The State of Museum Digital Practice | 2022

A collection of graduate essays

Museums and Technology | George Washington University

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GWU MUSEUM STUDIES, WASHINGTON, D.C.

Contents

Teaching Museum Digital Practice in 2022

The *Master of Arts in Museum Studies* program at The George Washington University responds to the evolving museum profession by combining hands-on training with future-focused theoretical engagement. Students who enrol in the program gain foundational knowledge about the state of museum work today, practical skills and the ability to critically engage with developments in the field.

In *Museums and Technology*, we take on an ambitious project to realize these goals. Across the 14-week semester, the class creates a publication about the state of digital practice in museums in 2022. Each student is responsible for creating one 3,000-word publishable piece that explores a specific research area related to the overall topic of museums and digital technology. Submissions can synthesize current readings and practice around a broad area, or dive deeper into a single technology or case study related to the theme of digital practice and its impact on the museum.

This is the third iteration of this publication project. The first, produced in 2019, was designed by Dr Suse Anderson, and informed by her experience co-editing several digitally-informed publishing projects, including *CODE|WORDS Technology and Theory in the Museum*, which brought together leading museum thinkers and practitioners to explore the impact of digital technology on the nature of museums, and *Humanizing the Digital: Unproceedings from the 2018 MCN Confererence*, which responded to the *MCN annual conference*. In many ways, each of these projects within the sector marked a specific moment in time. Likewise, it is intended that each book in the *The State of Museum Digital Practice* series will stand as a marker of each cohort of students and their concerns and interests in a specific timeframe. The first two versions of this publication buttressed the global coronavirus pandemic, with its huge disruptions to museum practice, education and daily life. This newest publication exists in a world still grappling with the implications of the pandemic, but is already showing signs of concern with different kinds of issues, and new possible futures for museums in their relationships with technology. Students have focused on topics related to digitization, including its ethics and implications, accessibility, the realities of zoom education for museum learning, and emerging technologies, such as virtual reality and NFTs.

Each student is responsible for defining and researching their topic and writing their paper. Suse Anderson, Assistant Professor in Museum Studies is responsible for compiling the final book. Because the project is produced quickly, the editorial hand is only lightly felt, so there may be inconsistencies in style, formatting and approach.

We hope you enjoy this publication, produced by the fall class of 2022.

I

Indigenous Data Sovereignty and Open Access in Museums

Grace Bautista, The George Washington University

> *We live in a world where data that once only existed in dusty boxes in museums are now being brought out and digitized and made widely available, including data that includes our traditional knowledge and our stories about ourselves.*[1] ***–Dr. Tahu Kukutai*** *(Ngati Tiipa, Ngati Kinohaku, Te Aupouri), founding member of the Maori Data Sovereignty Network Te Mana Raraunga and the Global Indigenous Data Alliance*

With the internet at our fingertips, data is everywhere. From DNA sequences used in genetic research to social media feeds tailor-made for every user, data can shape our perceptions. It allows us to examine our past and predict our future. Data is now a valuable resource, with the ability to purchase data or use it to build open access resources. Museums, libraries, archives, and galleries worldwide hold online data repositories, often found in collections metadata. These institutions, too, are swept up in an ongoing dialogue over open access data. In this project, open access data refers to open cultural data, as explored by digital humanities scholar Mia Ridge. Ridge defines cultural data as "objects, publications [...] archival material" and more "created and distributed by museums, libraries, archives and other organisations."[2] More broadly, data can also include "different types of content, from metadata or tombstone records [...] to entire collection records" and even digitized versions of this content or "digital surrogates," as Ridge labels.[3] Open access data is, in essence, "content that is available for use outside the institution that created it" mainly through "licences that clarify the permissions and restrictions placed on data."[4]

This project seeks to address the benefit of open access resources while understanding the harm it can inflict on Indigenous communities. Indigenous data encompasses the intangible and tangible cultural materials and knowledge of Indigenous peoples. Online repositories in cultural institutions often contain significant gaps in their data, as scholar and Te Kotahi Research Institute Director, Maui Hudson (Whakatōhea), explained during a presentation for eCampusOntario's Open Education Week 2022. Hudson contends that Indigenous names, places, and provenance information are often missing from online collections.[5] Mistakes and gaps in physical records are also absorbed into the metadata.[6] Copyright law can further complicate matters by limiting Indigenous communities from owning the rights to their knowledge, which this project explores later.

Hudson and other scholars are part of a growing movement to promote Indigenous data sovereignty. Miranda Belarde-Lewis (Zuni/Tlingit), an independent curator and assistant professor of North American Indigenous Knowledge at the University of Washington, describes the concept of data sovereignty in the context of

cultural heritage as the ability "to inform the practices of record-keeping systems" which occur in cultural institutions.[7] Reclaiming and recontextualizing this data can constitute "a vital act of sovereignty."[8] She argues that "tribal information is part of our sovereignty" and by working to change practices of record-keeping systems, "we are asserting our treaty rights, we are asserting our right to self-determine how we handle our own information, our own data gathering, and also the data that's been gathered about us."[9] Belarde-Lewis' affirmation of data sovereignty as a tool of empowerment provides insight into the importance of Indigenous data sovereignty as a crucial consideration for museums re-examining their relationships with tribal source communities. This project will explore how the field of museums and cultural institutions—specifically in the United States, despite much of the most visible discussion generated in non-US institutions—has responded to and created solutions for issues surrounding Indigenous data sovereignty. These solutions demonstrate how the field must incorporate Indigenous data sovereignty into online collections as a core component of moving toward a decolonized, 21st-century museum.

COLONIZING KNOWLEDGE

To understand Indigenous data sovereignty, we must first examine the knowledge and traditional data of Indigenous communities. Desi Rodriguez-Lonebear (Northern Cheyenne and Chicana), professor of sociology and American Indian studies and co-founder of the US Indigenous Data Sovereignty Network, argues that Indigenous people have gathered data for centuries.[10] "Contrary to colonial narratives of savagery and unsophistication," Rodriguez-Lonebear says, "Indigenous peoples were relentlessly empirical with advanced systems of knowledge."[11] Rodriguez-Lonebear cites examples of Plains Indians, such as the Lakota and Blackfeet tribes, who used hides to record winter counts.[12] These records included "numbers of tribal citizens, allies, enemies, wild game, lodges" and other significant tribal data.[13] Rodriguez-Lonebear also cites Pacific Northwestern totem poles as methods of record-keeping; totem poles documented "everything from family histories and tribal origin stories to achievements, marriages and land rights."[14] Lastly, Rodriguez-Lonebear examines her tribe, the Northern Cheyenne, and their record-keeping practices. The Northern Cheyenne's strong oral history tradition passed knowledge down through generations and still impacts tribal decisions today.[15] As data sources, oral histories challenge "the idea of data as products of modernity with little relevance to Indigenous lived experiences or traditions."[16] In short, Indigenous data and data gathering have long informed Indigenous knowledge and traditions.

Despite numerous Indigenous record-keeping practices, museums and other cultural institutions remain "ongoing settler-colonial projects" in which "the dispossession of homelands runs hand in hand with dispossession of knowledge."[17] Citing Eve Tuck and K. Wayne Yang's "Decolonization is not a metaphor," scholars Jane Anderson and Kimberly Christen discuss how settler colonialism distorts human relationships with the land into one between property and owner.[18] They argue that the "process of remaking relationships to land has subsequent consequences where relationships to knowledge are also made through property's lens."[19] Because Indigenous data is viewed through the lens of property available for settler colonial institutions to claim ownership over, the colonization of knowledge persists with modern data issues.

Recent issues with open access and copyright laws threaten Indigenous communities and their data. In 2018, the United States passed the Music Modernization Act, which sought to change copyright laws regarding recordings made before 1972.[20] The new law developed a system to pay royalties to artists to "find and compensate artists whose music was recorded before 1972 whenever their work is streamed online today."[21] However, if artists cannot be located, the Act opens up the possibility of increased public access to ethnographic sound recordings.[22] These recordings could include ritual performances and oral histories from Indigenous communities that would become open for public access for non-commercial purposes.[23] The American Indian Policy Institute (AIPI) of Arizona State University weighed the risk that likely "hundreds of thousands of sound recordings were made on Tribal lands between the advent of sound recording in the late 1800s until 1972."[24] These recordings, many of which are held in museums, may have been captured by members of Indigenous nations. However, "a substantial volume were made by anthropologists, missionaries, tourists" and others who recorded events, songs, and practices which may be sensitive and sacred.[25]

As museums and cultural institutions digitize and publicize these recordings, they can subvert Indigenous ownership through the non-commercial exception of the new copyright law, thereby avoiding copyright violations. Similar to physical objects in museums, these recordings may also lack information due to poor documentation.[26] AIPI points to missing details such as "the names of performers, the date of recording, the specific location

where the recording was made, or agreements as to who would own the rights to the recordings" if the recorder even considered such an agreement "necessary."[27] Furthermore, recorders may not have explained their intended use for the recorded materials, meaning "numerous tribes and tribal members have no idea what recordings exist, including ones that may have deep personal and cultural value."[28]

THE CASE FOR DIGITAL REPATRIATION: THE PASSAMAQUODDY TRIBE

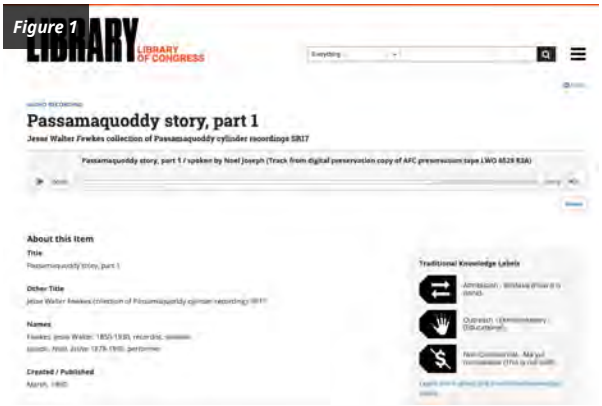
In 1890, American anthropologist, Jesse Walter Fewkes, passed through the Passamaquoddy Tribe (in what is now eastern Maine) on his way to study the Hopi and Zuni people. Fewkes stopped to document the "remnants of the Passamaquoddy" through an Edison phonograph, culminating in over thirty wax cylinder recordings of Passamaquoddy songs, chants, and stories.[29] The cylinders captured sacred knowledge as well as "precious audio of people's grandmothers and grandfathers, in a language that was becoming more endangered with each passing year."[30] Members of the Passamaquoddy Tribe did not have access to these recordings previously held in the Harvard Peabody Museum.[31] The Library of Congress later obtained the cylinders and began working with the Passamaquoddy to digitize the cylinders and engage in the digital repatriation process. The digital repatriation process, in this instance, involved returning authority and ownership to the Passamaquoddy for the "digital files, metadata, and documentation" of the recordings.[32]

Kim Christen and Jane Anderson describe these repatriation discussions, noting their experience hearing the recordings—specifically, the Passamaquoddy "Trading Song"—for the first time with members of the Tribe:

> *What started as listening quickly became singing by elder Gracie Davis. Then another person joined in. Then many, young and old [...] For the rest of the morning we listened to that one two-minute song over and over, verse by verse [...] That day, the songs from the cylinder were reconnected into community practices—knowledge exchange, language instruction, historical education, and so on. This was only a beginning. (Anderson and Christen, 113-114)*

Christen and Anderson later heard from Passamaquoddy Tribe members that the recordings had been used in listening sessions with community members, resulting in more "words, phrases, and beats that they were defining and using in language classes, and younger children who did not speak the language were using the beats to create new songs."[33] The digital repatriation of these recordings helped the Passamaquoddy Tribe assert their ownership over their cultural knowledge. Current and future generations can learn and reclaim their language. It also brought Passamaquoddy ancestors out of the shadow of Fewkes' ownership, as the listening sessions helped clarify the singers and others who participated in the recordings—rather than the subjects of the recordings, they are co-authors.[34] Now, the Library of Congress website hosts the digital recordings of the cylinders while giving proper attribution to the Passamaquoddy Tribe through Traditional Knowledge (TK) labels, a subject discussed later in this project. As Christen and Anderson explain, these labels and repatriating the recordings are only the beginning. "Redefining attribution through Passamaquoddy cultural authority," they say, "initiates the unraveling of settler-colonial structures of property possession exerted over Indigenous knowledge."[35] The Passamaquoddy recordings serve as an example for museums and cultural institutions to decolonize their data and assert Indigenous data sovereignty.

Figure 1



The Library of Congress webpage showing a Passamaquoddy recording along with TK Attribution, Outreach, and Non-Commercial labels.

INDIGENOUS DATA SOVEREIGNTY IN PRACTICE: TK LABELS

As Indigenous communities have struggled to gain legal ownership of their data, several digital tools have emerged from Indigenous scholars, museum professionals, and others to expand Indigenous ownership over data. One example is Local Contexts' Traditional Knowledge (TK) label system. Local Contexts, co-founded by Jane Anderson and Kim Christen in 2010, follows in the footsteps of organizations such as Mukurtu CMS. Also founded by Christen, Mukurtu works similarly with tribal organizations as an access portal for digital collections. The open-source

software also works to implement TK labels and cultural protocols. While Mukurtu focuses on building a digital platform, Local Contexts emphasizes the role of Indigenous governance frameworks. These frameworks and the TK label system aid in "determining ownership, access, and culturally appropriate conditions" for sharing collections of Indigenous knowledge.[36]

TK labels draw on the concepts of Creative Commons and IP labels to "recognize the cultural authority" of Indigenous groups alongside legal recognitions.[37] As Local Contexts co-founder Jane Anderson explains, "as non-legal rights holders, you can't have a license over [data held in cultural institutions], you can't exert any control."[38] The project began over ten years ago. Now, Local Contexts has developed twenty TK labels reflecting cultural protocols and Indigenous sharing expectations.[39] Every community can customize TK labels to convey certain attributes, including their own languages. Local Contexts has three main types of labels: provenance labels, protocol labels, and permission labels. *Provenance* labels, as Anderson explains, ask us to consider "where does Indigenous knowledge come from?" while "putting Indigenous names back in the record."[40] They can also specify various community or family relationships regarding the sharing of information, such as the Family Label (TK F), indicating knowledge only shared between family members.[41] *Protocol* labels vary widely—the seasonal label, for instance, can be used to designate knowledge that should only be shared during a certain time of the year (such as after the first snowfall).[42] These labels can also describe the protocols around sharing information based on gender, family, or culturally sensitive knowledge.[43] The final category of *permissions* labels describes "the different kinds of permissions communities would like in relationship to sharing their material," such as opening material to commercialization (or restricting it to community use).[44]

The Sq'éwlets Virtual Museum is one example of an Indigenous community using TK labels. The Sq'éwlets First Nation, located in present-day British Columbia, use their virtual museum to share "our journey from ancient times to the present" through their digital collections.[45] Visitors are invited to view á:wkw' ("belongings") related to plant harvesting, fishing, building, dwelling, and caring for ancestors, among other belongings. The Sq'éwlets use TK labels in several instances, notably regarding their secret and sacred objects.

