AR Exhibitions for Sensitive Narratives: Designing an Immersive Exhibition for the Museum of Memory in Colombia

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ABSTRACT

Augmented Reality (AR) in human rights museums and memorialization efforts can empower these initiatives to create stronger connections between audiences and victims; however, there is little research on the risks of depicting sensitive narratives through immersive technologies. We examined the opportunities and challenges of applying AR to memorialization by designing and deploying an AR application with a human rights museum in Colombia. We report lessons from our collaboration about navigating the risk of re-victimizing testimonial authors while creating engaging AR interactions. Furthermore, we report on a user study where participants interacted with our museum exhibition. Based on observations of our co-design process and the user study results, we discuss implications for immersive application design with strategies for selecting immersive content, balancing audience engagement, and identifying technology gaps. Finally, we reflect on the implications for collaborations between HCI researchers, human rights professionals, and organizations to inform designs involving sensitive narratives.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**; *Empirical studies in HCI*.

KEYWORDS

Museum; augmented reality; AR; research through design; memory museum

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1 INTRODUCTION

Augmented Reality (AR) technologies offer a unique opportunity to blend a user's physical environment with virtual content. The increasing sophistication of computer graphics and computer vision techniques has enabled increasing degrees of realistic interaction and imagery in AR applications, enabling more "believable" and immersive AR experiences. The immersive qualities of AR have led researchers and developers to explore AR as a tool for simulation applications in emergency training, immersive storytelling, and historical education. For example, realistic manipulation of the environment through AR can allow users to look into the future and safely experience stress-inducing situations like a crisis [96, 110], engage in realistic medical training without risk to patients [28, 127], or connect with dramatic events of the past [101, 117, 120].

We are particularly excited about the potential of AR for documenting and preserving memories of people or historical events– a practice collectively referred to as *memorialization.* For museums and other humanitarian institutions that practice memorialization, audience engagement can be critical for securing resources and reaching "as many people as possible" [46]. As a result, researchers have called for further work to develop cultural heritage systems that foster emotional engagement and personal connection [46]. Researchers have also studied the use of fictional interactive narratives to talk about racism [33], supporting victims of domestic violence, [39] and informing the design of technologies for commemorating tragic events [92]. Many aspects of AR technologies are well aligned with the goals of memorialization because the immersive nature of AR can elicit powerful forms of audience engagement. Museums and other humanitarian organizations have already begun to explore AR as a tool to collect and tell testimonials as part of their broader mission for collective memorialization [7, 17, 34, 40, 54, 133]. Cultural Heritage researchers have also examined the potential for immersive technologies to engage audience empathy. Examples include the use of immersive sound and location-based technologies in the context of war memorials [101], virtual simulations for storytelling led by virtual characters [72], and audio and AR video portals for a Holocaust museum [117].

Although AR suggests new potential benefits for memorialization, it may also pose risks. There is limited understanding of the effects of widespread AR adoption; however, prior research suggests that AR and other immersive technologies can negatively

impact specific domains and user groups. For instance, AR technologies for manipulating our digital appearance can distort self-image with potentially negative effects on self-esteem and wellbeing [55]. Mixed Reality technologies that encourage audience engagement can potentially lead to disengagement by distorting or trivializing the subject matter– for example, immersive applications that encourage wildlife conservation [102]. Furthermore, the development of Mixed Reality experiences with high degrees of realism raises ethical questions, including the implications of committing disrespectful or immoral acts towards virtual depictions of real people [115]. Memorialization initiatives already use AR as a tool; however, it is unclear how AR depictions of real-life conflict, discrimination, or violence may affect victims or viewers. Similarly, we also lack an understanding of how AR content creators can responsibly develop AR technologies, especially when presenting sensitive narratives. We join other researchers in our belief that there are many gaps in our understanding of ethical approaches to implementing augmented experiences and the limits we should impose on immersive reproductions of real people and events [60, 65].

Our objective is to contribute to the future design of ethical immersive technologies by exploring the opportunities and challenges of designing AR applications for sensitive narratives. For this work, we define *sensitive narratives* as accounts of trauma, emotional distress, and suffering caused by violence. Our research questions are: (1) What specific opportunities do AR technologies offer for fostering empathy towards victims in sensitive narratives? (2) What can AR developers learn about ethical and responsible AR design for sensitive narratives from human rights organizations? (3) How can HCI practitioners collaborate with human rights organizations to find best practices for designing immersive content for sensitive narratives?

To investigate these questions, we collaborated with a human rights museum, the *Museo Nacional de la Memoria* (MNM), to co-create a digital memorialization exhibition using AR. As researchers, our experience was primarily in designing and using AR technologies. Our collaboration with MNM allowed us to examine tradeoffs between different forms of visitor engagement through AR and the risks of misrepresenting or re-victimizing by learning from the Museum staff's expertise in working with victims and creating story-based museum experiences. Our research joins existing HCI initiatives to partner with and learn from more diverse agents in designing and creating digital technologies for Cultural Heritage, including volunteers [124], Cultural Heritage professionals[22, 37, 104], and communities[37, 106].

To examine opportunities and ethical practices for AR depictions of sensitive narratives *(RQ1, RQ2)*, we designed an AR experience across multiple workshops with the museum staff. We built from previous research on co-design with Cultural Heritage professionals [82] by including methodological elements such as brainstorming sessions to discuss the content to exhibit, narrative scenarios to discuss ideas and technical concepts, and the collaborative design of low and high fidelity prototypes by researchers and museum staff. First, we documented speculative iterations of possible approaches, which enabled us to discuss and balance risks without harming users or victims during this process. Next, we iterated on alternative designs and deployed our final design as a functional prototype in the MNM. We then conducted a user study with museum staff (external to our design process) and museum visitors and analyzed the feedback we received. Finally, to guide the design of future AR projects involving sensitive narratives using a systematic approach *(RQ3)*, we reflected on our approach of collaborating with institutions to inform best practices in designing AR content for sensitive narratives.

In the subsequent sections of our paper, we present a review of technologies used to communicate sensitive narratives. We also include insights from the literature regarding interdisciplinary approaches to digital content creation that led us to collaborate with a human rights institution. Next, we introduce the context: the MNM's mission, values, members, and exhibition material that was the base for our design process. Following this background, we describe our cooperation process across two phases: design and deployment, and we summarize the results in the form of themes we conceptualized from the design process and the user study. Finally, we conclude with the reflections on our design process and highlight the specific methodological challenges of developing AR applications for sensitive narratives for HCI researchers.

2 BACKGROUND

We summarize existing technologies used to recreate sensitive narratives. We begin by describing digital media representations in general before discussing AR applications dealing with victimization accounts. Next, we motivate the importance of considering the ethical dilemmas of digital recreations by describing the adverse outcomes of prior technologies. Finally, to inform collaborative methodologies for the experimental design of immersive experiences, we include insights from the literature regarding the methodological approaches to the interdisciplinary creation of interactive exhibitions.

2.1 Digital Simulations and Sensitive Narratives

Some interactive applications are similar to AR in that they can use digital recreations of a victim's account. Therefore we first approximate potential issues of using AR for sensitive narratives by highlighting issues that arise when implementing other types of interactive applications. Samuel Toten describes how simulations can be harmful in the process of teaching about the Holocaust: "by using simulations to try to provide students with a sense of what the victims of the Nazis were subjected to, they are minimizing, simplifying, and distorting, and even 'denying' the complexity and horror of the Holocaust" [123]. James G. Brown describes another example in "Darfur is Dying," a game where users can maneuver characters to forage for water. Brown argues that "the best simulations require great care, lest they become mere entertainment" [29]. These examples show how digital simulations of sensitive narratives, though well-meaning, can do more harm than good. AR aggravates these faults because it presents digital simulation as an almost real-life experience, which can stir the audience further from recognizing their privileges and constitute a disrespectful stance towards the victims.

