about it. Was there any data on that at all? And if there was like did they articulate a difference between AR and not in that.?

Interviewee: Not, not really. It's hard for us to get a sense of what they, then once they walked away from us, what they would do with that information. But one thing that we were happy to see and really intrigued by was people sharing the device. I mean, we were using like pretty small mobile phones to do this and we didn't have any audio associated with it. So, it was just, you know, the image recognition would trigger that photo that's on the wall to fade onto the screen. And then there were chunks of text telling a story about that person and each one where each photo story, it was about 30 seconds.

So there was no audio associated with that. People had to read the text as it appeared on screen. And people were sharing, you know, like crowding around the phone. We would ha we would hand it to somebody, you know, who's part of a family group or a pairing. And they would share it with their companions and sometimes read out loud to the people that they're with. And so in that it created, you know, more of a shared experience within the space itself, but I'm not sure how much that translated. After they left the space,

Interviewer: love that you generational information sharing, like when you see it happening in the museum. And I think it's absolutely beautiful. Yeah, I don't, I feel like people are just more engaged when that sort of like conversation happening.

Then it sounds like, I mean, correct me if I'm wrong, like was like really a tool of like, promoting that rather than sort of like silently taking something in rather than like appreciating it. More active rather than a positive learning experience. Would you agree?

Interviewee: Yeah, I think so. And actually one, one of the reasons that we were so like intrigued by it was.

I mentioned that we had 10, 10 photos, nine of them were just the photos that are hanging like right. Or on the walls, around you and the tower. And then there's the one that's in this Memorial alcove space. And for that one the format was a little bit different. We created a video that kind of gave more context about the community and it was narrated.

And so that was the one thing that did have audio. And when we first started testing that iteration of. We were handing out disposable earbuds. So it was really, you know, giving

one person a phone with earbuds to listen to that, that one audio piece. And then, you know, look at the other photos that they were interested in.

When we started off that way. It was only that one person who was doing the AR experience and anybody that they were, you know, going through the museum with would kind of wait off to the side while they were doing it and then going through the interview with us. And so it became a very individual experience when you hand somebody earbuds, and they're the only ones who can hear and experience that content. And at a certain point, a couple of days later after, you know, testing. For, you know, a few periods in the museum, we decided to stop giving out the earbuds and said, you know, it's okay if people play this audio out loud, it's only, you know, 45 seconds. It's not going to be a big deal. It's not that loud, but you know, it's not going to create that much of a disturbance. We should feel like we don't need the earbuds. And if people want them, they can have them, but it wasn't the default. And that's when we started seeing people actually sharing. So it wasn't, you know, this individual experience anymore. It was something that everybody could experience together.

Interviewer: That's like an interesting comment on like museum culture and how it's like a very quiet, reflective space, a lot of the time, and I think promoting a more active sort of engagement can definitely bring out more facets of the history you're representing.

Could you tell me a bit about how you collected your data? Like, did you, have you analyzed anything at getting any statistics from this, anything of that sort of nature?

Interviewee: Yeah. So we did a combination of observations and interviews. So, we had a specific Google form that we were using for observations. And we were asking observers, to fill out. Roughly the amount of time that the visitor was spending with the AR. And then we had checkboxes for every photo that was part of the AR experience so that the observer to the best of their ability could kind of check off which individual photos that person saw.

So that's, that's how we were able to get, you know, the average number of photos that people looked at and then the distribution of, you know, how many people looked at one versus all 10, that kind of thing. So that was really the most, most quantitative data that we got was from the observations. And then for the interviews we were, we always try to ask very open-ended questions.

So we were never specifically asking about, you know, how did this detail of the story Like, or did this detail of the story resonate with you or something like that? It's very much like, what would you say this display is about? And in general, who are these people in the photos to kind of get at, you know, what is it, what are the things that they're actually remembering and getting out of the, the experience.

And then, and then we go back to the data and kind of pull out the themes of what people are talking about. So that's where the themes. So that’s where those themes of family or ordinary people living their everyday lives come from.

Interviewer: Would you be able to talk a little bit more about the themes that sort of resonated from those questions?

Interviewee: Yeah, so like I said, there were a lot of very general responses that they, our experience was powerful or emotional in some way. And then. Family and fate, especially fate. That was the main theme that visitors talked about both with and without AR. And so, you know, that could be them remarking on the specific way that a person died potentially, or specifically what happened to them if they immigrated that kind of thing. Or it could be a more general comment about, you know, the community being destroyed, that kind of thing. Children is a big one. So, the photos with children in them, have really resonated with people.

And then there are also people who just talk about the space itself, the architecture, the display yeah, especially on the, on the fourth floor, like I said, when they first visitors first encounter this space, it is such kind of, you get an overwhelming sense of scale by looking up into the space.

And then by the time you get down to the third floor, the photos feel much closer to you when you're on the third floor. And so, you can, you can stand in front of a photo and it feels very large and it feels like, you know, if it's an individual portrait, it feels like that person is looking at you.

And so there are people who talk about just kind of the general sense of the space and Yeah. And you know, what an amazing display it is.