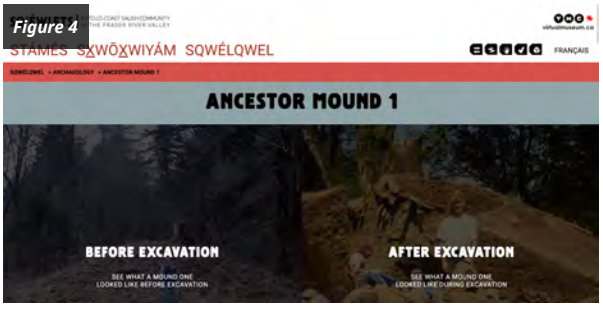
Figure 2

This TK label is applied to human remains, which are sacred and cannot be shown to the public.

Figure 3

The Secret/Sacred TK Label

Figure 4



Ancestor Mound 1, also designated as Secret/Sacred along with four other labels (see below).

Figure 5

These TK labels denoting attribution, non-commercial use, outreach, and verification also include a custom name, as well as an audio file of the Halq'eméylem translation.

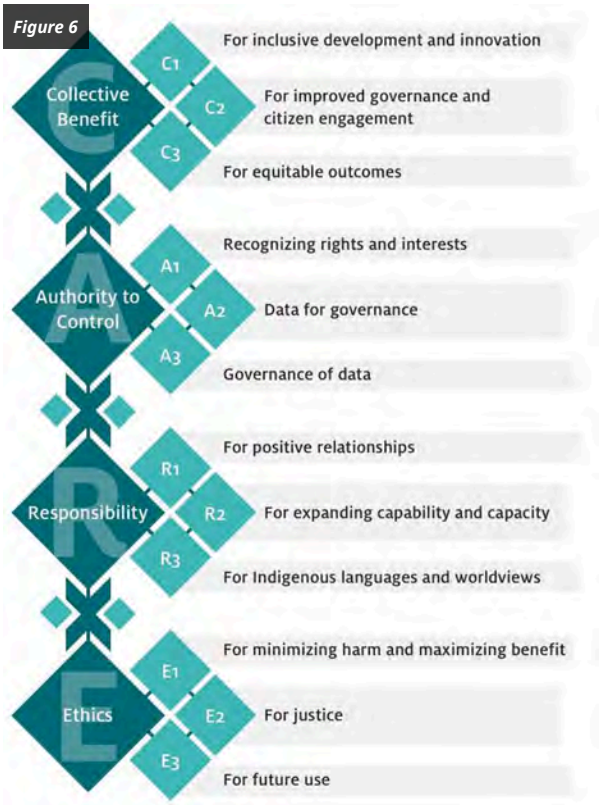
Christen and Anderson affirm that the act of attribution makes visible what has been erased by settler colonialism, as well as Indigenous survivance.[46] Indigenous survivance is a concept that scholar Gerald Vizenor (Chippewa) defines as "an active sense of presence over absence, deracination, and oblivion."[47] It is "the continuance of stories" which are themselves "renunciations of

dominance."[48] Museums and other cultural institutions should consider using TK labels—whether through Local Contexts or another system—to put the power of attribution and cultural authority back into the hands of Indigenous communities, thus strengthening and promoting Indigenous survivance.

APPLYING THE CARE PRINCIPLES TO MUSEUMS AND CULTURAL INSTITUTIONS

While tools such as TK labels have created avenues for Indigenous data sovereignty, open access still threatens Indigenous knowledge. Indigenous nations may feel a tension between protecting this data and supporting open data-sharing initiatives.[49] To resolve some of this tension, the International Indigenous Data Sovereignty Interest Group[50] was formed to create the CARE Principles for Indigenous Data Governance, beginning with workshops in 2018.[51] The principles of CARE stand for "Collective Benefit, Authority to Control, Responsibility, and Ethics" and were developed with the guidance of scholars, organizations, and Indigenous peoples themselves.[52] Rather than centering data, CARE Principles emphasize a people-first approach. These principles also further define Indigenous data, which can include information about the land, Indigenous people (through administrative, census, and other means), and Indigenous people's traditional and cultural knowledge.[53]

Figure 6



The CARE principles for Indigenous Data Governance (Carroll et al. 2020)

Several concepts support the core CARE Principles. The first principle denotes how "Indigenous data must facilitate *collective benefit* for Indigenous Peoples to achieve inclusive development and innovation, improve governance and citizen engagement, and realize equitable outcomes."[54] Under the collective benefit principle, data reflects community values and puts data in the hands of Indigenous people. Further emphasizing this is the principle of Indigenous people's *authority to control* data through data governance, which necessitates access to the data and involvement in stewardship decisions.[55] The third principle of *responsibility* urges data stewards to "nurture respectful relationships" with their Indigenous source communities.[56] Lastly, CARE's *ethics* principle states that these concepts are not possible without the "representation and participation of Indigenous Peoples, who must be the ones to assess benefits, harms, and potential future uses based on community values and ethics."[57] In other words, the ethical principle exists to minimize harm to Indigenous communities.

Several organizations have moved to adopt the CARE Principles, including the Research Data Alliance, the Open Data Charter, and the Smithsonian Institution.[58] While the Smithsonian does not cite the CARE Principles directly in their Open Access Initiative Values statement, their Open

Access FAQ page and values statement echoes the core sentiments of the CARE Principles. One significant aspect of the Open Access initiative is that assets deemed "culturally sensitive" are not available for open access.[59] While Smithsonian does not define the term "culturally sensitive," the Institution does state they "[respect] the rights and sovereignty of the diverse cultures Smithsonian collections represent," adding that the Smithsonian "engages with these communities about the use of these assets, so culturally sensitive content may not be Open Access now or in the future."[60]

Despite the Smithsonian's willingness to publicize physical repatriation efforts—which are notably visible at the National Museum of the American Indian—the CARE Principles are difficult to uncover when searching for information on Smithsonian's digital collections management. To move towards a more decolonized framework, museums must not only commit to stewarding Indigenous data with respect, but communicate how their practices will nurture respectful relationships, recognize authority, and minimize harm toward Indigenous communities. Ultimately, the CARE Principles lay out the ethical groundwork for digital repatriation and TK labels as museums and cultural institutions develop open access resources.

THE PATH FORWARD

Outside of the United States, Indigenous data networks have sought to address the issue of data sovereignty. Groups in Aotearoa/New Zealand, Australia, and Canada have generated much of the visible guidance and collaborated through the global Research Data Alliance. These networks have informed the practices of data scholars in the US, such as the US Indigenous Data Sovereignty Network launched by Carroll and Rodriguez-Lonebear in 2016. These data scholars created recommendations for both Indigenous and non-Indigenous stakeholders to advance data sovereignty in the US. Stakeholders in museums and cultural institutions should consider at least three of the many recommendations. First, museums should promote the "adoption and implementation of common principles of Indigenous data governance by tribes" and other organizations, such as the CARE Principles.[61] Second, museums must "establish data governance mechanisms that non-tribal governments, organizations, corporations, and researchers can use to support Indigenous data sovereignty."[62] This could mean engaging in digital repatriation or working with source communities to create TK labels. Lastly, it is imperative that museums "share strategies, resources, and best practices" while investing in "Indigenous professionals and community members who are skilled at creating, collecting, and managing data" or "data warriors."[63] Creating a transparent and collaborative process for data sovereignty will ultimately help museums form relationships with Indigenous communities and facilitate more equitable decision-making processes. The issue of data sovereignty goes beyond data stored in digital collections and back to the museum as an ongoing settler colonial project. Museums hold vast quantities of Indigenous knowledge and remove the authority of Indigenous authors and knowledge-holders to uphold settler colonialism. Policies such as residential schooling and forced assimilation also upheld settler colonialism as they "sought to erase Indigenous knowledge and forced many tribes to rely on external sources of information about their communities' economic, environmental, and health status."[64] Moreover, museums are still culpable for the remains of many Indigenous peoples held in their collections which illustrates "the ultimate theft of Indigenous peoples' data: their bodies."[65] Policies such as the Native American Graves Protection and Repatriation Act (1990) regulate the return of human remains, funerary objects, sacred objects, and objects of cultural patrimony to Native American and Native Hawaiian groups. But NAGPRA's regulations guiding museums only apply to physical objects and remains. Despite NAGPRA—and NAGPRA's recently-proposed changes—policy guiding Indigenous data governance remains lacking.

CONCLUSION

It is difficult to deny the benefits provided by open access resources to museums and their publics. With over 4.5 million Open Access objects in the Smithsonian alone, creating open digital collections erodes the barriers between visitors and the knowledge stewarded by museums. However, the advantages of open access cannot justify further harming Indigenous communities. Museums must recognize the emerging role of data sovereignty as they grapple with physical repatriation and decolonizing initiatives.

Museum scholars have argued that the museum cannot be decolonized.[66] This is a crucial perspective as museums reconcile with the violent colonial history of their physical locations, objects, and data. Each of these aspects can perpetuate colonialism. However, with emerging tools such as TK labels, digital repatriation, and frameworks such as the CARE Principles, museums have the opportunity to assert Indigenous cultural authority over Indigenous knowledge. This process may not decolonize

the museum, but it is one step to avoid further harm and move toward healing. Rather than excluding Indigenous voices—thus perpetuating a cycle of dependence on museums to learn one's own cultural knowledge—museums can collaborate with Indigenous people and ensure better stewardship for all.

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II

Balancing Access and Ethics in Digitization

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Digitization and its translation to an online format is often championed as an asset for museums as a means of providing expanded access to a wider audience. On average, approximately two to four percent of a museum's collection will be displayed in galleries, an increase in digitization, however, can enable unprecedented access that otherwise would be unavailable. Additionally, an increase in digitized collections can facilitate a diversified experience for visitors and provide added levels of historical interpretation. Simply, digitization of cultural heritage is "fundamentally about democracy and human rights…Cultural heritage belongs to everyone and everyone should have the same opportunities to take part in and contribute to our cultural heritage."[1]

Figure 1

Figure 1 illustrates a collections page from the National Gallery of Art, Camille Pissarro's *Place du Carrousel*

Furthermore, the process of digitization and online access also has the potential to reorient objects outside the western, colonialist perspective and agenda. To the benefit of source communities, digitization can allow for a subtle reclaiming of culture and is considered part of the restitution process. Additionally, digitization can work to build strong relationship with source communities and museums. Above all, it is also important to understand that digitization should not be considered a replacement to physical exhibitions. Instead of an inferior method of viewing objects and collections, digitization provides a

parallel experience that allows for a unique perspective and interpretation.

In contrast to the praised effects, digitizing museum collections and making them available online also leads to important questions regarding whether vital context about the object is lost. For instance, while museums can largely control the environment in which objects are presented within their galleries, meaning they can provide context to orient visitors, the same is not always the case online. Online collections can be viewed outside of the museum's anticipated context. As a result, this can lead to differing interpretations by internet users that while sometimes liberating for the object, can also be detrimental for the online collections and individuals depicted within them. The digitized collections may be used to promote harmful stereotypes that were entirely unanticipated prior to the museum's efforts to increase digitization for greater online accessibility and transparency.

Although digitization and increased online access is generally lauded and viewed as progress for the development of museums and the cultural heritage institution, it must not be considered without its potential harm. While it is true that unprecedented access is a commendable achievement for museums, it can come at the cost of breaching privacy in regards to sensitive collections and a perpetuation of western ideals in the digitization process, augmenting an already prevalent power imbalance. In order for digitization to achieve its desired affects, an increase in access for a broader audience, strong ethics must be considered. Is it possible to achieve the balance of invaluable access while also abiding by ethical guidelines? This essay will use case studies from across the sector to unpack the issues of digitization related to privacy and the perpetuation of western/colonial power imbalances.

Museums acquire sensitive collections, those that contain vulnerable topics and individuals, for many reasons, one of them may be to address difficult histories in an ever-continuing pursuit of educating visitors. In fact, it may be argued that it is important for museums to obtain such collections. While on exhibition and in storage, museums can ensure, or strive to attempt, that sensitive collections, and people affected, are able to retain a sense of privacy and protection due to exhibition design or collaboration with source communities in regards to storage conditions. However, through digitization, the ability to ensure privacy can be hindered. "Memory Archive," a collection of vulnerable testimonies and objects from the Holocaust within Swedish museums will serve as a case study for this ethical concern relating to digitization.

The "Memory Archive" was prepared as a part of a Swedish Government's agency in 2003 titled, Living History Forum. This collection contains "over 100 video-taped testimonies from individuals with a connection to the Holocaust (e.g., victims, rescue workers, and bystanders)."[2] Interestingly, this collection has been shielded from the public, defying a larger trend within museums to increase transparency of Holocaust collections. However, in 2019, Swedish Prime Minister Stefan Löfven declared the need for "a museum to preserve the memory of the Holocaust."[3] In addition, with the number of living survivors dwindling, pertinent considerations have arisen relating to increasing accessibility and transparency of this collection, evidently digitizing the Memory Archive. Stemming from the Prime Minister's realization, it becomes important to question digitization and sharing collections in an online context. Ethical concerns abound when privacy concerns collide with a desire for increased access and must be considered, especially when objects can be radically recontextualized noted previously.[4]

A major concern with digitizing these testimonies is the need to protect privacy for individuals involved. Privacy is linked to anonymity, and while some argue that both should be preserved when necessary, opposing perspectives opine that situating anonymity in historical context as a priori efforts can neglect minority groups from important historical events.[5] In connection to this opposing perspective, it is also important to recognize that often times collections of Holocaust materials are digitized in order to acknowledge individuality and to memorialize victims and survivors, seen through projects such as Shoah and Yad Vashem.[6] Given the trend in eliminating privacy in Holocaust related collections, and its apparent acceptable nature, the ethical issue of privacy within digitization needs to be addressed. Is it appropriate to digitally produce these immensely vulnerable testimonies for a digital audience that can attract a host of negative and patently historically inaccurate comments and critiques? For those still living, has consent been addressed? These questions matter deeply in all museum collections, especially with topics as sensitive as genocide, something the Memory Archive has considered.