A closer example of digital simulation technologies to AR in terms of immersiveness is Virtual Reality (VR). In his 2015 TED Talk, Chris Milk called VR "the ultimate empathy machine" [87].

Academics have also noted the effects of VR on empathy and presence [27, 53, 129]. However, these empathy arousal properties have received skepticism [64] and raised concerns about the implications of their use in storytelling [52, 88]. Digital Media and Film Studies scholars have proposed a "proper distance" in digital storytelling to bring attention to the proximity created by immersion and acknowledge differences in people's contexts [93, 113].In our discussion with the museum staff, we learned they agree with these criticisms, and in practice, we collaborated to design an immersive experience that enabled empathy "from a distance." Our understanding of distance is two-fold: one distance is the gap to be closed between narrator and audience. The other distance is a respectful distance where the virtual recreation does not reduce the victim's experience to any virtual simulations of the testimony. We formulate the second distance from a critical perspective of a naive approach to AR content creation that ignores or hides the privilege of witnessing and reliving traumatic experiences from the safety of a simulation.

2.2 AR and Sensitive Narratives

Scholars have studied the empathy arousal properties of AR [26, 58], and AR applications for sensitive narratives are already in use in the wild. For example, the ManifestAR collective participated in the exhibition LA Re.Play [1] with AR apps about forced disappearance [54], artist censorship [121], mass human rights violations [17]. Participating artists also had experience with war memorials [54]. In a Manifesto, some of the collective members declared that "With AR we install, revise, permeate, simulate, expose, decorate, crack, infest and unmask Public Institutions, Identities and Objects previously held by Elite Purveyors of Public and Artistic Policy in the so-called Physical Real" [118]. This manifesto shows other potential uses of AR to disrupt the public sphere and provoke emotional responses. Another example of sensitive narratives AR in the wild is an International Red Cross campaign that augments the world with a portal to a child's room in the middle of an airstrike. The red cross calls participants to "Experience the trauma of war through augmented reality" [40]. Museums like the United States Holocaust Museum have also used AR "to tell a deeper story about the tragedy and to build a more emotional connection between visitors and history" [7]. According to the museum director of future projects, this app aims 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" [51]. The use of AR to seek empathy is not limited to stories of human rights violations but also extends to conservation efforts that seek to "bridge the human-nature gap" [102]. These examples show a view that conceives AR as a tool to engage the audience viscerally and connect distant contexts, temporally and emotionally, through the overlay of digital content. We build on this conception of user engagement enhanced through immersion in our work. However, we take a critical view and look into the tradeoffs that this interaction can introduce through a case study of sensitive narratives.

AR applications can also result in unintended scenarios, with the digital content permeating the realities of people and creating emotional distress or offending those whose stories are involved. For example, Pokemon Go, a popular AR game, was requested to remove the Auschwitz Memorial from the locations where 'hunting Pokemon' was enabled: "We think that allowing such games to be active on the site of Auschwitz Memorial is disrespectful to the memory of the victims of the German Nazi concentration and extermination camp on many levels and is absolutely inappropriate" [119]. Another example is INGRESS, an AR game where players could use concentration camps such as Dachau and Sachsenhausen as bases to capture [94]. These two cases were documented by Haake et al. in the context of digital memorial designs, noting that "there is a lack of comprehensive references to good practices that may provide guidance in the development of new forms of digital memorial products" [62]. In our work, instead of focusing on the success or failure of AR systems to deal with sensitive narratives, we provide careful documentation of the process of designing these technologies and support our final recommendations with an evaluation of users. Other scholars have questioned the ethics of how hyper-realism can affect users [115] and the negative consequences of using VR embodiment in experiments [97]. Our discussion around the ethics of producing AR content focused instead on the impact on victims represented in immersive simulations.

2.3 Interdisciplinary Approaches to Designing Interactive Systems for Sensitive Narratives

To explore the opportunities of using AR for sensitive narratives, we faced two methodological challenges. First, as we explored different designs, we had to walk a thin line between exploring technical possibilities with AR and meaningful usage of AR in our context. We found the need to document and study the tradeoffs in our design decisions. Second, we needed to experiment and discuss alternative designs with our MNM collaborators without harming victims during these explorations.

For our first challenge, Research through Design (RtD) [134] offered a viable method for generating design opportunities and studying ethical challenges. RtD's focus on the rigor of the design process and the solution's relevance was vital for us to engage in a multidisciplinary approach where we could learn from our design collaboration with practitioners. Researchers have applied RtD in collaborative work between HCI and professionals in museums. For example, Claisse et al. have explored this method in the context of Cultural Heritage while investigating a methodological shift in interactive exhibition design [38]. In their work, the authors present the process of embodying critical discourse in a co-design process that involved the authors and museum volunteers. Another example is Schofield et al.'s work that articulated knowledge of heritage scholars and interaction designers, comparing Critical Heritage research and experimental design practice applied in a specific project [107].

In our work, we focused on nurturing collective forms of creativity by bringing together the richness of our participants' contributions. To achieve this, we drew inspiration from a collection of literature that advocates for broadening the participation of professionals in the creation of digital technologies for Cultural Heritage [22, 35, 37, 81, 104]. For example, the meSch project [23] has broadly explored the contributions of Cultural Heritage professionals, documenting several case studies and opening resources for technologists to engage with domain experts in creating interactive exhibits

to foster a "more inclusive approach to the design of exhibits" [82]. However, our research has a different motivation: to consider the experience of professionals of human rights museums in dealing with sensitive narratives and creating compelling content in AR that is respectful of the victims and sensitive to re-victimization.

Our second challenge included the ideation, iteration, and evaluation of a technology respectful of the victim's dignity. To our knowledge, no previous work in HCI directly addresses the process of creating AR apps for sensitive narratives. We considered that an approach focused on co-speculation [21] and the discussion of tradeoffs could lead us to find ethical boundaries in our design process more safely. Following existing approaches for co-creation with museum professionals [35], we split our co-creation process into two phases: one of open exploration and one centered on the technical development and critique of an existing prototype using AR.

3 RESEARCH CONTEXT

We built on prior collaborative design-research methodologies to structure our design collaboration with professionals in the area of human rights and designing museum experiences. This section describes our background and position concerning the topic of our collaboration (the Colombian armed conflict), the Museum of Memory, our collaborators within the institution, and the museum exhibition we redesigned. This collaboration combined the research team's knowledge of creating AR experiences, having designed AR experiences for more than five years, with the museum staff's expertise in working with victims and creating interactive narrative experiences for sensitive narratives. Finally, we describe the attributes of this museum that make it an ideal context to investigate AR for sensitive narratives, and the learning opportunities for AR development we identified in our collaboration with their staff members.

3.1 Researcher Positionality Statement and Backgrounds

This paper deals with the experiences of victims of the Colombian armed conflict. None of the authors themselves are victims of this conflict, nor did they have prior experience working with victims within this context. Instead, we relied on the extensive expertise of our MNM collaborators (see section 3.3) to determine our approach to working with this subject matter, as we detail in section 4.

While all the authors currently study or work in the US, the lead author, Ana, was born and raised in Colombia and directed the collaboration with museum experts. Similarly, another author, Andrés, is from Mexico and has researched the use of social media in the Mexican Drug War [41, 90]. All the authors share a commitment to ethical technology research and development, particularly in AR. Michael has conducted extensive research on broadening participation in AR and has co-organized a workshop on the ethical implications of mixed-reality [60]. Andrés has recently worked on and published about AR in an industrial research lab, including most recently on AR activism [112]. Jennifer has discussed the effects of AR on self-image perception [55] and is interested in informing HCI research from the knowledge of professionals and field experts [75].

3.2 The Museum of Memory in Colombia

Several countries marked by violent events and violations of the Universal Declaration of Human Rights (UDHR) have established memorialization policies. In humanities, scholars consider these violent events part of a society's Collective Memory [63]. For Collective Memory, we understand events that constitute an active factor of cultural identity for a particular group or society through a constant interplay of past and present where the truth is contested [49]. Grassroots movements and governmental policies have established public museums that document human rights violations. Examples of these museums are the Museo de la Memoria y Los Derechos Humanos (Museum of Memory and Human Rights) in Santiago de Chile, the Espacio de Memoria y Derechos Humanos (Space of Memory and Human Rights) in Argentina, as well as the institution we partnered with: the Museo Nacional de la Memoria (National Museum of Memory), or MNM, in Colombia.

The MNM is an ongoing initiative implemented by the National Center of Historical Memory (CNMH) [10], a Colombian government agency. The Law of Victims established the MNM in 2011, but its physical location is currently under construction. Despite this, the museum continually produces digital and physical exhibitions, audiovisual productions, documents, and reports presented through official web channels and alternative physical venues. The Colombian government established the MNM as part of the reparation process for the victims of the internal armed conflict in Colombia. The civil war in Colombia has an extensive and disputed background, and it is constantly evolving as clashes are ongoing today. This research will discuss the conflict presented by the conceptual guidelines and museological script published by the National Center of Memory in 2017 [66]. While working with the MNM provided us with a unique opportunity to gain insights for our research, we acknowledge that the MNM itself is controversial and reflects different political views.

The MNM was founded on a set of conceptual guidelines [66]. The guidelines define the museum as "un lugar para el encuentro" (in this context, a place for meeting [for exchange and remembering]) [8]. The museum sustains its character and vision on three main axes. First, it continues the civil action of victims' organizations, social movements, and activities of human rights organizations. The MNM acknowledges these movements as antecedents and inspiration for its mission. Because of this, the MNM operates as a network of museums and civil organizations that lead social memory projects. It seeks diversity in the projects it promotes, emphasizing those led by oppressed groups. Second, Colombian law supports the museum's guidelines, more concretely the law 1448 promulgated by the Colombian Congress in 2011 [42]. In this law, the MNM exists in the context of a transitional justice process as a reparation measure for the victims (Ley 1448/2011, Art. 1) with a preferential focus [enfoque diferencial] [8, p. 37] on violations of human rights. Third, the museum seeks to create dialogues and "generate a deeply emotional and critical experience in its visitors" [66]. The museum aims to be an educational and cultural platform for the creation, production, reflection, discussion, and circulation of memory of the Colombian armed conflict. For transparency, it is also critical to acknowledge that, as a public entity, MNM is under the jurisdiction of the Colombian state and subject to state control

and regulation. There have been tensions between the MNM's internal mission and changing state ideologies and political ambitions as Colombian leadership has changed, and political leaders have exerted pressure to reorient the MNM. This tension has recently manifested in statements by the MNM's new director that represent a shift from the MNM's prior portrayal of the conflict [99, 100].

Our collaboration with the MNM was motivated by three important aspects. First, the museum's exhibitions focus on narratives, not objects. Testimonies of victims always accompany the artifacts documented. The availability of this material supported our goal of designing AR for sensitive stories. Second, the MNM aims to engage with people from around the country. Looking to break physical and geographic limitations, the museum has been interested in exploring new forms of digital exhibition. Finally, because the MNM's objective is to promote dialogue and understanding between the actors of the conflict and the country's general population, empathy is an essential factor in the experience of its audiences. In our interactions with the museum staff, we learned that they respect certain constraints that limit the interaction mechanisms and content they can present. We believe this knowledge helps guide the creation of AR applications in the context of narrations by victims of war and violence.

The museum guidelines establish several essential concepts for the context of this research: the concept of victims and "difficult knowledge." The museum guidelines have established the concept of victims according to national and international law lineaments. Victims are people or their direct family members [31] that have suffered direct damages such as lesions, emotional suffering, financial loss, or violation of their fundamental rights from illegal actions, whatever the nature of the crime [43, 44]. Borrowing from Lehrer et al., "difficult knowledge" [73] relates to our definition of "sensitive narrative." This knowledge refers to the contents and representations of oppression, violence, and atrocities presented by human rights museums. This content might generate evasive attitudes from the audience because they raise difficult questions about the causes of oppression and trauma.

3.3 Our collaborators

In the context of our project, we worked in close collaboration with three members of the "Virtual Dimension" of the MNM [13]. Our collaborators create digital experiences for visitors and victims, including developing platforms, promoting digital culture in historical memory and human rights, and multimedia content. To give better insight into the roles of all the participants in our research, we include a description of our museum partners.

We will refer to our three main museum collaborators as MNMS1, MNMS2, and MNMS3 (for Museo Nacional de Memoria Staff). These three staff members participated in all phases of the design process and collaborated in the participant study, assisting us in carrying out interviews and de-briefing of the study results. MNMS1 has a background in social communication and journalism and was the digital content coordinator at the museum. MNMS2 has training as an artist with experience in digital mediums and worked on executing digital strategies at the museum. MNMS3 is an artist and designer with an emphasis on web development. Two additional staff members, MNMS4 and MNMS5, participated in the prototype critique workshop and the co-design of our final prototype. The MNM staff did not have any previous experience with AR applications, but they had studied digital initiatives in other museums and experimented with VR recordings and panoramic and 360 imagery in their exhibitions.

3.4 Redesigning existing museum exhibits using AR

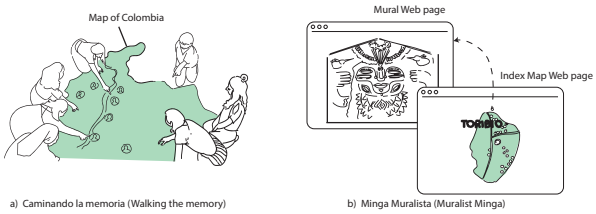


Figure 1: Two exhibitions curated by the MNM. "Caminando la memoria" (a) was an itinerant exhibition that used a large scale map of Colombia to show locations of social leaders. "Minga Muralista" (b) is a web page that shows murals created in an indigenous territory.

As an AR research team based in the U.S., we started cooperating with the MNM by aligning the objectives of the research team and the MNM. The collaborative research process with the museum was limited to a year, beginning with several months of remote collaboration leading up to one month of the research team working in the museum installations. These time and distance constraints did not allow us to create a new exhibition, so we used two existing museum exhibits to expedite the research process. The first exhibition, called "Caminando la Memoria" [45], used a large format map of Colombia to show social leaders in their corresponding territories of influence, as shown in Figure 1a. We used this exhibition for the initial stages of ideation and discussion. The second, called "Minga Muralista" [89], is a web page showcasing murals painted in indigenous territories and the stories that inspired them, as shown in Figure 1b.We focused our RtD process using the "Minga Muralista" exhibition and detail it here to contextualize the work presented in future sections.

"Minga" is a word that originates from the Quechua "mink'a" and denotes "agrarian collective work done without charge and with a social purpose" [19]. This word is not exclusive to communities in Colombia's geography; other Andean cultures in South America use it. In the context of the "Minga Muralista" exhibition, different social collectives and movements have repurposed this term to represent a form of social protest [78], particularly social protest by the Nasa people [105]. The exhibit receives this name as it documents a cultural initiative led by indigenous organizations [9] and Nasa indigenous reservations in Colombia. The Nasa people, displaced from their ancestral lands, have been caught in the crossfire of illegal groups that tighten their grip on strategic drug routes in the region. These cultural activities represent the resilience of the indigenous communities despite the direct and indirect violence that they have endured. The "Minga Muralista" exhibition documents the work

of artists invited to decorate the town buildings, showing that the walls had more to them than bullet marks [89]. This exhibition encompasses more than sixty walls transformed by fifty artists with illustrations about overcoming the stigma of a war-torn town.