Zinaida Manžuch writes in, "Ethical Issues in Digitization of Cultural Heritage" to explicate the dangers related to breaching privacy for the benefit of greater accessibility. Privacy issues flourish through digitization and online access as copious amounts of personal information within cultural heritage documents and objects are brought to an online audience at an incredible rate. Intimate details of personal life-events are made visible for an overbearing

audience. For objects and collections acquired before digitization prospects grew, the sensitive information referenced above would only reach visitors in the physical museum.[7] Is it reasonable to assume that certain museum collections gathered prior to these efforts are not appropriate for digitization? Even in the case of information pertinent to Holocaust education? Returning to the case study of the Memory Archive within this debate, ethical concerns surrounding anonymity and privacy were strongly considered. Individuals in the collections who wished to collaborate with digitization efforts, creating important shared authority, were allowed to break their anonymity, facilitating a safe relationship between the source community and Museum.[8] Bucking the trend of most Holocaust collections and museum digitization efforts, the Swedish Memory Archive is contemplating the sensitivity of oral testimonies that uncover humanities most vulnerable moments. Where legal requirements in the form of policies and laws are shaky, ethical considerations must remain dominant throughout digitization.

Tara Robertson wrote "Digitization: Just Because You Can, Doesn't Mean You Should" to further expand upon the dynamics of digitization and online access breaching privacy concerns. In her writing, Robertson focused on the lack of sensitivity given to LGBTQ+ groups and Native Americans in digitization. Many universities engaged in flippant behavior while digitizing collections related to Native American as Robertson expressed, "I've heard similar concerns with lack of care by universities when digitizing traditional Indigenous knowledge without adequate consultation, policies or understanding of cultural protocols."[9] Moreover, Robertson acknowledged that "librarians need to take more care with ethical issues, that go far beyond simple copyright clearances, when digitizing and putting content online."[10] Efforts to digitize collections for the benefit of increasing accessibility must go beyond legal considerations. Underscoring Robertson's pleas, it is imperative that ethical concerns are diligently considered and respected.

In stark contrast to what Robertson described, Mukurtu, "a digital collection platform that was built in collaboration with Indigenous groups to reflect and support cultural protocols" should serve as a guiding example for digitizing collections from minority communities by a majority group who often lack nuanced knowledge of these communities. Mukurtu represents as a stellar exemplar of ethical digitization.[11]

Aside from the above-mentioned need to consider balance for access and ethics, digitization's benefits related to accessibility must also be weighed against an additional problem, the perpetuation of western ideas and colonialism. Firstly, it is important to note that as collections are digitized and made accessible to internet users, relevant information is transcribed from a Collections Management System (CMS) in order to create an object collection page that is displayed online. Unavoidably, a CMS holds inherent biases that work to uphold western knowledge systems and language, which starkly illustrates the present ethical dilemma.

According to Feminist and Queer digital humanity theories some CMS contain "encoded biases, false binaries, and implied hierarchies. Feminist thinking teaches us to question why such distinction have come about and what values they reflect- not just the categories, but the structure of the system itself."[12] Elaborating upon this blistering critique, a CMS is often hampered by rigidity. Ironically, a CMS informs our understanding and importance of an object, "if there is no way to hold a kind of knowledge or type of information in a collections management system, then it is relegated to a space outside of the official, institutional, source of knowledge about an object."[13] Additionally, when CMS metadata is produced in order to contribute to part of a collection's page, an internet user is unaware that "they are only seeing a part of the picture" and does not "acknowledge diverse ways of know" which are located outside the CMS metadata.[14] This translates to the harmful realization that "collections management systems impose constrained notions of what is object information, and therefore, what is an object- and what is object knowledge."[15] Above all, the present dichotomy, an us vs them structure, encompasses the CMS along with the proliferation of specific knowledge systems that are the direct manifestation of western ideology and colonialism. It is this aspect that directly hampers the applauded benefits of digitization and increased access.

Digitization practices using a CMS as described above and colonialism within the cultural heritage institution are directly connected and as a result lead to great inequities and the misrepresentation of source communities. The Iziko South African Museum as well as the *The Crying Child* photograph housed within the Royal Danish Library will serve as case studies for this ethical issue. Additionally, through these case studies the inherent normalization of colonial knowledge and practices becomes widely apparent, especially on the digital front. As will be seen, the Iziko South African Museum depicts a strident effort to decolonize the digitization of material collections and the Royal Danish Library exposes unfortunate flaws while

producing metadata for enslaved or colonized individuals.[16]

To begin, it is generally understood that within Danish and other colonial collections "images of enslaved and colonized peoples were predominantly envisioned by Europeans, who also controlled the means of production, rights of access, and dissemination."[17] The effects of such collecting practices reveal that source communities lack legal representation and perhaps more importantly, the visual representation of the individuals relayed to the public.[18] As a result of this trend, "it has become clear that ethics of care requires a more nuanced and holistic organizational mindset to accommodate the vulnerabilities of postcolonial collections management."[19] To bolster the above point, a response to the Sarr-Savoy Report in 2018 noted the need to decolonize French institutions holding African material culture, strongly reinforcing the claim for ethics of care.[20]

The photograph of the unidentified crying child held in the Royal Danish Library was taken in 1910 by Axel Ovesen a military officer who went to St. Croix as a young man in 1906, documenting tensions for enslaved individuals regarding their conditions after achieving emancipation in 1848. The child in the photograph is unnamed and as of now, unknown. To date, the photograph remains randomly pasted in private albums and donated to the Royal Danish Library.[21]

Figure 2

Figure 2 depicts the Crying Child photograph pasted in a private scrapbook with other images from the early 20th century St. Croix

It is important to note that digitization is certainly not a neutral process, rather, it is a process which reflects decisions made by the institution. Racialized terminology such as "slavery," "racism," and "Jim-crow", etc. often remain the predominant terms within online object collections.[22] Searching for images such as that of the crying child using racialized terms that perpetuate colonial ideals and systemic racism dematerialize and decontextualize historic objects and collections. Instead, images portraying extremely sensitive topics and vulnerable individuals lose all dimension and interpretation, certainly from the perspective of the source community. The harsh reality is that "photographic collections… 'are reduced to, and managed as, data banks of images, understood to be uncomplicated, transparent and passive representations of truth.'"[23] The results stemming from this process of digitization is extremely damaging and fails to honor the traumatic experiences of many minority groups. This represents another example of the reckless nature of digitization and increased online access in connection to western institutions remaining steadfastly rooted in colonialism, underscoring the need for a diligent adherence to ethics.

Perhaps what Gibson proposed in the case study surrounding the Iziko South African Museum provides an exemplary model for dismantling the power of colonialism within the sector in contrast to the treatment of the Crying Child photograph. In this example descendants of the Zulu community, the group represented in the collections that will be digitized, collaborated with the Museum and proposed alternative categories, classifications, and knowledge structures throughout the process in order to change how the museum represented their ancestors.[24] As opposed to having predominantly white, western museums, "develop a definitive anticolonial narrative that might make a futile attempt to fill these archival gaps," source communities such as those who self-identify as Zulu can "explore the possibility of producing alternative stories."[25]

Through initiatives such as the previously mentioned Mukurtu and the Iziko South African Museum, western, colonial narratives will be challenged, eventually striking the "core museum activities of collecting, cataloguing, and classifying."[26] Through efforts to include Indigenous narratives, these projects appear less as "add ons" or mere substitutes for colonial systems of knowledge, rather they can be regarded as equal or even prevailing in prominence for digitized objects/collections. It is important to note however, this must not constitute a substitute for repatriation, but "a broader decolonization process aimed at the restitution of knowledge."[27]

Although digitization practices are fraught with colonial undertones as described above, many plausible arguments

can be made which advocate for the continued process of making Indigenous and Native American objects/ collections available online at an increased rate. To provide context, after the passing of NAGRPA (Native American Grave and Repatriation Act) in 1990, the term "digital repatriation" rose in prominence, described as "the return of cultural heritage items in some type of digital format to the communities from which they originated." [28] Stemming from this monumental piece of legislation, digital repatriation has gained traction, allowing for renewed ownership by source communities.

What has resulted since 1990 is the Indigenous Digital Archive which aims to digitally return collections to source communities, providing a way of reversing colonialism and increasing a sense of cultural revitalization. This product is the result of collaboration between the Museum of Indian Arts and Culture, the Indian Pueblo Cultural Center, and the New Mexico State Library's Tribal Libraries Program, among many other cooperating organizations. [29] Stated in an August 2018 Pasatiempo magazine, "it's important to understand the Indigenous Digital Archive as more than a socially collaborative archive. It's best seen as the tech component of a larger social movement that has pushed for Native American families to repair and recover from intergenerational trauma inflicted by Indian boarding schools."[30]

Emerging from the creation of Indigenous Digital Archives, which promotes ethical accessibility of Indigenous collections, is the realignment of ownership and the path to mending generational trauma. Some of the multiple projects highlighting an Indigenous interpretation of online collections in the Archive are, American Indian Histories and Cultures, American Indians of the Pacific Northwest Collection, and the Duke Collection of American Indian Oral History.[31] Therefore, as each project has the ability to reach beyond Indigenous communities to educate a wider audience on Native American culture and history, they also return power and a sense of ownership to source communities, an authority which had been previously demolished. In this instance, digitization of objects/collections from vulnerable groups is seen as extremely beneficial for source communities and wildly educational for others groups. To reiterate, ethical digitization is not only achievable but strongly encouraged.

It has been well established that increasingly open access to museum collections via online collections pages is also extremely beneficial to the institution. Noticeably, prominent museums such as the Metropolitan Museum of Art and the J. Paul Getty Museum have exponentially increased access to digitized collections. The Metropolitan Museum of Art's (The Met) open access initiatives "'grew out of [their] 2006 strategic plan' and was officially announced in 2007, making it one of the first major museums in the United States to adopt OA." [32] As of October 2020, The Met's online art collection provides digital access to more than 375,000 high resolution JPEG images of public domain works.[33]

Figure 3

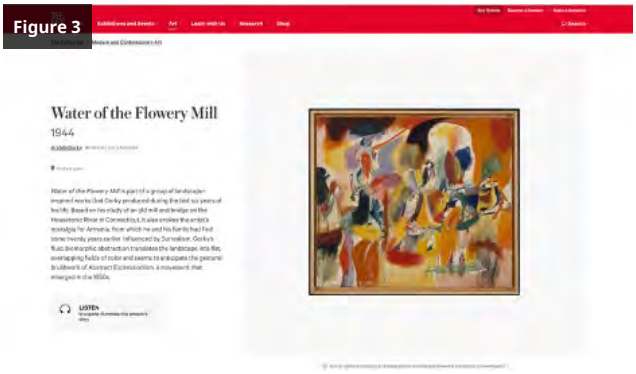

Figure 3 represents Arshile Gorky's *Water of the Flowery Mill's* collection page from the Metropolitan Museum of Art which includes information pertient to the artwork.

Similarly, The Getty's Open Content Program, which debuted in August 2013 has made over 10,000 images of public domain works accessible to the public. As of 2020 the number has risen to over 74,000. The result of these efforts is that the various publics of the J. Paul Getty Museum have unprecedented access to the Museum's robust collection.[34]

Figure 4

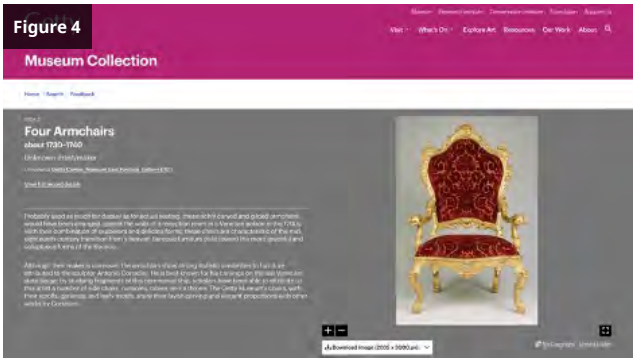

Figure 4 illustrates the *Four Armchairs* collections page by an unknown artist. The photograph of the chair is accompanied by descriptive information.

Although art museums have notoriously "gatekept" collections from public exploitation, an earnest attempt to deconstruct this notion by the Association of Art Museum Directors (AAMD) has led to the gradual acceptance of providing unprecedented digital access to collections.[35]

Since the AAMD's initiative dating back to 2005, a burgeoning number of museums have adapted their collections for a digital format, reaping benefits such as increased access to their institution by a diversified audience and an inevitable boost in publicity.

As stated previously, digitization and online access in museums and other cultural heritage institutions has proven to disrupt the sector's ethics by exhibiting a lack of care to sensitive collections depicting vulnerable individuals and perpetuating western, colonial knowledge systems that are undeniably harmful. However, if executed successfully, ethical digitization is a process which can be instrumental for the advancement of museums, libraries, archives, etc. Previously mentioned examples such as Mukurtu and the Indigenous Digital Archives illustrate the notion that ethical digitization and online access is certainly achievable.

Finally, the undeniable ethical complications previously mentioned must be considered in this nuanced topic. In general, most museums are trying their best to achieve this task, however, multi-faceted problems must be dealt with in order to generate success. It is imperative that digitization efforts are firmly rooted in unwavering ethical actions. Without laws or regulations in place to prevent unethical behavior, it is important to acknowledge what is appropriate and what is damaging for vulnerable communities within a museum's collection. If digitization works to deconstruct colonial undertones and respects the sensitive nature of collections, the incredible access granted to online visitors is invaluable. However, if racist terminology is perpetuated due to a lack of care, failing to honor victims and survivors of mass atrocities within museum collections, the results of unethical digitization are unsuccessful at best and irreversibly damaging at worst.

NOTES

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III

Patterns of Engagement

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From the moment we are born to the day we die; we are surrounded by clothing. Clothes have become an integral part of the human experience, varying across time, culture, and geography. Clothing has the "power to alter perceptions and opinions, to disguise and interpret, to heighten or lessen the wearers' very sense of themselves for better or for worse."[1] Therefore, it is unsurprising that the global fashion industry will be valued at $1.7 trillion in 2022.[2] As fashion and clothing are so intertwined with our daily lives, it makes sense that, as a society, we are fascinated by the aesthetics, history, and production of clothing. Many museums collect, preserve, and store clothing, accessories, and objects relating to or documenting clothing production. To reconnect "museum objects and knowledge to global flows of culture and information," museums have developed online collection databases allowing the meaning behind the objects to come forward and be represented.[3] Yet, digitization efforts have not engaged fashion collections in the same way as other objects in museums.