4 RESEARCH APPROACH AND METHODS

We describe our collaboration which provided insights in two phases: First, we carefully documented the process and resulting artifacts of the redesign of a museum exhibit, highlighting the perspectives of the museum staff. Second, we presented our design in a participant study to other museum staff (external to our design process) and museum visitors.

4.1 Research through Design process

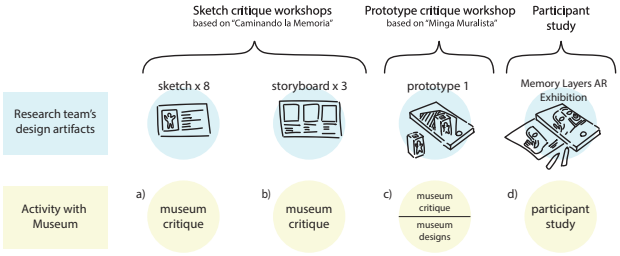


Figure 2: We organized two sketch critique workshops (a,b) followed by a workshop centered on the critique of a prototype and the co-design of a new application (c). Finally, we implemented a prototype based on these designs and organized a participant study with this application (d).

As described in our background section, RtD enabled us to engage in a collaborative workflow to explore design alternatives and elicit conversations about opportunities and tradeoffs of using AR in a safe environment. We focused our design process on collaborating with the museum staff and learning from their experience working with victims and curating war narratives. During this process, we engaged in collaborative reflection around ethical challenges, opportunities for AR to foster audience engagement, and the limitations of AR through guided discussions and the co-designing of a final prototype.

Figure 2 shows how we structured the design and discussion sessions in three phases. *First*, during two **sketch critique workshops**, the research team presented three MNM staff with eight and three designs of AR exhibits in each session, respectively. In the first sketch and critique workshop, the research team created designs by selecting AR app attributes based on existing AR taxonomies and applying them to an existing museum exhibit through sketches. In the second sketch and critique workshop, the research team presented the museum staff with storyboards of three more designs based on their initial feedback in the first session. *Second*, the research team met with five museum staff in person for the **prototype critique workshop** on the installations of the MNM. We discussed a functional AR prototype and asked the staff to propose designs for an AR exhibition. The result of this workshop was the design of an AR exhibition that we called Memory Layers that the research team implemented. *Third*, with assistance from the MNM staff, the research team organized a **participant study** where we presented the final prototype to twenty participants; we recruited ten internal participants from museum staff external to the design process and ten outside of the museum.

4.2 AR App Design Attributes and Sketch Critique Workshops

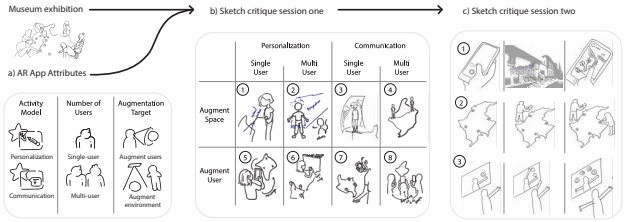


Figure 3: The research team started reviewing the literature for taxonomies of AR in the Cultural Heritage domain to define a set of attributes of an AR app (a). From here, the research team created eight speculative AR designs (b) based on these attributes and presented them to the MNM staff. From the museum feedback, we refined the designs and presented the museum staff with three storyboards (c).

Our first challenge was fostering shared understanding and expectations between the research team and the MNM staff. In preliminary interviews, we discussed with the museum staff their experience with designing interactive exhibitions with different technologies like VR, QR codes, websites, projection mapping, and 360 video [45, 122]. However, expectations of what our collaboration could, in theory, achieve with an AR exhibition were unclear to the MNM. As documented in prior research on current practices of AR creation, it was hard to get started and evaluate "state of the art" [20]. To explain and discuss possibly unknown AR concepts, we presented the museum staff with concrete AR app examples. We used an AR taxonomy to define AR attributes that were comprehensive for Cultural Heritage applications. Here we detail how we built this taxonomy from a literature review of AR taxonomies focused on Cultural Heritage applications and later used them to create and discuss designs that featured combinations of these attributes. Since the introduction of the Mixed Reality Continuum [86], multiple taxonomies have subdivided the Mixed Reality space according to various criteria. We drew specific characteristics from overlapping taxonomies that presented features our stakeholders highlighted as challenging and exciting. We defined a taxonomy with three dimensions: number of users, activity model, and target of augmentation, as shown in Figure 3a.

We developed the first dimension from the *activity model* described by Pucihar and Kljun [103]. Pucihar and Kljun distinguish between *personalization* applications, where users can alter the content, and *communication* applications, which create a channel between the institution and the visitor. We decided to include this

dimension because communication and personalization were underexplored in Cultural Heritage spaces. We defined our second dimension, the *number of users*, to distinguish between *collaborative* and *individual* applications. Speicher et al. introduced the number of users as one of the seven dimensions in MR applications [116], and cooperative versus individual applications are considered in other taxonomies [24, 130]. During initial discussions with the MNM staff, our collaborators stated that introducing collaboration was a challenging and unachieved milestone for their digital applications. Additionally, the implications of multiple users for the concept of proper distance were unclear. Finally, we included the *augmentation target* as our third category. Multiple prior mixed-reality taxonomies defined the augmentation target as the primary category [24, 79, 86]. For our purposes, we distinguished between *augmenting environments* using projective AR and *augmenting the user* using phone screens or head-mounted displays. We concluded that the augmentation target dimension was relevant because MNMS1 and MNMS2 described their intent to reflect on the relation of the application with the physical space of the installation.

We created eight application sketches that featured different combinations of attributes from our taxonomy (see Figure 3b). Several of our sketches referred to Colombia's map and we drew inspiration from the large-scale map used in "Caminando la Memoria." As Figure 1 shows, the original exhibition displays stories of the social leaders on the map. In sketch 1 (fig 3, b1), we proposed presenting visitor reflections, pictures, and other exhibition multimedia, projecting them on a map. In sketch 2 (fig 3, b2), the app randomly selects an audience member. A projector shows assets for the story projected around and in this person's body. The participant will then see instructions to enact a story. In sketch 3 (fig 3, b3), a user walks over the map, activating a mapping between the user's location and the content projected on the wall. In sketch 4 (fig 3, b4), after two people stand in a marker on the map, information about the path connecting the two places is displayed. In sketch 5 (fig 3, b5), we proposed to include visitor reflections, and multimedia in the exhibition that visitors can access by scanning a marker. In sketch 6 (fig 3, b6), users can capture video snapshots with filters of different themes in their contexts, i.e., apply a filter that shows murals created by a community but can see this mural in their room. In sketch 7 (fig 3, b7), the app uses visitors' facial expressions to find stories, i.e., a sad face followed by a happy face would show narratives of emancipation. Finally, in sketch 8 (fig 3, b8), users create profiles about the perspectives they want to include in the story; as more users point at a marker, they can access more diverse content.

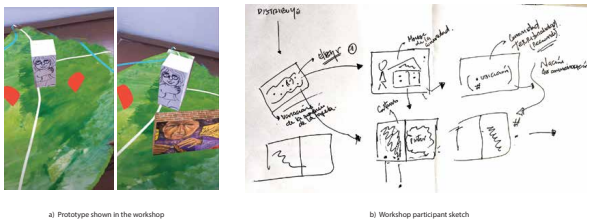
We led a discussion session based on these designs with MNMS1, MNMS2, and MNMS3. We asked them to compare the different designs regarding tradeoffs and motivations for the design features and opportunities missed by these designs. We provided MNM staff with criteria to compare the solutions we presented: 1) the potential to use the material suggested by the museum, 2) possible issues with technology literacy, and 3) the likeliness of contributing to the creation of an exhibition outside of the museum. The staff identified three proposals (b4, b6, b8) that best fit the criteria. In addition, MNM staff underscored the importance of creating exhibitions that enabled interaction among audience members. We also learned that the museum had struggled with technological gaps in different populations when attempting to decentralize through itinerant exhibitions. Access to the internet was also a challenge in some rural places. Finally, MNM staff emphasized that the audience can empathize with the victim's stories regardless of the technology, but they cannot truly put themselves in the victim's position. They stressed the importance of avoiding designs that failed to acknowledge viewer privilege. By viewer privilege, we refer to the difference in context between the exhibition and actual events and the difference between any visitor of the museum and the victims who often face socioeconomic disadvantages.

Based on the results of our previous session, we updated our designs and interviewed the MNM staff to review the updated designs artifacts (storyboards) presented in Figure 4c. Since the last discussion concluded with the importance of allowing visitors to interact, all proposals included shared activities between users. In storyboard 1 (fig 4, c1), we propose an app that uses a photo-sharing social media platform. People who follow the MNM can access different camera filters on these platforms where the real world can be augmented using 3D models, surface tracking, and target tracking. These filters can be published by the museum, hosted on their social media accounts, and used locally by museum followers on their phones. In storyboard 2 (fig 4, c-2), we use a map augmented with markers. If multiple users register simultaneously in the system and scan markers in different locations, they will receive information about the connection between the locations represented by the markers scanned. In storyboard 3 (fig 4, c-3), we present a screen and a camera setup. The prototype can interact with the position of the arms to navigate the temporal points of a testimony story. If two users join their hands, they can extend the content displayed.

Again, we presented the storyboards to MNMS1, MNMS2, and MNMS3 for discussion. We included the following criteria to compare the solutions we sketched: 1) the potential to use the material suggested by the museum, 2) possible issues with technology literacy, and 3) the likeliness of contributing to the creation of an exhibition outside of the museum. These criteria related to the missed opportunities the museum saw with other technologies they had used previously. Our collaborators emphasized the necessity to have the audience contribute to the museum and interact with each other. Additionally, the MNM staff were enthusiastic about leveraging social networks to create a connection between the museum platforms, the audience, and the victims. Finally, they insisted on designing an experience that does not limit the content to a purely aesthetic experience but promotes analysis and reflection on the content.

4.3 Prototype Critique Workshop

The next workshop started by critiquing an AR adaptation of the "Minga Muralista" exhibition created by the research team. We show this AR adaptation in Figure 4a. This prototype consisted of a paper handout with a cutout character that users can personalize by drawing on the paper. The cutout paper has an image marker that an app can recognize [15] to display a 3D map model containing different murals in locations occluded by the paper character. This configuration creates the illusion that the character is placed on the map. The research team introduced the paper handout to discuss how the



a) Prototype shown in the workshop b) Workshop participant sketch

Figure 4: The research team visited the MNM installations and interviewed the staff about a mobile AR prototype (a) and, based on their feedback, directed a workshop where the staff designed an application (b).

audience can include themselves in the narrative and dialogue with the museum content. We implemented these prototypes using Facebook's Spark AR library [50], which enables the deployment of AR apps into Facebook and Instagram mobile apps. We decided to use this platform following the museum staff's observations regarding access to mobile data, which Facebook subsidizes in Colombia [5]. We also saw potential in using social media to connect the audience with accounts managed by the MNM.

In the prototype critique session, we interviewed MNMS1, MNMS2, MNMS3, MNMS4, and MNMS5. The participants interacted with the prototype and then attended a technical session about the technical possibilities of using Spark AR to create AR applications. After this technical instruction, we facilitated a co-design exercise where each participant redesigned the prototype during the session by creating sketches of their ideas. We show an example of a design sketched by MNMS5 in Figure 4b. We discussed each participant's design in the group and their reflection on the possible implications of their redesign. Participants' ideas converged into a proposal that linked the AR to a real-life event during this session. One participant gave the example of the communities inaugurating many murals from the "Minga Muralista" exhibition. The staff discussed how social media's tagging features could allow people to participate in these ceremonies remotely. The staff found the personalization feature or drawing on the paper character exciting but limited in its capacity to engage the audience with the content. This feature also presents the challenge of filtering user input that could be damaging, inappropriate, or abusive.

4.4 Memory Layers App

We used the designs created by the museums in the previous sessions and their observations to implement a new prototype. This app was an AR adaptation of the "Minga Muralista" exhibition like the previous prototype. In the last session, the museum staff conceived the AR app as part of a virtual museum campaign launched with specific events of the communities, for example, the inauguration of a mural by an indigenous community. This feature enabled the audience to directly engage and contribute to the museum from their personal experience. A paper handout is distributed among museum attendees or during off-campus activities as part of the campaign. Figure 5a shows the design of the paper handout, which contains a mural cropped in half and outlined to imitate a coloring

Figure 5: The Memory layers exhibition included a paper handout (a) with a black and white version of a Nasa mural and information about the Nasa people's story. In (b) and (c), we show the experience of the AR app. Users trigger an animation of an unfolding origami bird by pointing their phone cameras at an image marker. The bird unfolds into the mural's missing half, showing the original mural.

page and a description of the authors and the story behind the mural. We discussed the coloring experience as a strategy to scaffold users' participation to minimize offensive or ill-intentioned content. The paper handout also contains text and visual prompts to customize the page using colors or other materials and share it using social media.

Moving to the AR component of the exhibition, users can access a particular camera filter if they follow the MNM on social media. Figures 5b and 5c show the filter's behavior: it uses the handout as a marker to display the original mural. The marker triggers an animation of a paper bird that unfolds as the missing part of the mural showing the contrast between the user's coloring and the original mural while traditional music played by the Nasa people plays in the background. We decided to include the juxtaposition of the original mural next to the personalized content because of the importance of having museum participants contribute their personal experiences but recognize them as different from the victims' backgrounds. The handout also prompts users to create social media posts recording their colored page augmented with the filter. After collecting the shared content from different participants, the museum can share a gallery of all the remote participants of the event linked to visual reports of the actual event with the communities where they inaugurate the murals. This last feature is a strategy for the museum to curate the content presented to the public but enable both visitors and communities to engage in real-time events.

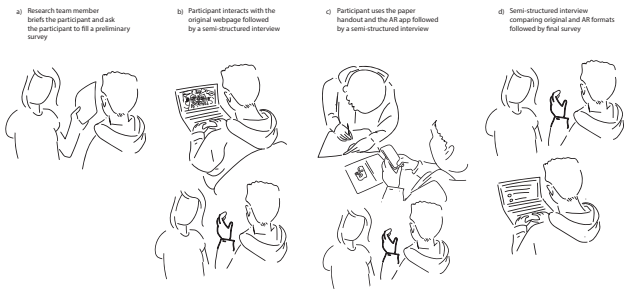


Figure 6: An interviewer (research team or staff member) briefed the participants about the study and handed a consent form (a). During the first part of the study, participants interacted with the original web exhibition, and a researcher interviewed them (b). Next, the interviewer described the AR exhibition campaign scenario and asked the participants to interact with the paper handout and the AR app finishing with an interview about these interactions (c). Finally, the interviewer asked the participant to compare the two experiences and fill out a post-interview questionnaire (d).