To digitize clothing to their full potential, museums should not just preserve the garments through photos or three-dimensional(3D) imaging but go beyond that by creating step-by-step instructions on how the recreate the clothing. By providing instructions to recreate garments in a fashion collection, museums can help preserve the object and engage with a broader audience by reconnecting the garment's social past. This paper will first discuss the problems museums face regarding the digitization of fashion collections. Then the paper will describe three methods museums have used to digitize fashion collections and the opportunities and obstacles of each method. Subsequently, the paper will explore the importance of creating patterns of garments in fashion collections to preserve the object while engaging visitors.

OVERVIEW OF FASHION COLLECTIONS

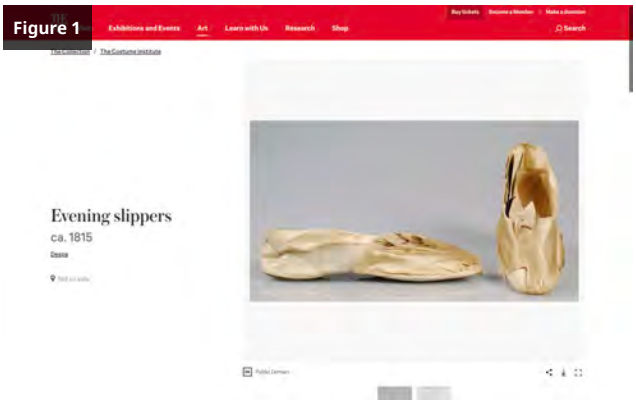
Fashion collections at a museum include clothing and accessories spanning centuries. The Costume Institute at the Metropolitan Museum of Art's (MET) collection has "more than thirty-three thousand objects [over] seven centuries of fashionable dress and accessories for men, women, and children, from the fifteenth century to the present."[4] Another museum with an extensive fashion collection is the Victoria and Albert Museum (V&A), with a collection spanning five centuries containing "rare 17th century gowns, 18th century 'mantua' dresses, 1930s eveningwear, 1960s daywear and post-war couture."[5] These two museums are an example of how vast fashion collections are and that the collection does not have the constraints of time, the original owner's gender, or the origin of an object. This wide range makes working with fashion collections complex, as a shift dress from the 1960s is easier to put on a mannequin for display than an eighteenth-century gown. This paper will focus on historical garments dated before the twentieth century

because garments from his period illustrate the problems fashion collections face when digitizing their collection.

DIGITIZING FASHION COLLECTIONS: CHALLENGES

Over time fibers that make up historical clothing weakens and often break, which is part of the natural life cycle of a garment. Even with standard wear and aging, factors such as light exposure, humidity, temperature, pests, physical forces [such as], and pollutants make historical clothing vulnerable.[6] The composition of the textile, such as the type of fiber, the structure of the fabric, and the dyes or embellishments, can also cause damage, which requires urgent conservation and presentation before the garment becomes too delicate to display.[7] An excellent example of a combination of external factors reacting to a specific textile is weighted silk, which was used in the nineteenth century. Weighted silk is silk fabric that has been treated with metallic salts to improve the drape of the fabric and restore the weight of silk, which enhances the dying process.[8] Over time the metal dyes become photosensitive and deteriorate, causing the fabric to look shattered (fig. 1).[9] The example of weighted silk shows that one or more external factors can cause irreparable damage to clothing in a museum collection.

Figure 1



Screenshot of shattered silk on evening slippers from The MET's Costume Institute's Collection

Museums utilize digitization as a preservation method to catalog the current state of a garment, track the deterioration of fibers, and give the public access to objects they would not have a chance to see. Like many digitization projects, digitization uses a lot of resources and funding to plan and complete. The process of digitizing a fashion collection is outlined by Tekara Shay Stewart and Sara Marcketti as "objects [are] selected, they [are] then placed on dress forms, photographed and saved in raw format, and then the photos [are] edited and uploaded as low resolution jpeg files to the website."[10] The complexity of digitizing a fashion collection is in selecting the objects and placing the garments on the dress form. When choosing objects, a large amount of space is needed to unbox the garments from storage onto a flat table to see what the garment needs to have before the garment is placed on the dress form.[11] To aid in dating and the determination of what under support is necessary for the garment before it goes on the dress form, staff utilize the resources found in books, such as Janet Arnold's *Patterns of Fashion* series, which is a collection of line drawings of the inside and pattern of a garment made through reverse patterning.[12]

Due to the delicate nature of historical clothing, the dress forms need to have the proper under support not just to create the original shape of the garment but to help prevent stress on the fibers. Dress forms that do not provide adequate support can cause the garments to warp due to gravity, and "mounting a costume on a [dress form] can involve a great deal of manipulation; as such, this type of handling can result in undue stresses on certain parts of the garment."[13]

DIGITIZING FASHION COLLECTIONS: METHODS

Clothing in museum collections is often stored relatively flat but needs to be displayed three-dimensionally. This quality has led to many museums using different digitization methods for their respective fashion collections. Currently, there are three ways to digitize fashion collections: multiple high-resolution images, 3D imaging of a garment, and reverse patterning by analyzing a garment.

Multiple high resolution images

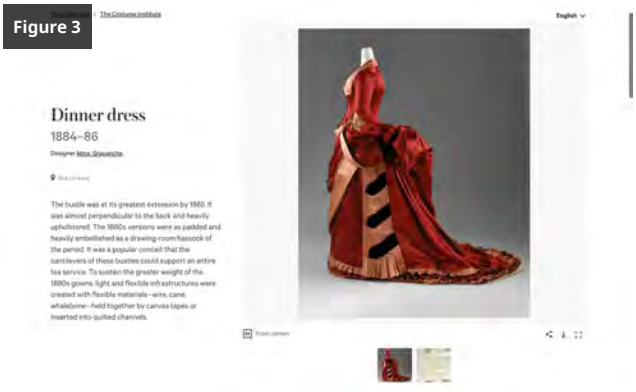
The most common method for digitizing fashion collections is simply taking multiple images. This form of digitization involves readily accessible technology and enables a visitor to explore a three-dimensional garment in a two-dimensional format through various viewpoints, giving viewers an idea of what a garment looks like.[14] However, this form of digitization is most successful when the garment's silhouette is correct, the resolution of the images is high, and all of the details of the garment are captured. We can look at two examples from the MET's Costume Institute online collection to compare a highly successful use of this approach with one that is less so.

There are two late nineteenth-century gown ensembles in the Costume Institute's digital collections database, which shows the pros and cons of using multiple images. The first is the 1887 wedding ensemble worn by Louise Whitfield Carnegie (fig. 2). Thirty-nine photos from different angles show the complete garment with the correct silhouette, close-up images of the garment, the inside of the garment, and the garment on and off the dress form. The second example is of a dinner dress from 1884-1886 that shows the limitations of multiple images (fig. 3). The gown ensemble only has two images: the first is a side view of the dress showing the length of the bustle, and the second image is of the designer's tag with no image of the front or back of the dress. Capturing clothing through multiple images is an accessible form of digitizing fashion collections but is limited to the amount of time and pictures taken of the garment.

Figure 2

Screenshot of the 1887 wedding esemble worn by Louise Whitfield Carnegie on the MET's website.

Figure 3



Screenshot of the 1884-1886 dinner dress on the MET's website"

3D Imaging

Besides the multiple high-resolution images of historical clothing, a few museums, such as the Royal Cornwall Museum (RCM), have used 3D imaging to digitize their collection. To complete the project, the RCM worked with Purpose3D, a British tech startup focusing on 3D imaging of fashion collections and making the files readily available as digital downloads.[15] RCM decided to use 3D imaging because the imaging process would help make their costume collection more accessible and immersive.[16] After scanning the object and processing its 3D image, the RCM and Purpose3D uploaded the collection to Sketchfab, a 3D modeling platform. 3D imaging of fashion collections allows researchers, designers, and fashion enthusiasts to explore the shape, silhouette, and details of a garment without the need to handle the physical object. However, 3D imaging isn't perfect. In this case, garments that should have been paired together, such as the wine-red dress ensemble, were separated in the scanning process but not put together in the final 3D rendering (see below). The 3D imaging only focused on the outside of the garment. By only focusing on the exterior of the garment, it is difficult to understand the construction and any additional material used to create the garment. 3D imaging allows audiences to explore a piece of a fashion collection without the potential of damaging the original objects.

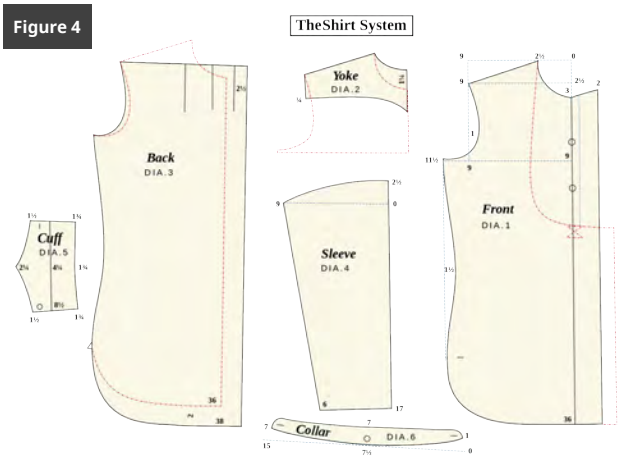
Wine-red velvet bodice of a two-piece dress by **Royal Cornwall Museum** on **Sketchfab**

Wine-red velvet skirt of two-piece dress by **Royal Cornwall Museum** on **Sketchfab**

Reverse patterning through analysis

All clothing, modern or historical, is made from a pattern (fig 4). A pattern is defined as a "template from which the parts of a garment are traced onto woven or knitted fabrics before being cut out and assembled."[17] Patterns are an integral part of fashion design and garment construction. Over time methods have been developed to take an already constructed garment and transform the garment back into its pattern pieces to be duplicated. This process has many names as it is not a formal technique used in fashion design; therefore, I will refer to this technique as reverse patterning. As all clothes are made from flat pieces of fabric, the complexity of reverse patterning is due to the specialized skill of pattern drafting and the specific knowledge of clothing construction. Having the pattern of a historic garment gives more information than what is included in multiple high-resolution photos and 3D imaging, as the construction of a garment is just as important as the exterior aesthetics.

Figure 4



Digitized *The Cutter's Practical Guide 1898 Edition Part 1* shirt system. Created by Jembezmamy and uploaded to Wikimedia Commons

A museum that has used reverse patterning for historical clothing in its collection is the Los Angeles County Museum of Art (LACMA). The 'Pattern Project' is a free PDF pattern archive of a selection of historical clothing from two past exhibitions Fashioning Fashion: European Dress in Detail 1700-1915 and Reigning Men: Fashion in Menswear 1700-2015. The free PDF of each garment includes a "scaled pattern of an extant fashion object from the collection, a description with historical context and object-based observations, overall and detail images, and instructions for construction of the garment."[18] It was noted in the description of the 'Pattern Project' states that:

> *The cut of a garment can speak volumes about its wearer, maker, place, and time. This resource is a means to make this information freely available to enthusiasts and scholars alike, while continuing the museum's mission for greater access and meaningful engagement to significant works of art in the collection.*[19]

To create a pattern through reverse patterning, the garment must be handled beyond the garment being placed on a mannequin to understand the construction methods. The museum would have to create directions for constructing the garment based on the reverse patterning process.

THE BENEFITS OF REVERSE PATTERNING AND ANALYSIS OF COMPOSITION

There are two reasons why reverse patterning can benefit fashion collections. The first is that by having the pattern, the garment can be preserved further through having the ability to recreate the garment. Although handling historical clothing can damage a historical garment, the museum is preserving the piece beyond its life through reverse patterning. By creating a digital pattern of a historical garment, a concrete record will be made of how the garment is constructed, adding to the multiple high-resolution images or 3D imaging of the garment. If something does happen and the object is damaged, the museum can continue caring for part of the object by having a pattern of the object. By preserving the physical garment and information about the garment by recreating the pattern, we can gain insights into the practices and processes involved in constructing the garment. Reverse patterning requires great care in handling the garments, knowledge of garment construction, textile structure, and fashion history, and combining this knowledge into a readable pattern with instructions.[20] While completing the pattern of a boy's frock (fig. 7), Thomas John Bernard noted that the garment was made by a "talented home seamstress [as] the pieces did not line up exactly, and sometimes the fabric is slightly off-grain."[21] Without the prior knowledge of garment construction and pattern making, Bernard would not have noticed the slight differences in the garment. From his analysis, future pattern drafters and sewers can use the knowledge from the LACMA Pattern Project to inform their own studies and practice.

Secondly, as garments are social objects, having the pattern of garments in a fashion collection can engage different groups of people and visitors in a new way. The concept of social objects was initially used by Jyri Engeström in 2005, who stated that a social object "connects the people who create, own, use, critique, or consume it."[22] Nina Simon pushes Engestrom's definition further by stating that social objects "are engines of socially networked experiences, the content around which conversation happens" and that "people can connect with strangers when they have a shared interest in specific objects."[23] With these definitions in mind, clothing falls into the category of a social object. Many fashion collections in academic settings focus on clothing's broader connection to the world through the accessibility of hands-on interaction and analysis of the construction of garments by students and designers.[24] Museums are noted to be inaccessible to students and designers by not allowing hands-on interaction with fashion collections.[25] The stories and connections to the time and world around a similar garment in a museum fashion collection are lost or reduced to its aesthetic qualities, unlike its counterpart in an academic fashion collection.

Although fashion and clothing are very social objects, museums often do not use the social aspects to engage a more diverse audience. Digitization allows museums with fashion collections to open their collection, allowing people "to create, share, and connect around it."[26] Through understanding the construction and history of a garment using the technique of reverse patterning, the social past of garments in fashion collections is amplified, allowing them to become social again. The garments can then serve as a "contrast to an increasing fast fashion production and to the over-consumption…that has come to structure much of our relation to garments."[27] An example of the contrast between the clothing that makes up a museum fashion collection and modern clothing is the boy's frock from the LACMA 'Pattern Project'. Through reverse patterning the garment was found to be made from a previous garment by a home seamstress trying to reuse the fabric as it is an expensive fine embroidered cashmere.[28] Reusing clothing to create a new garment is rare as our clothing has been made to be disposed of because of fast fashion and overconsumption. This is one example of how reverse patterning can reengage the social aspects of museum fashion collection objects.