4.5 Memory Layers Participant Study

We tested Memory Layers in the installations of the MNM in Bogotá, Colombia. One member of the research team and three members of the MNM acted as facilitators of the user study. To recruit participants, we sent a flyer through an internal mailing list of the museum and on Facebook groups of universities. We chose these groups because universities are in Bogotá's downtown near the offices of the MNM. We recruited twenty participants; ten through the MNM mailing list and ten through social media. Each subject participated in a one-hour session on the installations of the MNM, which included monetary compensation of $20 delivered in cash. Some participants from the museum had experience working with victims in the field, and one identified themselves as a victim.

In Figure 6, we show the steps we followed with each participant in the study. First, the interviewer opened the session with a briefing on the study. Then participants filled out a questionnaire detailing if they were part of the museum staff and wished to identify as a victim (part of the national registry of victims). We also asked if they had interacted previously with the "Minga Muralista" exhibit and their familiarity with AR. Next, the participants interacted with the original "Minga Muralista" web page. We did not modify the website because the content we presented did not differ from publicly available content. Still, we told participants they were free to abandon the study at any moment should they not be comfortable. After this, the interviewer conducted a semi-structured interview about the web exhibition. We asked participants to retell what they recalled the most about the web page, how they would tell a friend about the Minga Muralista, and what they liked, disliked, and would change about the web page.

The interviewer followed this interview by setting the scene for Memory Layers, describing the campaign, and asking the participant to follow the prompts of the printed handout and use a phone provided by us to interact with the app. After participants finished coloring the paper handout and used the AR app, the interviewer conducted a semi-structured interview with the same questions asked for the web page. Finally, the participants answered a questionnaire comparing the two experiences and asking what stood out the most for them in each format.

To analyze the interviews, we used thematic analysis [59]. We developed themes using inductive coding of the interviews and followed an inter-coder agreement methodology, where coders first developed codes independently, then agreed on codes, then independently applied codes, and finally merged the codes applied. We also went through a final discussion session with the museum staff (MNMS1, MNMS2, and MNMS3), where we presented our codes and received feedback from them.

5 RESULTS

We present the results of both our design process and user study. These two aspects work together to inform our first two research questions: examine opportunities for AR depictions of sensitive narratives and learn ethical practices from professionals *(RQ1, RQ2)*. The possibilities and ethical considerations manifested in our design process as negotiating audiences' engagement with the stories, strategies for selecting content, and working with the affordances of the digital technology and the logistical context. The user study helped us identify the challenges in giving protagonism to the victim's stories but revealed the opportunities that are present in connecting the audience with the narrative while still acknowledging the different perspectives of victims and spectators.

5.1 Design Process Takeaways

We conceptualized three main themes from our analysis of the design process. First, there was a constant tradeoff between audience engagement through immersive and realistic depictions or purely aesthetic content and the sensitivity required to represent the victim's narratives. Second, despite this constant tension between possible content and re-victimization present in our discussions, carefully curated content could use AR not to immerse participants but to make them part of the narrative. Furthermore, we found from the final co-design session that we could complement this user–content relation with a curation process in social media that allowed us to aggregate many more of the museum attendees' input. Third, we learned from previous attempts of the museum to create decentralized experiences that access to network connection and digital literacy are significant challenges to be considered in the technical implementation of an AR exhibition.

5.1.1 AR requires careful design tradeoffs between digital simulation and re-victimization. From the very start of our work with the museum, the MNM staff made clear that "it is not possible to recreate the circumstances of an act of victimization" and that attempts to do so might bring us to an act of re-victimization where "the decisions of the victim are called into question" (MNMS1). Furthermore, the MNM staff emphasized that empathy is possible, but "you cannot put yourself in the victim's shoes; this means not recognizing your privileges and disconnecting from your context" (MNMS1). Following these thoughts, we limited the AR component of Memory Layers to the symbolic meaning of the murals painted by the victims and used it to juxtapose the mural with the visitor's colored

version instead of using AR to blend the user's environment with the circumstances of the victim.

We explored more immersive uses of AR in some of the **sketch and critique workshop** designs. In one of our initial sketches, for example, we tested the idea of projecting different elements on people's bodies, like an outfit of a farmer. Changing the user's clothing or physical appearance is a popular application of AR where users access social media "filters" to change their clothes [11] and body. AR apps could use this interaction to show the audience elements of the victim's environment. One example is the red cross simulation in AR [40] which immerses users in simulations of the violence experienced by a victim. Outside of AR, we can find examples in VR first-person perspectives of violent situations lived by a refugee [71], an African American man [6], a victim of sexual harassment [128], or an eyewitness of an emergency at a Los Angeles food bank [3]. Here we reflected on how digitally superimposing personal identifying elements can blur the lines of the audience's privilege concerning the victims.

Additionally, the museum staff re-emphasized that it is vital that the interaction with the app did not end up being reduced to an aesthetic experience but to challenge the audience to understand and reflect on the background behind what we presented through visuals and sounds. Therefore, we included in our prototype the text excerpts narrating the stories behind the murals, which highlighted the traumatic experiences that the community had overcome.

5.1.2 AR can create an active dialogue with the audience. Through our exploration of AR taxonomies in the literature, the museum staff highlighted the importance of creating a communication channel between the audience and the museum. The MNM's role in repaying the victims and creating citizen dialogues motivated their interest in promoting citizen participation. During the design process, participants highlighted initial proposals that enabled communication and personalization, which resulted in a final application that leveraged AR to include the visitor's content and social media to help the museum curate and aggregate this participation. We introduced drawing and coloring as the primary channels for personalization and proposed the coloring page format as a mechanism to control and filter user input. During our **prototype and critique workshop**, the staff highlighted the need to manage and curate the content contributed by the audience to avoid hate speech. We introduced the coloring paper handout to structure the audience's input while interacting with AR markers. They also thought of the small printed formats to decentralize exhibitions like large-format maps they used in previous exhibits like the one seen in Figure 1a.

To create a channel of communication, we relied on infrastructure provided by social media, namely Instagram, since we used SparkAR [50] to implement the AR component of the exhibition. This feature was motivated by the discussions with the museum staff interested in proposals where some form of file sharing allowed user submissions. When we presented Spark AR as a viable platform to prototype our applications, they were also interested in integrating the affordances of the social medium as they already have a presence in these social networks. We aimed to create a channel between the audience and the museum through posts made by the AR users on social media and encouraged this use by prompting the users to post their colored pages in the paper handout to be collected and curated later by the museum. With AR moving towards broader adoption of multi-user applications, creating better communication could enable future research on the impact of multi-user interactions in sensitive narratives immersive applications like existing work in social networks.[30, 32, 69]. Regarding immersive technologies, some recent research has also explored the potential of VR memorials that leverage communications in VR communities to face the challenges of in-person memorialization [125].

The use of Instagram (owned by Facebook) calls for a point of caution. While one of our motivators for using Instagram was the possibility of delivering our content by taking advantage of subsidized internet, the government's policy of aligning with Facebook to provide free internet has been called into question for violating internet neutrality [76]. In addition, efforts to build community in social media platforms could be called into question as these platforms have been accused of knowingly harming their users [56, 132], promoting hate speech [25, 48, 57], and dissemination of false information [47, 67, 84]. We brought up and discussed these risks with the Museum staff. Still, the MNM thought there were advantages to using Facebook because it made the technology accessible and took advantage of the existing use of the platform. These considerations are specific to the context of our research, and other researchers and practitioners would need to approach this in any future study carefully.

5.1.3 AR creates both opportunities and challenges for decentralizing exhibitions. MNMS2 said that access to the internet and phone models were a significant obstacle in exhibitions around the Colombian territory. The museum mentioned how exhibitions like "Caminando la memoria" relied on hyperlinks triggered from QR codes. However, the web information remained unused as users did not have internet access, and setting up ad-hoc internet connections for an itinerant exhibition was technically challenging.

We surfaced several technical attributes of interest when discussing the initial sketches. First, we decided against creating a native or web application that relied on an internet connection after hearing about the museum's previous network issues. We also established that the objective was to create an experience that could be accessed on-demand without the need for the museum to set up internet hubs or provide users with devices. Because the museum exhibition did not focus on a particular location or cultural artifact but on histories that people can access anywhere, we decided to exclude solutions that would require the audience to attend a specific location. We chose to use Spark AR [50] instead of other platforms like Snapchat or open formats emerging around the WebXR specification [16] due to most Colombians' subsidized internet access sponsored by Facebook [5]. In addition, we wanted to take advantage of the integration with social media that these platforms offer. Furthermore, given the popularity of Facebook's platform in Colombia, we discarded other alternatives like Snap's Lens Studio [14].

5.2 User Study Takeaways

Our user study allowed us to contrast our design goals, which underlined ethical principles highlighted by the museum staff around treating the victims' stories with dignity, with the new challenges and opportunities that surfaced as the audience interacted with

the implemented design. First, while we learned from our design process that it is essential to give prominence to the stories beyond enjoyable visual experiments, our user studies revealed challenges for AR formats to represent the narrative depth required to tell these stories. Second, the coloring activity and the augmentation of the users' drawings elicited reflections about the relations of the visitors with the victims that were not present in the original format. Third, the participants liked to provide input to the exhibition but were also conscious of the differences between their interpretations and the victims' story.

5.2.1 AR presents challenges to balancing content depth and overshadowing the victims' stories. During our design discussions, we learned of the importance of giving prominence to the clear communication of the experience of the victims beyond any visual or aesthetic representation. However, our user studies showed that the visuals and audio effects overshadowed the stories. Pictures of the murals painted by the Nasa community overshadowed the stories behind them. We observed the participants overlook these descriptions in contrast to the visual content. Beyond our observations, some participants directly alluded to the importance of balancing the audiovisual experience with the facts, context, and process.

Adding to the conflict of content versus visuals, we observed some participants distracted by the novelty of AR. The AR app was more salient due to its visuals, as P10 remarked: "[I remember the AR app most] Because of the music and the color. The image is very beautiful. When aligned with the hummingbird, the initial animation is very well done. This animation is very fluid". However, other participants contrasted the engaging nature of the AR app with its short duration. Some participants suggested the app would complement a more content-rich format such as a web page. For example, P10 remarked "The important thing about this type of expression is not only the mural or the final result, but all the community work [..] the process, the path is equal to or more important than the result". Nonetheless, we also found the same remarks referring to the web format. For example, P1 said, "[I would like] that the galleries had prominence. I would like them to have brief descriptions of what appears". In the case of the AR app, our decision to use a specific framework limited the size and time of our experience leading to observations about lack of depth.

5.2.2 AR helped tie together the content by victims and the audience input. Another significant discussion element in our design process was the museum's interest in using AR to add to their strategies for citizen engagement. Using social media campaigns arose from the discussion of different platforms to implement AR prototypes and morphed into specific design features like having the users draw and upload their videos which the museum would later curate. Beyond using a particular platform, AR played an essential role in helping us bridge the drawings created by the audience and the content created by the victims.

When we asked participants about their experience with Memory Layers, we observed they included themselves in these statements: "It [the app] involves me more with the information, and I feel part of it. I am a researcher, part of the experience" (P8), "I think it's interesting that they make me a part of the Minga process, the muralism process. You are part of this process of muralism. It was nice to me that the other half was already done, but I was part of a much larger mural" (P7). The coloring activity also allowed us to discuss the audience's connection with the story; for example, one participant used the white space in the coloring format to communicate with the victims and write the message "a path together." (P7). The participants' reflections happened in contrast to the web app comments, which focused on the content and the format. We can map these remarks about being part of the narrative to our design decision of having the users draw the content to be augmented. While the active participation helped shift the audience's focus into their actions, the AR also helped us tie it together. For example, P19 mentioned that "one can compare their work with the work of the people in the Minga," and P9 said that they liked to "be able to see how the drawing compared to mine. It showed what the artist does with this indigenous symbol and the side by side".

5.2.3 AR supported both immersion and identity boundaries between spectators and victims. Identity was a vital concept in our discussions with the museum. The MNM recognizes that the armed conflict has "deepened the rationales, practices, ideologies that discriminate, exclude and exert violence on groups and people based on their personal and collective identities" [61, 66, 114]. Regarding AR, research around Cultural Heritage has tackled the use of AR to preserve cultural identities [24]. Other research has explored opportunities for self-determination of social groups [68] and engagement by using identity-bolstering features such as self-presentation and personalization [108]. Our research faced unique challenges in that we needed to tune the immersive content to distinguish between the identity of the audience and the identity of the victims. We learned from the discussions with the museum that AR requires careful design tradeoffs between digital simulation and re-victimization as detailed in 5.1.1. Simultaneously, we aim to connect the audience with the victims and help them contribute to the museum. We learned from the user studies that the users could acknowledge the boundaries of identity, a reflection that surfaced when they compared their content with the original AR projections.

The users' reflections about their identity compared to the victims' surfaced after the interviewer asked participants what they would change about the experience. Some participants liked the personalization experience; others noted the importance of sustaining a balance between their creation and the original artist's intent. Some suggested it would be essential to show and share the mural in its entirety: "it is meant to inform. To fully understand it as what it is, an equilibrium between creating and educating" (P12). Participants also mentioned the complexity of interpreting the material: "I always think that this type of content is very complex because one can go very far from the original sense of the murals [..] this type of images should be consulted with the community or with the people who have authorship" (P20). Other participants acknowledged the identity of the victims. For example, one participant described Memory Layers as "an application to gather diverse perspectives" (P11).

6 REFLECTIONS ON INTERDISCIPLINARY WORK FOR SENSITIVE NARRATIVES

This section focuses on our takeaways related to the third research question regarding our collaboration with human rights organizations *(RQ3)*. As previous research has stated, "giving voice" through

technology is not a straightforward task considering the relations established between the HCI researchers, stakeholders, and participants [131]. Furthermore, we (the research team) recognize a limitation in our reliance on the MNM in our work. Therefore, we want to answer calls for transparency [126] and review our research processes by reflecting on the advantages and disadvantages of our approach. In doing so, we also aim to contribute to the field by giving insight into our final question of how can HCI practitioners collaborate with organizations to find best practices for designing immersive content for sensitive narratives?

The MNM is a public institution and part of the Colombian government. According to the law establishing this institution, their labor cannot create an "official truth" that obstructs plurality and participation. The research team found value in learning from the extensive experience that a well-funded institution can provide to the staff through diverse projects, material, financial and logistical support. For example, the museum staff was able to engage with us as part of their official duties in the MNM, and there are internal programs in the museum that promote engagement with academia. At this point, we cannot go on without mentioning that the CNMH's latest leadership had fallen into controversy [12], and the uncertainty of the effects of this new leadership hindered our collaboration with them. Nonetheless, the research team found the museum staff collaborators ideal because of their experience working with victims and their trajectory in this institution which had transcended recent political havoc.

Given the staff's work and trajectory in the MNM (which precedes recent scandals), we understood their approach towards AR exhibitions as seeking neutrality. This perspective had implications for many of the design decisions and recommendations. Research that addressed the voice of the victims directly could lead to different observations about AR applications, even contradicting our statements about digital simulations. For example, a participant in a workshop for Digital Storytelling as Public Engagement around Abortion Rights suggested creating "virtual reality abortion," [85] which would clash with the MNM's interpretation of the dignity of victims. Working with institutions is not the only approach to finding ethical approaches to sensitive narratives using AR, and other efforts have taken more victim-centric perspectives, sometimes in opposition to institutions [109] or State power [133]. To consider the value of partnership with institutions, we recognized through our engagement that the museum staff has had vast experience interacting with victims' stories and balancing the plurality of identities that can inform a reflection of sensitive narratives in immersive formats.