CONCLUSION

Through multiple high-resolution images, 3D imaging, and reverse patterning, fashion collections transform from an encyclopedia focusing on aesthetics to one focusing on the social and human experience of clothing. These three methods each show a different complexity of fashion collections and how digitization helps preserve the physical garment and the intellectual knowledge of the garment's construction. Reconnecting these two aspects of fashion collections can help people relate to and understand history in a new and more intimate way. This new way of looking at clothing removes the mysticism of the modern fashion industry and can go on to help inform our choices in the clothing we wear. Because one day, our clothes will be behind a glass wall in a museum exhibit describing our relationship to the world.

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IV

Copyright Law and Digitized Museum Collections

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Although digitization of museum collections is not a new practice, it has come to the forefront of many museums' concerns since the COVID-19 pandemic began in early 2020. Cultural institutions around the world, especially art museums, saw their digitized collections as a way to continue interacting with visitors even when in person activities could not occur. Not only were digitized collections used in virtual archives for exploration, but also in virtual exhibits and educational programming. Museums began to notice the greater impact that digitized collections could have on achieving their mission and interacting with a wider audience. As digitization and virtual access become more prominent, it is worth revisiting copyright law as it pertains to online collections. Through exploring the history of United States' copyright law in relation to cultural institutions, focusing on the role of fair use practices, the recent changes due to technology shifts can be seen. As these practices continue to shift museums should ensure their guidelines and policies properly address copyright laws in practice. These recommendations are not from the perspective of a lawyer and therefore are not legal advice.

HISTORY OF COPYRIGHT LAW IN THE UNITED STATES

Every jurisdiction has different legal frameworks for the protection of creators through copyright but many of the general practices are similar. It is valuable to understand the ever-changing nature of copyright protection within the United States to see how it has and continues to evolve to protect both creators and cultural institutions. The direct authority for copyright protection in the United States is found in the Constitution in Article 1, Section 8, Clause 8 otherwise known as the Patent and Copyright Clause.[1] The clause, like many legal ideologies in the US, is based on an English statute. The themes are pulled from the *Statute of Anne* which ensures financial incentive for creators along with eventual unrestricted public access to the work.[2] In the United States it is believed that to stimulate the production of creative works and cultural progress, economic incentives are necessary. The fear is that without this statute and said incentives, no one would create.

The key aspect in the Patent and Copyright Clause is that the protected work would eventually be freely available to the public for further use and development. To further define this clause, Congress enacted the Copyright Act of 1790 which set the initial timeline for protection to two 14-year terms. This act only protected authors of books,

maps and charts but was later revised and amended in 1831 and 1870 to expand the kind of materials it protected as well as aspects of the timeline and jurisdictions.[3] As time went on and new technologies were developed it was clear that the Act should be updated.

President Theodore Roosevelt initiated the overhaul of the Copyright Act of 1790 in 1905 which resulted in the passing of the Copyright Act of 1909. This updated act continued to expand the materials it protected including all writing of an author as well as changing the timeline of protection to two 28-year terms with federal protection under federal law beginning at the moment of publication of the work.[4] This act did not protect works that were not officially published. Outside of small amendments, the act was kept until Congress decided to replace it in 1955.

The project ended up lasting 20 years with conclusions not met until 1976. The Copyright Act of 1976 is currently relied upon today and worked mostly to clarify ambiguities in the law.[5] Although it altered many aspects of copyright protection, the most valuable changes for cultural institutions to be aware of are length of protection, codified judicial recognition that protection is available only for a particular expression of an idea, not the idea itself, protection for unpublished works, expanded copyrightable subject matter, compulsory licenses, and exclusive rights and limitations for creators furthermore, the concept of fair use.[6] The inclusion and limits of fair use are vital for cultural institutions and museums to understand moving forward with copyright guidelines.

Fair Use

In the United States, fair use is relied on by cultural institutions as it permits unauthorized use of a copyrighted work such as reproduction. The guidelines for fair use allow reproduction, for example the digitization of museum collections, if it is for purposes such as criticism, comment, new reporting, teaching, scholarship, or research.[7] Within the history of copyright law in the United States, fair use was not included in American statutory law until 186 years after the original Copyright Act was written to protect creators. The basis of copyright laws at large is to promote the advancement of society overall, but tension is created as it works to protect creators while still making works accessible for public use. Fair use seeks to resolve the tension but in favor of the public as opposed to the creator.[8]

When understanding the rights museums have for reproduction, it is vital to know that based on Supreme Court decisions, fair use is a first amendment safeguard.[9] This means that it is flexible, broad, and responsive to change over time. The Supreme Court views the practice of fair use as valuable to the economy, innovation, creativity, and scholarship therefore making it a powerful addition to the Copyright Act of 1976.[10] It allows museums and other cultural institutions to provide broader access to their collections and create greater impact.

COPYRIGHT OVERREACH IN MUSEUMS

As discussed prior, digitization is not a new venture for cultural institutions. When digitization first became a noteworthy activity, some museums felt that it lessened the control they had historically held over their collections.[11] One of the many goals of digitization is to increase accessibility to a wider audience and yet some institutions viewed it as taking away the curatorial voice.[12] This led to museums often asserting rights of control over images through copyright or contract and licensing terms. In 2012, Kenneth Crews evaluated the use of copyright laws within 50 American Alliance of Museum (AAM) accredited museums focusing on art institutions in his article “Museum Policies and Art Images: Conflicting Objectives and Copyright Overreaching”. His research found that many of the institutions would claim legal rights to control images even when the image existed in the public domain.[13] The assertion of control and the convoluted nature of copyright and fair use laws can cause the public to believe they have no right to use said image. This only further imposes the idea that museums are keepers of knowledge and only some are worthy of obtaining it. It can harm museum mission work as it can create a deeper divide between the public and the collection.

Crews continues, explaining the concept of downstream control of images as harmful to the proper use of copyright law. This begins with the physical object that is held by the museum therefore allowing complete control of access. The museum is able to determine this level of control and creates the perception of controlling all rights to the object. When the object is digitized, the museum continues this facade of control and asserts authority through terms of use for later users.[14] The harm in this practice is that it detracts from the purpose of fair use as it unfairly limits the greater access to the object continuing to give the museum control.

Crews states that many institutions would rather make a broad statement about copyright and leave details to be addressed as needed. This is due to the risks of more

precise policies as it is an ever-changing legal framework with many liabilities if approached incorrectly. The damage of leaning on simple and possibly overreaching policy falls on the user as it restricts their access which they have a right to.

The rationale for continuing to use restrictive policies around digitized collection hinges on museums' interest in protecting the integrity of art as well as the desire to use copyright as a way to earn back the costs put towards digitization projects.[15] There are other reasons such as adherence to donor requirements as that may cause portions of the collections to be protected which can cause confusion to visitors. Crews argues that it is time for museums to re-evaluate their existing policy surrounding copyright to ensure proper access and use within the legal framework. His work highlights how overreaching copyright can hurt the public by putting a paywall or strict use limitations on digital reproductions that are not protected under copyright and can be used freely. It can harm further creation and exploration by the public.

Another way in which museums have overreached on their use of copyright relates to the public domain and contract law. Kaitlyn Garvin explores this concept in her article "Reclaiming Our Domain: Digitization of Museum Collections and Copyright Overreach." She focuses on the ways museums have used contract law to claim control over digital photographic reproductions of masterworks that exist within the public domain pool of works. Public domain is essentially a pool of creative works from which society is legally allowed to draw from and is therefore not protected by copyright law.[16] It is seen as a communal resource that benefits all people. Garvin explains that photographic reproductions of masterworks exist firmly within the public domain pool.

An example of this overreaching was used by the Bridgeman Art Library. Garvin unpacks how the institution tried to use contract law to create copyright-esque monopolies over photographic reproductions. The Bridgeman Art Library case occurred in 1997 after Bridgeman claimed copyright control over digital photographic reproductions of famous paintings being used by Corel Corporation, a Canadian computer software company.[17] Bridgeman had been licensing its clients to use these copies pursuant to very specific contractual requirements. The clients were buying contracts to use these images and cost depended on resolution of the images. The contract allowed the institution to still maintain some control over the use of the image.[18] The court focused on the doctrine of originality to determine whether copyright could be claimed. In the end it was determined that Bridgeman's images were not copyrightable due to the fact they were exact reproductions of existing masterworks.[19]

Garvin explains that this decision was at a district court level and thus has limited legal scope and only addressed 2D art.[20] Even with this fact, the Bridgeman case has set the precedent that photographic reproductions are merely copies and unworthy of copyright given they lack originality. Garvin relates this case to current digitization initiatives as it shows how museums have previously tried to maintain curatorial control and make money through digital reproductions in the past. This desire for control only further hurts access to collections. She further argues, the works within public domain exist for public use and should not be exploited in order to recoup costs of digitization.

These examples highlight how museums have historically seen copyright as a way to maintain control over their collection and possibly create another form of revenue. This mindset stems from a lack of understanding that many museum professionals have of what control the museum has over digital reproductions under copyright. A major way to overcome this misuse of power is to ensure clear understanding by implementing policy guidelines and risk analysis when digitizing collections.

RISK MANAGEMENT

As museums and other cultural institutions move forward with digitization it is important to understand the risk associated with digitizing collections. Risk is not meant to scare institutions away from digitization projects but instead inform them of possible outcomes, so they are prepared to handle them. It is valuable to know that legal complications surrounding copyright infringement are not common especially with museums, but it is still important to mitigate risk as much as possible.

Guideline books such as *Copyright and Cultural Institutions: Guidelines for Digitization for US Libraries, Archives, and Museums* exist as tools to better understand how to approach digitizing safely and ethically. Risk management is a vital step in digitization projects and should come at the beginning to ensure the institution is capable of handling potential risks. Some possible factors that could indicate copyright infringement include copyright subsists in the collection item, the institution does not own the copyright for the item, the copyright owner is still in control of exclusive rights such as digitization, the act does not fall with exemptions such as fair use, or the copyright owner has not granted permission.[21]

The risk of litigation against museums and cultural institutions has historically been low but it is valuable for museums to understand the precedent set by previous cases surrounding copyright infringement.[22] As explained above, the Bridgeman case sets the precedent that digital reproductions are not protected by copyright. Since the passing of the Copyright Act of 1976, courts have historically sided with fair use and public domain claims or have found ways to settle cases outside of court. Much of the risk lies with copyright holders due to the cost of litigation and precedent of actions falling under fair use.[23]

Although the risk may feel low due to precedent and risk to copyright holders, museums should work to respect copyright holders and avoid infringement. The purpose of copyright law is to benefit public good by motivating creators. Through understanding risk and the creation of mitigation plans, museums are better suited to continue mission-based work and create better access to collections. Risk management as it relates to copyright law should not scare away museums from pursuing digitization but instead create more ethical practice standards.

MOVING FORWARD

As museums continue to focus on digitization efforts, museum associations can support and guide institutions by outlining best practices. The International Council of Museums (ICOM) has centered several workshops on copyright law and digitization since the beginning of the COVID-19 pandemic in 2020.[24] Although this organization is international and therefore does not strictly center around the legal framework of the United States, there are still many similarities. Digital cultural heritage can be accessed worldwide so it is valuable to build relationships and have conversations with professionals worldwide.

Digitization has caused change in copyright law around the world, not just in the United States. At the international conference When Museums Go Online held in Geneva in December of 2020, museum professionals from around the world gathered to discuss ways for museums and cultural institutions to clarify current legal and political frameworks for museums in the digital space.[25] During the conference, they workshopped the website digitizationpolicies.com as a resource for formulating policies centered around museums in the digital environment.

The site is separated into three main concepts. Part 1 includes policy proposals that can be directed towards policymakers and legislators to help guide new policies to best serve both the public and museums. It provides suggested policy changes or clarifications for varying museum scenarios revolving around copyright law.[26] Part 2 is directed at museums themselves and is a recommended code of conduct for digitization. It creates guidelines for museums to properly follow copyright law while pursuing digitization efforts.[27] Part 3 is centered around dispute resolution as a way to help museums create mitigation plans when digitizing. The alternative dispute resolution is directed at both museums and copyright holders to help identify possible issues and resolve disputes early on.[28] ICOM created this site to help bolster communication between museums worldwide as they continue to face the ever-changing nature of copyright law.

The tensions surrounding copyright law in the United States are also felt worldwide. By looking at practices and trends in other countries, museums can better prepare for upcoming changes. In the European Union, they have approached resolving tensions by gradually and progressively relaxing the existing legal framework.[29] This is similar to the inclusion of fair use and public domain in the United States. The recent trends appear to push for legal frameworks to create more exemptions and processes for cultural institutions to digitize collections and make works more widely available for public good. This flexibility should not take away the rights of owners and creators but allow for greater public access.

The American Association of Museum Directors (AAMD) has also sought out the creation of guidelines and policy for fair use in museums. They originally drafted a policy on the use of thumbnail digital images in 2011 which focused mostly on creating guiding principles for a rather narrow range of situations.[30] The association revisited this idea in 2016 with the release of its Guidelines for the Use of Copyrighted Materials and Works of Arts by Art Museums. The revision occurred as the rise in digitization projects, evolving technology and legal frameworks became a larger focus for museums and cultural institutions.[31]

The updated framework names six distinct times museums can lean on fair use for the use of digitized collections. These include online collections, publications, promotional, marketing and advertising materials, fundraising, onsite uses, archives, and other special collections.[32] AAMD wanted to simplify the copyright exemptions for museums as a way to ensure ethically and legally sounds practice. This kind of policy, like many other guiding policies created by museum associations, can be used by institutions to guide the creation of site-specific policy for best practices.

CONCLUSION

Copyright law is a highly complex and ever-changing legal framework that museums must understand as they move forward with digitization projects. The future of museum collection preservation and use will include digitization and access virtually. As previously discussed, copyright protection is centered around protecting creators while also ensuring public access to these works. Moving forward, museums must ensure ethical and legal frameworks are followed when digitizing collections and allow for public use without overreaching copyright claims. Museum associations such as ICOM and AAMD are taking the correct steps for the future of copyright policy writing.

Simplifying and standardizing the framework for addressing copyright when digitizing can be achieved through policy. All museums and cultural institutions must be knowledgeable about and prepared to assess risk and copyright protections before digitization processes begin. Although this may feel like a large and convoluted task, museum associations have already begun the work to create guidelines that can be altered for individual institutions and streamline copyright processes across the country and the world. By ensuring copyright is fully understood and outlined in policy, not only will museums be following the law, they will be respecting the rights artists and creators while building stronger relationships to promote cultural progress.

NOTES

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V

Will the Digital Do? Exploring the Role of 3D Technologies in Repatriation Negotiations

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Since their inception, museums and their physical objects have been intertwined, for better or for worse. In the nineteenth century, to conserve power and perpetuate colonial ideologies of superiority, Western museums were a tool of colonial control by expanding their halls with collections of artifacts created by, and important to, the communities they colonized. While Western museums collected trophies to display their wealth and power, Indigenous communities lost vital parts of their culture, community, and ultimately, their identity. As Mark Oppenneer notes in *Preserving Aboriginal Heritage: Technical & Traditional Approaches*, many Canadian Indigenous groups view objects not as inanimate or ornamental, but as a part of the living culture. [1]

In recent years, there has been an increasingly strong call for some of the world's most prominent museums and cultural institutions to repatriate certain cultural artifacts. As noted in *Preserving What is Valued: Museums, Conservation and First Nations*, the call for repatriation goes beyond the physical return of an object; it is a way for Indigenous communities to finally be reunited with lost traditions and knowledge; in a way, it is reuniting with their ancestors. [2] Many Western museums have pushed back against the repatriation of artifacts, citing a multitude of reasons as to why the objects must stay within their collections, with examples including the fragility of the object, or its importance to the museums mission of education and public service. [3]

The rise in digital technologies, ranging from archives to 3D printing, may offer museums and cultural institutions an agreeable compromise; allowing source communities to reconnect with important objects and histories without museums sacrificing the educational and outreach programs that are connected to those objects. However, as noted by Nicole Crawford, chief curator of the University of Wyoming Art Museum, "There isn't really any global guideline for repatriation." [4] Adding the digital layers can complicate repatriation, especially if it was the 3D reproduction returned, not the original object. For the purposes of this project, repatriation is defined as the act or process of restoring or returning someone or something, including lost cultural knowledge, to the community of origin, allegiance, or citizenship. This paper will explore the opportunities and challenges digital technologies, specifically 3D images or scans, and 3D printed objects, present to museum and culture professionals and Indigenous communities who are working towards repatriation of objects and knowledge.

STATEMENT OF POSITIONALITY

Before moving further into this paper, I believe it is helpful to speak about my position as an author. I identify as a white cis-gender female, using she/her pronouns, and am a second-year graduate student at the George Washington University. The university's graduate student body is predominantly white, making up 52% of the graduate students. My academic background includes a Bachelor of Arts in International Studies from Arcadia University, focusing on conflict resolution and peacebuilding. Currently, I conduct research through the George Washington University's library, with most sources peer-reviewed and accessible through academic databases. I have applied my studies in Museum Ethics and Decolonization and the Museum to address this research topic specifically. I have chosen this avenue of research to develop my academic and personal understanding of museums and their relationships with Indigenous communities.

OPPORTUNITIES FOR RECLAIMING AND REDISCOVERY

As museums work to engage and collaborate with broader and more diverse publics, they are turning to increasingly more creative solutions to support the growing interests of its communities. Since the early 2010s, the topic of repatriation has increasingly been a factor in how different publics interact with museums. 3D technologies can offer museums unique ways to address calls for repatriation, satisfying the demands of their visitors while balancing its mission for education and outreach. Sam Davies argues in *Repatriations & Restorations: The Growing Role of Digital Manufacturing Technology in Cultural Heritage*, 3D technologies "can be used as tools to support and facilitate repatriations, reuniting people with cherished items and replacing lost knowledge in affected communities, while still allowing museums to inform the public about the culture behind the objects."[5] Furthermore digital repatriation can offer a great compromise, reuniting communities with sacred items and replacing lost knowledge while educating the broader publics within a museum setting. As 3D technology advances, museums, cultural institutions, and source communities are finding new ways to foster relationships and conversations. The versatility of digital objects continues to provide new and innovative ways for communities to engage with their lost heritage, whether it be lost to time, or to a collections box in museum storage.

RECONNECTION TO LOST HERITAGE - 3D PRINTING AND IMAGING AND THE REVITALIZATION OF MEMORY

For some communities, the development of 3D printing and 3D imaging has revitalized their cultural identity. Rachel Parsons notes in *How Indigenous Groups Are Using 3D Technology to Preserve Ancient Practices*, the use of 3D printing has opened opportunities for the preservation and revitalization of source communities' cultural identity that may otherwise have been lost due to the original objects' compromised nature. [6]

For an example of how 3D prints can support the revitalization of memory and tradition, one can look to the Bell and Bell Shrine of St. Connell Cael. An important relic to the Donegal community in Ireland, this bell was integral in the celebration of St. Connell's feast day, which included an annual pilgrimage from Donegal, Ireland to St. Connell's Church on the Island Inishkeel. Since 1889, this eighth century bell has been a part of the British Museum's collection. While the original bell has damages that render it impossible to use, with the help of ThinkSee3D, an organization made of digital and physical makers for natural and cultural heritage, a 3D printed St. Connell's bell was gifted to the county museum of Donegal, where it is used once again for the annual pilgrimage.

With this 3D print, the community that actively participates in this pilgrimage can now reconnect with their history and ancestry in a new way. Through the 3D reproduction, the object once again can be put in the context it was designed for, creating unique opportunities for the Donegal community to engage with their history. As Katrina Rodriguez Echavarria and Myrsini Samaroudi describe, being able to touch and interact with an object, exploring its shape and weight, has the potential to transform cultural heritage experiences.[7] The digital print of this bell has allowed the Donegal community to reclaim parts of their heritage and their traditions that were lost. The digital creation of this bell recreates a multisensory experience, allowing the community to actively engage with it; to reanimate their culture in a new way.

While replicas are not new concepts to museums and the larger repatriation debate, 3D imaging, and printing can be incredibly accurate in mapping the exact shape and cut of an object. 3D imaging and printing also offer more opportunities for museums and Indigenous communities to transform, create, and revitalize an endangered or lost heritage. With technologies continuing to progress and evolve, digital archives are expanding the repatriation

conversation and how 3D technologies can help facilitate discussions amongst museums and source communities. While this paper will not specifically address digital archives and their interactions with repatriation discussions, it is important to note that 3D technologies, especially 3D imaging, are becoming increasingly favored as an additional element to repatriation as they are uniquely shareable and accessible.

Figure 1

[ThinkSee3D's Twitter Post] (https://twitter.com/ThinkSee3D/status/941051428021432321) on December 13, 2017, featuring the 3D printed St. Connell bell.

COLLABORATION AND COMMUNITY - RECLAIMING PARTNERSHIPS BETWEEN MUSEUMS AND INDIGENOUS COMMUNITIES THROUGH 3D COLLABORATION

With the passing of the Native American Graves Protection and Repatriation Act (NAGPRA) in 1990, museums, universities, and cultural institutions across the United States collaborated with Indigenous communities on how best to handle cultural objects within their collections that fell under this act. For the National Museum of Natural History, this act ignited dialogue between the Tlingit Dakl'aweidi clan, an Indigenous community located in the southeast of Alaska, on the repatriation of several clan artifacts. Specifically, in 2005, the National Museum of Natural History repatriated a wooden Killer Whale hat, which is both a sacred object and an object of cultural patrimony. The repatriation process opened new communications and partnerships between the Tlingit community and the Smithsonian Institution more broadly and in 2012, the Tlingit community and the Smithsonian Digitization Program collaborated to create a 3D replica of the Killer Whale hat. For the Tlingit community, the 3D print and imaging data is used as insurance to safeguard their culture against loss. For the National Museum of Natural History, and the broader Smithsonian Institution, this replica serves as an educational and exhibit tool for the museum.

In this case, 3D imaging, and printing are used as tools to facilitate partnerships between museums and Indigenous communities. It is important to note that it was through the express permission of the Tlingit community that the creation and display of the Killer Whale Hat replica came to be. The digital technology encouraged an active and continued partnership between two communities. As R. Eric Hollinger et al., notes, "The digital technology provides for more dynamic relations between museums and native communities to explore those common interests they both share; the perpetuation of culture and cultural education of future generations."[8] 3D printing and imaging technologies can support museum conversations around repatriation. These technologies offer Indigenous communities more autonomy over the use and display of their objects.

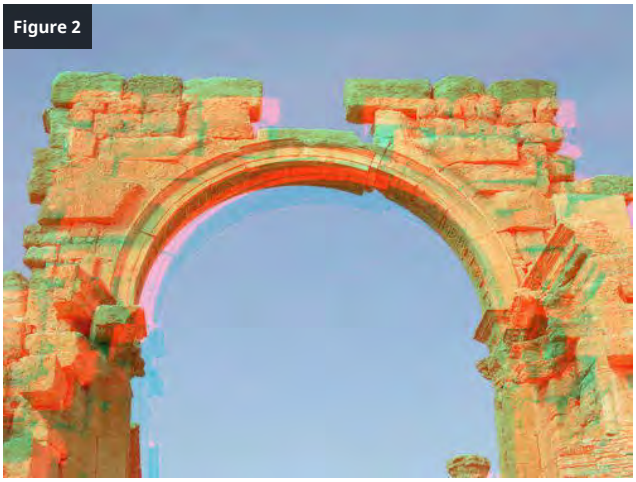
CHALLENGES

Just as 3D printing and imaging is creating unique opportunities for repatriation, they also create unique challenges. There is a lack of legislation and regulation around 3D technologies due to their rapidly evolving nature. As Christa Roodt argues in *The Role of Digital Technology in the Restitution of Cultural Artifacts*, the rapid growth of digital reproduction further complicates the ideas of repatriation, authenticity, and authority over cultural heritage.[9] Repatriation activists have argued that when Western museums rely on digital repatriation alone, they continue to maintain the status quo of power and domination.[10] Furthermore, with the rise of 3D technologies, a new group of actors now contribute to the repatriation discussion, each with their own motivations, regulations, and objectives. The next two case studies will explore how the unregulated nature of 3D imaging and printing can develop unique ethical challenges to repatriation discussions.

3D IMAGES AND PRINTS AND THE CONTINUATION OF COLONIAL IDEOLOGIES

Climate change, natural disasters, and war all threaten cultural heritage and some of the world's most precious cultural sites. Many in the field are looking to 3D technologies to help preserve these sites for future generations, through 3D imaging sharing and printing. 3D printing and imaging companies are capitalizing on their technology, often selling the 3D data to large cultural institutions, such as Google Arts & Culture. However, 3D scanning, and printing projects can cost thousands of dollars, putting less resourced nation states, communities, and companies at a disadvantage, regardless of where the cultural site resides. Scholars like Erin Thompson argue that this practice perpetuates colonial ideologies of domination and appropriation.[11] To explore the concept of digital colonialism, this paper will look to the work of the UK-based Institute for Digital Archaeology and its 3D recreation of the Palmyra Arch. The Palmyra Arch was a monumental arch located in Palmyra, Syria. In 2015, the arch was destroyed by Islamic State militants in an attempt to erase Syrian history. As the Islamic state continued to destroy antiquities, there was an urgent push to 3D scan what was left. The project was estimated to be around two million US dollars. [12] Using photogrammetry, a technology that uses photographs to create 3D models, the Institute for Digital Technology was able to create the Palmyra arch once again, only this time, it stood tall in London. The arch then toured to Western countries such as Italy, Geneva, Switzerland, and the United States. Physically, the 3D replicated Palmyra arch was not accessible to the Syrian people, therefore. Their cultural heritage was once again taken from them to benefit Western nations.

Figure 2



Un-captioned image of the arch under the Palmyra section of the "Million Image Database" site run by Institute for Digital Archaeology (Image is not under copyright and via the website.

Beyond the physical location, Western cultures further asserted their power over the Syrian people through the arch's descriptions. Roshni Khunti states, "While the reconstructed arch was not accessible for most Syrian people because of the locations where it was exhibited, the language used to describe the arch further distanced Syrian claims to their own heritage."[13] While on its Western tour, the 3D replicated arch had little to no text panels to describe the role the arch played in Syrian cultural heritage. The lack of context allowed Western nations to control the Syrian narrative, and therefore Syrian culture through omission. When the arch was discussed by political and cultural leaders, they often used the words and phrases that diminished Syrian peoples and culture. Phrases such as "our heritage", "our shared story", and "our human struggles" allowed Western nations to keep dominance over the narrative and perception of anyone who visited the arch. The possibility of 3D printing and imaging is a double-edged sword. When the object is taken out of context and not given proper credit, the object can be transformed into a pawn of digital colonialism; a new way for Western states to retain objects and knowledge of cultural significance.

GATEKEEPING AND PROFITING THROUGH COPYRIGHT

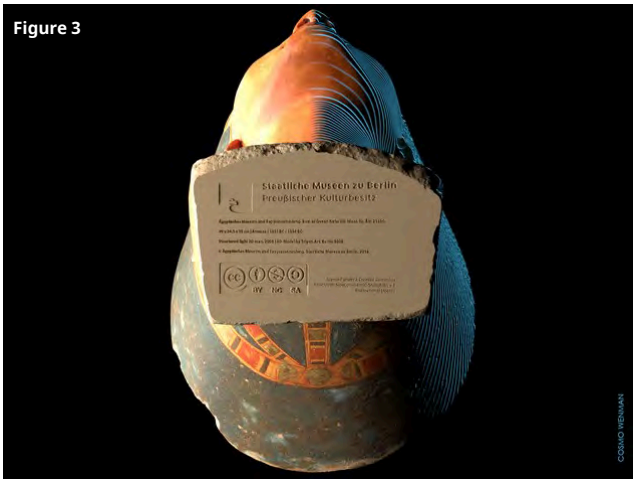
As more actors enter repatriation discussions, the more complex these positions become. Adding in digital technologies that are rapidly advancing and changing only complications these discussions. One aspect complicating the sector specifically is the role of the copyright.

According to the U.S. Copyright Office, copyright is a type of intellectual property that protects original works of authorship as soon as an author fixes the work in a tangible form of expression.[14] Simply, the owner of the copyright is in control of the production, dissemination, and profits of their work, even the metadata that makes up a 3D scan or print. In the case of 3D scans and prints, the museum, or cultural institution, could have control over the 3D production, and can use the legal power to say how that scan is used.