We join a growing body of literature where practical research gives space to reflect on the ethical challenges of HCI research practice, particularly in finding a power balance in the design process and recognizing the role of those involved through their experience and job role [95]. In our case study, we frame the role of the museum staff as value advocates, which brings with it the advantages of interdisciplinarity and the caveats of a limited set of values that can be considered hegemonic [111]. This approach is in line with previous research in other fields of sensitive nature, such as designing persuasive technologies for sustainability using Value Sensitive Design implemented through Participatory Design with domain experts [70]. However, the latter does not mean that the MNM staff was limited to giving ethical concepts about our designs, as they were pivotal in selecting content, participating in ideation, and deciding on specific features.

Future research that tackles the participation of victims could help inform what are tradeoffs in giving voice to different agents. We consider that focusing on digital simulation and immersive storytelling is a potential point of discussion and disagreement amongst possible contributors (i.e., victims vs. institutions). We believe our contribution can spark new conversations about the challenges organizations face while being sensitive and respectful to victims and spark many more angles to inform future directions that can foster empathy without removing the voice of the victims.

7 FUTURE RESEARCH DIRECTIONS IN THE DESIGN OF IMMERSIVE SENSITIVE NARRATIVES

Here we reflect on our experience working with the MNM and extract insights into future research pathways on the design of AR applications for sensitive narratives. Our collaborative experience with the museum provides a lens to reflect on the broader space of ethical considerations for designing immersive storytelling applications based on sensitive narratives. However, we recognize that this is a highly complex space that can welcome contributions in other directions. The space of sensitive narratives is broad enough to call for responsibility and careful crafting from producers and researchers of immersive technologies. Additionally, there is potential in leveraging the power of virtual recreations to help people connect with social issues, create informed dialogues, and broaden our perspectives of the world. Our work highlights three inflection points where designers can fail to recognize the dignity of the victims: 1) in the process of selecting the content to be recreated virtually, we had to be careful not to equate digital representations with life-threatening or traumatizing experiences, 2) in the process of engaging the audience we strived to draw in the audience and participate but at the same time have them recognize they are not the victims and there is a privilege in that, and 3) in designing an AR recreation we found that the context of sensitive narratives implies the need to technologies of easy access and compatibility with multiple devices which is not often the case with AR.

7.1 How to balance the vulnerabilities of victims and the use of immersive technologies

The objectives of using digital recreations to represent sensitive narratives can range from shocking and moving audiences to striving for accuracy and seeking accurate depictions. Artists have crafted discomforting technology-mediated experiences that seek empathic responses from the audience, for example, Hiromi Marissa Ozaki's (Spuniko!) Menstruation Machine [4] or Fabián Taranto's work "Search in Progress" [91]. However, there are challenges in effectively portraying and adapting historical contexts in interactive installations from a Cultural Heritage perspective [77]. In our work with the museum staff, we found a moderate voice that advocates for a less visceral approach to empathy, based on the principle that technology cannot emulate the conditions of victimization. Still,

this approach can risk blurring the audience's distinction between their experience and the victims.

Both our design process and the results of our study challenged us to select the content and its format carefully. In terms of our design process, based on the discussion of the sketches described in 4.2, we chose a strategy where we avoided personally identifying elements and instead focused on symbolic aspects of the story. Additionally, we avoided approaches where the whole story of the victim was somehow partially enacted by the audience. However, we failed at selecting elements that represented the complexity of the victim's message, as discussed in 5.2.1. Because we focused the digital augmentation on the murals, the animations, sounds, and colors captured the audience, who made little mention of the background behind the images. We learned that it is essential to highlight the seriousness of the victims' experience. Our attempts to avoid this representation in an immersive format made us water down the original story and made the actual testimony lose weight compared to the audiovisual experience.

7.2 How to engage the audience in sensitive narratives

The role of the spectator in AR for evocative storytelling (see section 2.2) is not fully understood. In the broader sense of "new media," [80] Meg McLagan emphasizes that this understanding is "critical to making sense of the new arenas of practice that are emerging around human rights" [83]. In our work, we aimed to contribute to this understanding by following two principles in engaging the audience: eliciting active audience participation and maintaining a respectful distance between the experience of the victims and the audience. Following this goal, we created content that represented both the victims and the audience; we did not equate the audience's experience to the victims' but explicitly included both as separate entities. We implemented this by literally juxtaposing the victims' content digitally over the audience's creations. We found that this created a reflection from the audience that promoted dialogue, engagement, and recognition, as shown in our user studies 5.2.3.

Researchers have approached the search to engage the audience in cultural heritage through personalized content [98]. Existing work in apartheid-era narratives [72] constitutes an example of digital recreations in sensitive contexts that are compatible with our approach. In this example, the authors did not create virtual simulations of the victims but virtual narrators that acknowledge the audience's existence by answering or asking questions. Other work used a similar approach in an immersive sound installation where "The curatorial team searched the museum archives looking for intimate personal stories specifically relevant to the site or the local area. The aim was to create a style of narrative that was personal, at times even intimate" [18].

7.3 How to answer sensitive narratives specific needs around technology

In our design process with the MNM, we found that their use case for telling sensitive narratives challenges us to build a distributed and participative system. Suppose technologists want to make a case for AR as a tool for raising awareness and cultivating empathy. In that case, it is a wasted effort if access to the technology is a privilege in itself. Victims, dialogue, and difficult conversations can happen anywhere on earth and are arguably needed most where technology is lacking. We found that repurposing social media AR, usually targeted at cosmetic manipulation and marketing, can open the door to easy access, device-independent AR, as discussed in 5.1.3. At the same time, initiatives like the free internet project in Colombia, sponsored by Facebook, do not come without critics [74] that highlight how the advantage of free internet we leveraged can turn around into a tool of censorship and limited access.

We are not alone in underlining the importance of technologies that promote participation. Giaccardi [2] argues for social media to move beyond engagement into involvement and co-creation. HCI research about Information and Communication Technology in genocide memorials found that "engaging public audiences at a distance" [46] was essential for sustaining the archive. Work by Ciolfi and McLoughlin [36] simultaneously addresses questions about inclusion and the technical challenges of integrating technology with Cultural Heritage exhibitions. While these concerns are not specific to AR, ensuring that AR as a new technology for sensitive narratives does not lock the exhibits inside the museum's walls is critical to include a broader audience and ensure the continuity of these narratives.

8 CONCLUSION

This paper reports a design collaboration with a human rights museum of an AR app for sensitive narratives. To find opportunities and challenges in the design or AR reproductions of victim accounts, we draw from the analysis of our design collaboration and the thematic analysis of a user study we ran in the MNM's installations. We documented our combined efforts with the museum staff around walking the line between digital simulation and re-victimization, actively engaging the audience using AR, and the technical challenges we faced in creating an itinerant decentralized exhibition. The participant study showed that despite our efforts to highlight the victims' stories, the aesthetic experience and novelty effect could relegate them to a second plane. We also observed that AR helped participants feel more engaged with the exhibition than the original web format. Finally, we learned that the spectators could acknowledge their privilege as viewers and not the protagonist of these stories. By combining notes of our design process and the learnings of our study, we provided recommendations for designing AR for sensitive narratives.

Additionally, to further the discussion in HCI about learning and collaborating with professionals in the domain of human rights and victimization stories, we reflect on the roles of our collaboration and the implications of working with the museum staff as "value advocates" instead of working directly with the victims whose stories the MNM collects. In this way, we contribute to HCI discussion around co-creation and "giving voice" [131] to others through research.

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