Major museums from the Louvre to the Smithsonian Institution have collected high quality 3D scans of their collections, however, many institutions have kept the data under strict lock and key to profit from and to control the object. For an example of museums adding copyright to their scans, one can look to the Neues Museum, located in Germany, and the 3D scans of their Nefertiti bust. The three-thousand-year-old statue was discovered by German archaeologists in 1912 and was claimed by a Western museum. Since its public exhibit in 1924, Egyptian authorities have called for its return. The Nefertiti bust is arguably the most important object within the Neues Museum, however, the museum prohibited visitors from taking photos to retain control over its image, despite it being a public domain artwork.[15] Though the public could not take photos, the museum conducted high end 3D scanning of the bust for their own purposes, keeping the scan data under lock and key. In 2016, artists Nora Al-Badri and Jan Nikolai Nelles snuck a 3D scanner into the museum and reportedly scanned the Nefertiti bust, where they released the files under a Creative Commons open license (CC0), essentially allowing anyone to access the files and print a facsimile of the bust for their own use. Once the scans were released, however, the museum made a startling claim.[16] The digital data that was released was too high of quality for the 3D scanner the artists used. To put it in other words, it was not their 3D scan data, but the museum's scan data that was released.

According to copyright eligibility, the data is a piece of code that can be copyrighted, just as one could have a copyright over a sketch of a sculpture from the museum.[17] While the Neues Museum ultimately released their 3D scans to the public for broad use after the "Nefertiti Hack" of 2016, the scans have an interesting add; a copyright notice at the bottom of the 3D model scan, stating that while one can copy, redistribute and build upon the material, one must give appropriate credit (i.e. the museum) and cannot use it for monetary purposes. When looking at 3D prints and scans, wealthy Western nations have more resources and funding opportunities to develop and benefit from 3D technologies, and therefore, can copyright these scans for their own profits. In short, the copyright license still allows the Western museums control over the object. Regarding the Nefertiti scan, Cosmo Wenman argued that the Neues Museum policy around the object copyright is informed by fear of loss of control as well as fear of the unknown.[18] The Western museum's need for control over an object limits the power of the Indigenous community, in this case, the Egyptian people, of how the scan and associated data of the Nefertiti bust can, or should, be used.

Figure 3



Bust of Queen Nefertiti 3D-Model by Trigon Art, Berlin 2008. © 3D Model Scan data from Cosmo Wenman on behalf of Ägyptisches Museum und Papyrussammlung, Staatliche Museen zu Berlin – Preußischer Kulturbesitz

Furthermore, museums and cultural institutions can use a copyright to scare Indigenous communities with legal action to slow or deter repatriation. Indigenous communities often do not have the resources to fight against some of the larger, wealthier cultural institutions. In the context of 3D scans and prints, copyrighting could be seen as the new form of domination and control, muddying the waters when it comes to discussions of object ownership and repatriation.

CONCLUSION

The digital technologies of 3D scans and prints offer unique challenges and unique opportunities to the repatriation discussion and process. Using 3D technologies, in many ways can help, or hinder, Indigenous communities. These technologies are evolving rapidly and the museum field is working to keep up. On the one hand, 3D digital technologies can reconnect source communities with lost knowledge and develop stronger partnerships with museums and other cultural

institutions. On the other hand, 3D scans and prints can raise new ethical questions around ownership, public access, and the continuation of colonial ideologies. In the coming years, interested parties will continue to use 3D technologies in new and innovative ways to address repatriation claims, and reunite objects, and knowledge, with their rightful owners. As the calls for repatriation grow louder, museums, cultural institutuions, and Indigenous communities will have to ask themselves, will the digital do?

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VI

Ghost in the Machine: Gender in Museum Database

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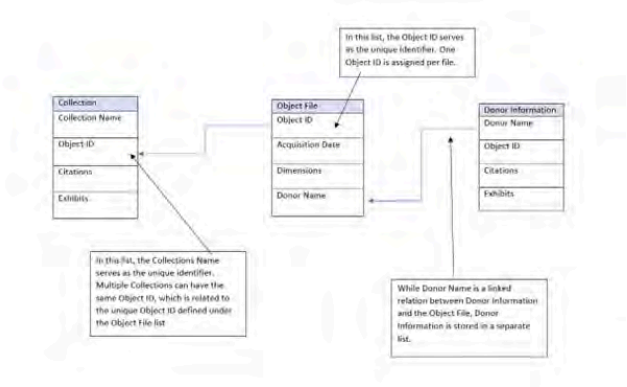
In cataloguing, museums assign meaning, categorization and value to objects in their collection, creating the foundational information used to link the object to its history and the museum. While this process at first appears to have three actors, the museum, the object and the cataloger, the modern museum employees a fourth often unrecognized partner, the Collections Management System. Since the 1970s, Collections Management Systems (CMS), or Collections Databases, have transformed into the keystone tool for museum collections, a foundational piece employed by many collecting institutions.[1] Databases have fundamentally changed the nature of museum cataloging, allowing museums to keep, manage and share information on scale previously unimaginable.[2] Further, the very nature of relational databases allows museums to connect and organize data in ways previously unfeasible, creating a whole new dynamic between the object's information and the museum. Despite the power of these systems to shape and manage museum information, museums often ignore the effects of the relationships drawn by collection databases in the way that they access, store and preserve information. As critical repositories of societies cultural expectations, museums often serve to enforce societal norms, particularly around gender and sexuality. Museum databases not only contain the information surrounding objects, but the cultural context both knowingly and unknowingly included by catalogers in the records. Museums must critically examine information management in collections management databases, as they have the potential to deeply embed these systems of patriarchal power, or to deconstruct the norms surrounding gender and sexuality.

UNDER THE HOOD-RELATIONAL DATABASES OVERSIMPLIFIED

Databases are a staple of life in the information era, both inside and outside the museum. Businesses, Individuals and Organizations extensively utilize databases to manage personal, public and privately held data. Museums use databases not just in collections management, but to keep track of visitor and financial data. However, despite the incredible impact that databases have on our daily lives, they are often misunderstood by society at large. Database is an extremely broad term, used to describe a variety of information management systems. At its core, a database is an organized collection of structured information, or data, typically stored electronically in a computer system.[3]

How this information is structured, stored and retrieved varies from database to database, however most museum databases are relational.[4] A relational database separates the information held in a series of tables, which include distinct rows and columns.[5] The database is comprised of relationships between these tables, created through the

linking of object categories to create relationships between unique identifiers and other tables. [6] What this means is that a relational database is made up of a collection of relationships between information, rather than a series of distinct, individual files. An example of how this might be visualized is shown below:



This is an oversimplified representation of relational databases.

GENDER INEQUALITY: A FEATURE, NOT A BUG

Museum Collections are powerful vehicles. They are often used to explore identities, values and experiences, while also serving to provide educational insight onto large cultural issues. Museums play a central role in telling these stories, as visitors overwhelmingly trust museums as sites of cultural, historical, and artistic authority. [7] While stories told through these objects often can push societal boundaries, museums can also serve to reflect and normalize norms, stereotypes and in some cases, discrimination. In these cases, collections can knowingly and unknowingly inform viewers world view, leading to the internalization of problematic systems of power through assumptions. This is particularly problematic for issues regarding gender and sexuality, as lack of representation and casual misogynistic narratives serve to reinforce problematic norms, and in turn support and build systems of power that activity utilize gender roles to discriminate and oppress those who do not fit into the normalized boundaries set out by society. Museums not only play an active role in shaping these narratives through the exhibition of problematic pieces of art and labels, but also in how they manage the information related to objects that both fit into and fall outside of these systems of power.

The creation of categories for museum objects is not an innovation spurred by Collections Management Systems or even Collections Managers, but rather a deeply embedded practice within the museum field. As noted by Kransy and Perry, classification is a fundamental tenant of museum curation, the "creation of knowledge through identification and categorization." [8] Museums are intentional about the information that they collect about objects. While this provides museums a great deal of freedom to describe their collections, it also provides collections professionals with the daunting task of defining what information should be catalogued about an object. Museums have limited funding, and collections departments do not have the resources or time to provide in depth information about every object in their collection. Despite this, all cataloguing involves some degree of naming, organizing and classifying objects. This process serves a real and important service to the museum, allowing for a clear organization of data that is accessible to both internal staff, researchers and casual visitors, all of which can have very different interests and needs. However, this process can also serve to disassociate objects from their original cultural context and situate them in recognizable gender and sexual norms for the cataloger.

GENDER AND DATABASES

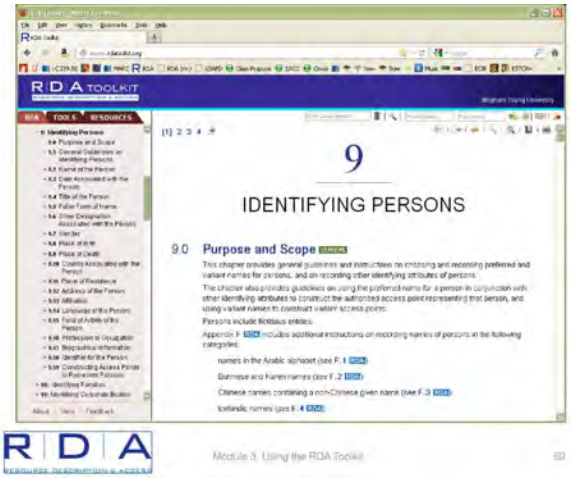
Categorization lies at the root of these two seemingly separate pillars of the museum: the collections management database and the position of cultural authority taken by museum curators, collections and exhibits. Both serve to reinforce hierarchical structures of information in the museum. The categories in the museum database enforce strict standards for the institution to define what is and is not relevant for an object, like the position museums often play in shaping cultural expectations and norms through art and discussion of historical events. While these seem like broad, opaque forces in the museum, they are rooted in very specific choices made in what language museums use to describe their objects. It's important to remember that computers and databases reflect the intentional or unintentional instructions of their users, and that biases in computer databases are rooted in systems of power internalized by the user. Despite museum databases being digital spaces, they are rooted in human practice and description, and have very clear effects on how databases store and retrieve data.

CASE STUDY- RDA AND THE DATABASE

In 2010, the Library of Congress released a set of guidelines on "recording the contents and formulating

bibliographic metadata for description and access to information resources covering all types of content and media held in libraries and related cultural organizations".[9] This standard, Resource Description and Access (RDA), was developed with the digital age in mind, recognizing the central role of databases in cultural institutions. [10] The RDA toolkit provided by the Library of Congress contains guidelines, instructions and recourses designed to help organizations adhere to a unified content standard in their cataloguing process, providing a clear, unified method of categorization across the museum field. Important to note is that RDA primarily acts as a content standard, meaning that it focuses primarily on the RDA is particularly interesting as it is deigned intentionally to optimize the capabilities provided by relational databases. Through its support of linked data applications, RDA aims to interlink individual museum data with larger controlled vocabularies, creating a system which functions well in creating categories and organization within a relational database.

A main selling point for RDA is its focus on providing organizations with an easily applicable content standard, which also allows a degree of flexibility for individual institutions to organize their data structures based on their needs. In fact, making the content standard more "user focused, and less anglo-centric" was a main goal in the creation of RDA. [11] This means that the description method aimed to create a degree of latitude for organizations when defining curatorial categorizations, both in digital and analog services. By providing a set of guidelines, RDA aimed to standardize the cataloguing process by providing clear, set rules of what information should and shouldn't be included in object files. This process provides some real benefits to cultural institutions seeking to standardize their data sets, especially those that intake large collections with less resources. The development of RDA was a response for a lack of clear, standardized categorizations in the museum field, fulfilling a pressing and important gap in data standards in the digital age. However, the development of the standards closely reflected previous understandings of categorization within the museum field, specifically around gender.



The RDA toolkit is a child of the web, designed to be opened and accessed via the internet. The language is similarly created to be used with digital technology. Image Courtesy of Library of Congress.

As highlighted by Biley and Drabinsky (2014), RDA employees the use of binary language when attributing gender to an authority file, creating a system of gender norming throughout the descriptive practice. [12] This can be seen most particularly in authority files, which asks catalogers to assign a gender tag to author or creator. In theory, this provides an easily accessible data point for researchers to utilize while searching the database. Problematically, the rule governing this aspect of cataloging, RDA rule 9.7, asks catalogers to assign an "appropriate" term for the gender field. While the term "appropriate" implies that researchers do not have to use "male" or "female" as identifiers, it still demands that a firm label be affixed to an object, which might have a more complicated relationship with gender and sexuality. In the RDA form of cataloging, gender serves as a unique identifier in a relational database, a guiding tool used to sort and search through information. Affixing a static, singular gender identity to an author or creator not only is problematic for individual files, but also data sets linked to this unique identifier. Singular gender identities are not just imposed on singular sets of records or collections, but rather on the database as a whole.[13]

To be clear, the issue presented by RDA is not the inclusion of gender in museum collections management software. Gender can be an important contextualize of an individual's identity and experiences and can serve a key role in understanding objects or overarching stories present in collections. Further, databases serve as critical links between large museum collections and communities whose identities have often been marginalized in traditional historical narratives, both inside and outside the academic community. These complex issues of gender

have often been written out of history through purposeful omission, erasing critical aspects of people's lives and identities in order to prevent more complicated discussions surrounding gender and sexuality. By removing gender from databases, museums would contribute to this legacy of erasure, electing to disengage from peoples' often complicated relationship with gender and sexuality rather than embracing the discussion. When done correctly, gender in databases can serve to connect those searching for these stories inside the collection. What is an issue, however, is the inclusion of singular categories that reinforce traditional heteronormative understandings of gender and sexuality as static, unchanging categories that remain permanently fixed. As concluded by Biley and Draminsky, it would not matter how many options a cataloger was provided with, as long as the core of the cataloging process around the selection of a singular gender identity from a fixed list, all data in the CMS becomes centered around this restrictive view of gender and sexuality.

THE GHOST IN THE MACHINE: RELATIONAL DATABASES

While Biley and Dramisky's work primarily focuses on RDA as a cataloging process, the issue is much more fundamental than specific choices made by one cataloging method. As pointed out by the Library of Congress, RDA was envisioned to synergize with museum databases, acting as a cataloging tool for the digital age. [14] Relational databases that museums utilize are based on systems of standardization, lists are defined by unique identifiers and consistent categories, which link together to create the information management tools that museums rely on. It's no accident that museum database software has led to a rise in homogeneous nomenclature in the field, the digital layout of a relational database inherently revolves around the creation of these standardized lists for the linking of data. Relational databases were designed with categorization in mind, to easily store, query and filter information for end users. Relational databases that museums utilize are based on systems of standardization, lists are defined by unique identifiers and consistent categories, which link together to create the information management tools that museums rely on.

It's no accident that museum database software has led to a rise in homogeneous nomenclature in the field, the digital layout of a relational database inherently revolves around the creation of these standardized lists for the linking of data. At first glance, this data management model seems extremely convenient for museums seeking to categorize their collection. However, as discussed, this process of categorization foundational to the museum field often serves to place or incorporate objects and stories into dominant, heteronormative gender identities. The failure of RDA to provide a dynamic vocabulary that reflects the constant fluctuation of gender identity lies not in its failure to understand collections management systems or gender identities, but rather how well the cataloging standards are constructed to fit within the nature of a relational database. On the surface, RDA appears to be based around the cataloger's relationship with the objects being cataloged. However, on a deeper level, RDA revolves around the cataloger's relationship with the tool they use to catalog, with the database playing an active role in defining and shaping these processes. While on the surface issues revolving around the institution of heteronormative terms and beliefs in cataloging processes appears to revolve around the user, the relational database acts as an active player, an invisible specter which prevents a fluid and changing definition of gender from being utilized by the very nature of its being. To exorcise this ghost from collections management software, museums professionals must dive deeper than simply redefining cataloguing terms and consider a data management model based on complexity and overlapping identities, rather than on fixed categorization.

BUILDING A NEW TYPE OF DATABASE

The creation of a new type of museum database is a task more easily identified than completed. Setting aside the logistical issues of migrating large museum collections, as well as ethical issues related to the equal distribution and access of technology to smaller and less funded institutions, there is the considerable challenge of designing a software that reflects both the collections management needs of an institution. This logistical challenge should not stop museums from engaging in the issue. Continuing to employ systems simply because they work well enough maintains systems of gender normativity in the museum space, continuing a long and troubling history of academia aiding in de-queering history. Instead, acknowledging the reality that immediate improvements to language used in current collections management systems are needed in addition to the continual goal of developing new information systems not based on categorization is necessary to make the field a more equitable place, now and in the future. For both immediate and long-term projects working on creating these new database systems, empowering LGBTQIA+ communities to be decision makers in design and implementation processes is essential.

As discussed, the relational databases that museums traditionally utilize rely heavily on the categories defined by users. For standardization processes, adopting a unified lexicon (such as RDA) is necessary for creating organized databases. While this process is inherently problematic, there are immediate solutions to ensure that these categories utilize terms and language accepted by LGBTQIA+ communities. As noted by the Trans-Metadata collective, the current descriptive practices for trans and gender fluid people inside of GLAM spaces presents the risk of being misnamed or outed, potentially opening individuals to harm or violence. [15] The collective published a cataloging standard "Metadata Best Practices for Trans and Gender Diverse Resources", which seeks to provide best practices for "for the description, cataloguing, and classification of information resources as well as the creation of metadata about trans and gender diverse people." [16] By providing a set of relatively easily accessible standards for institutions, the document provides a road map for improving cataloging practices already utilized by museums. As pointed out by the Trans-Metadata collective, "Perfect is not always possible, and sometimes you just have to do your best". [17] While this form of categorization runs into the same issue of providing a static identifier for gender, which is often fluid and complex, it at least provides a baseline for museums to start to implement within currently existing databases. While recognizing these databases are not perfect, empowering LGBTQIA+ individuals to make decisions about what categorizes are used within them provides a necessary middle ground for progressing the field.

While empowering LGBTQIA+ professionals to shape databases in ways that utilize preferred terminology is an important step towards creating collections management systems that reflect the complexity of gender, working towards systems of information management that are responsive, rather than static, is a necessary step for the field. In her work on diverse systems of knowing in the museum, Erin Canning suggests moving towards an event centric information data model. [18] Essentially, the suggestion revolves around basing the management of information in museum databases not around physical objects, but rather around the context and knowledge surrounding them. What Canning provides is not a fully functional framework for a new model of data management. However, it does call attention to different ways of constructing database to emphasize different types of data and organize it in ways that do not revolve around firm categorization into distinct, unchanging categories. Shifting the mindset of the museum away from collections databases to simply manage physical objects to collections management systems as a way to incorporate and preserve complex, changing stories around topics like gender is necessary step for the evolution of the field. The solutions are frustratingly vague and seemingly out of reach. However, the rethinking of the use of databases in managing museum collections holds boundless potential for enabling LGBTIA+ communities to access and preserve critical knowledge, stories, and histories. By opening the field to alternatives in collections management systems, the field also provides space towards moving past a legacy of upholding gender norming ideals, and towards acting as a critical resource for challenging systems of power and identity.

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VII

Are You There? Archival and Curatorial Silences in the Digital Sphere

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As digital preservation and public dissemination of museum-held knowledge through digital collections become more prevalent, the very real issues of ethical considerations within these collections are amplified. Collection silences, in particular, are both exposed and reinforced by the digital space. This paper will address the following questions. What are collection silences? How do collection silences develop as a result of non-neutrality in collecting? How does converting the physical collection to a digital space effects collection silences and the people represented by these silences? What solutions are being implemented to resolve these silences in digital spaces?

What are Collection Silences?

> *"Museum interpretation has traditionally emphasized "presences"—artifacts, buildings, artworks, etc.—the tangible items produced or left behind by a culture. Radical interpretation might instead emphasize—or be self-consciously aware of—the "absences"—the stories and artifacts of those whom traditional history has largely forgotten or those whom dominant cultural thinking (infused as it is with racism, sexism, classism, anti-Semitism, homophobia, etc.) has deemed unworthy."*[1]

The Museum as Site for Social Action, MASS, Action Committee released a toolkit in 2017 to examine the overarching unneutral nature of museums and how museums can and should address this issue.[2] The MASS toolkit discusses collection silences, although it refers to them as absences and gaps, framing the concept as a matter of representation and social justice. The document links interpretation silences of physical sites and silences in collection holdings as the same concept, with several case studies of museums that have addressed their silences. Lacking a precise phrase to describe this concept of collection silences makes it challenging to place the discussion presented by MASS with other discussions. Without the language to describe this problem, we, as a field, cannot discuss and find solutions for it properly. Notably, the MASS Toolkit does not address digital collection spaces.

'Archival Silences' are defined as "a gap in the historical record resulting from the unintentional or purposeful absence or distortion of documentation."[3] Collection silences can be understood as the same kinds of gap or absence but in museums and other collections. This could be through absences or distortions via collecting or interpreting artifacts and representative objects, including art or historic buildings. Curatorial silences would be gaps or silences in a collection surrounding underrepresented groups that directly result from curatorial decisions, whether unintentional or purposeful.

Although multiple sources discuss archival silences and the challenges they present within an archive,[4] few sources have discussed curatorial silences,[5] and when they do, they utilize different terminology; even fewer sources have discussed how these silences transition to the digital space.[6] Terminology used varies drastically, making it difficult to find relevant sources. Terms can include 'gaps,' 'absences,' 'blanks,' 'voids,' or 'silences.' For this reason, this paper utilizes many examples from archives.

Whether in an archive, a museum, or another institution, collection silences are absences in the collection typically surrounding underrepresented or suppressed narratives. An example presented by Lisa Taylor is of women historically excluded from sports history collections in the River & Rowing Museum, Henley-on-Thames, where men's sports history is the overwhelming majority of the collection holdings. Taylor addressed this silence through an oral history project.[7] Collection silences are, in essence, absences of materials that can lead an institution not to discuss groups of people. Collection silences do not present through the absence of single objects or object types within a collection. Instead, they manifest in profound systemic absences of objects representing historically marginalized or excluded peoples or cultures.

Collection silences result from destruction of objects over time, lack of availability of objects to be collected, non-neutral collecting, bias in collecting practice, or many other contributing factors. Bias in collecting or interpretation is one of the most apparent reasons for collection silences.

Non-neutrality and bias in collecting are the main contributing factors to collection silences. Concepts of non-neutrality have been a recently renewed topic in the museum field, sparking heated debates in 2017 and 2018.[8] A consensus is emerging that museums are not neutral and never have been. Cara Bennet put it succinctly in response to the debates at the time, "Museums reveal bias in the items they choose to collect, the stories they choose to tell, and the way they choose to tell them."[9] The very nature of choosing what is worth collecting and preserving versus what is not is, by its nature, choosing and constructing a narrative.

Choosing and constructing narratives is at the heart of non-neutrality in museums and archives, defining the power of the institutions and shaping collection silences. Joan M. Schwartz and Terry Cook discuss this power of archives and choice,

> *"...a tiny fraction of all those records created are appraised, selected, and memorialized as archives; the vast majority are not. Archival choices about how to describe this archival fragment reinforce certain values and impose emphases and viewing orders for the archive. Archival approaches to making records available (or not) again create filters that influence perceptions of the records and thus of the past."*[10]

Museums and archives make choices that can deepen collection silences in the process of describing materials creating different kinds of description silences.

These silences of description and collections perpetuate systems of oppression and continue to have real-life impacts. Suse Anderson states "As institutions, museums have long, troubling histories as mechanisms of imperialism and colonization."[11] Collection silences result and enable these concepts to continue and influence interpretations of museum collections and history.

At the National Digital Stewardship Alliance in 2016, Bergis Jules explored why collection silences matter to living people and gave concrete examples of political repercussions. In examining the inherent white nature of the archival, library, and digital preservation fields, Jules emphasizes the importance of confronting bias within collections and the impact on living people and groups to the gaps. "The work we do as archivists, as librarians, as digital preservationists, have real consequences for marginalized people because who is remembered and how they're remembered dictates who gets violence perpetrated against them."[12]

Silences in the Digital Space

In today's museum, creating a digital version of the collection and sharing it online is considered vital to public engagement and transparency. However, collection silences originating in the physical collection can carry over when a collection is digitized and made public. Suse Anderson points out:

> *"When one museum puts its collections online, there may indeed be a democratising effect, as objects previously hidden become visible and usable...When hundreds or thousands of museums digitise their collections and put them online, the effect is one that further embeds the status quo at scale, making claims writ large across millions of objects about whose histories and objects have been worth collecting, and in what circumstances, as part of whose narratives."*[13]

When physical collections are made digital, they push existing silences into public visibility while creating new silences. This is complicated by the digitization process itself.

Only some items can be digitized, and digitization does not happen quickly. Digitization is a process that can take many years, and not every institution has the resources to digitize its whole collection. Prioritization in digitization is a valuable way to maximize the benefits and justify the expense of digitization.

> *"...digital collections rarely reflect the entirety of a physical collection, as limitations of staff time, digital storage space, equipment, and the personal biases of the curator impact the decisions made when selecting materials for digitization..."*[14]

When organizing a digitization project, there are multiple questions to consider. Unless an institution has unlimited resources, that institution has to decide what to prioritize for digitization. Fragile artifacts, highly used or highly requested items, items that address collection silences, or items that rarely go on display may all be good candidates for prioritization.[15] The Northeast Document Conservation Center puts forth that the most important considerations are the value of the material, if legal copyright is an issue, and the technical aspects. Rarity, research and educational value, and user demand may all affect how an object may be valued and prioritized by an institution.[16] Copyright concerns may further limit how a collection is digitized and shared in online collections.[17]

The Smithsonian Open Access website lists multiple reasons why an object may not be included in the digital collection, such as copyright restrictions, "contractual restrictions from a donor, lender, or artist," unsupported data formats, and an object being culturally sensitive.[18] While 'culturally sensitive' is not defined or explained in the FAQ page, it most likely refers to objects that may have cultural restrictions.

The Albin O. Kuhn Library & Gallery Special Collection discusses cultural sensitivity, "Some groups...have traditional norms surrounding who can use certain materials, or specific items may be part of a ceremony or tradition that is only accessible for people within that group."[19] This holds the caveat that not every community and culture wants their records in the hands of third party institutions, let alone published online by groups outside the community.[20] Respecting these cultural norms and traditions is vital to cultivate trust and maintaining transparency.

Not digitizing a collection item due to cultural sensitivity is not collection silence per se. It is respecting the originating culture and maintaining community trust through purposeful silence. Not digitizing a selection of artifacts due to cultural sensitivity does not stop a museum from engaging with that community or culture or detract from the mission of education. Instead, this gives museums a chance to engage in open conversations with the general public about why some collection items cannot be shared in this way.

Silences in Metadata

Collection silences can present in more ways than a lack of collection objects or the limitations of what can be posted; silences can also appear in descriptions. Practicality dictates that most objects in digital collections are limited in interpretation to the metadata unless included in museum blog posts or virtual exhibits where context can be discussed as deeply as exhibit labels. Metadata is the data that makes digital collections searchable and can also be places filled with silence.

Metadata can include location data, filenames, creation date, object type, object materials, page numbers, dimensions of the physical object, who created the file, file type, details about what is in a photograph, and the potential for silences and gaps as well. In short, metadata is data about data, providing context and descriptions, allowing catalogs and computer filing systems multiple routes of organization, and creating a structure that search engines can look through.[21]

Metadata is a route for the analysis and democratization of collections when made publicly available. Diana Greenwald facilitated a 'Datathon' for the National Gallery of Art, which examined new uses for museum collection data, largely utilizing metadata already publicly available for digital collections. Greenwald argues that not only does data democratize museum collections by creating transparency, but that data analysis of this kind can and does show collection silences. Greenwald does not use the term collection silences or related terms; she does discuss acquisitions trends with the collection, examining the number of female artists represented. As well as new approaches, by studying the number of female donors, researchers can take to examine silences. Greenwald demonstrates how collection silences can be exposed by examining publicly available metadata. This allows transparency and acknowledgment of previous collecting policies.[22]

Schwartz and Cook's discussion of choosing how things are described extends to the metadata, often written by the museum and archival staff, who may have an inherent bias or simply lack the knowledge to provide useful metadata. Archival materials not only document objects that describe or are used to create an identity but enforce

identity through collection decisions and by organizing and describing those records.[23] Greenwald explained that, "Cataloging is a profoundly human process; there is the possibility of error…"[24] When records with these organization methods and descriptions are made digitally available in a digital collection, they retain these organization methods, thereby perpetuating those same methods of describing and discussing materials. If a material has been disconnected from its originating culture by description, it will continue to be disconnected. If metadata is a human process with human errors, what happens if metadata describes objects in ways foreign to their originating culture? How are those cultures supposed to find them?

The FOR THE PHOENIX TO FIND ITS FORM IN US. ON RESTITUTION, REHABILITATION, AND REPARATION exhibition at ifa-Gallery and SAVVY Contemporary hosted an invocation discussing problems of representation in collections and other related issues.[25] Speakers Chao Tayiana Maina and Molemo Moiloa of Open Restitution Africa[26] discussed unfamiliar metadata descriptions in their talk, "For Those of Us the Algorithm Doesn't See." Maina discussed metadata and "…visible and invisible labyrinth of underground roots of data…metadata isn't just data about data it is the engine behind data." Maina makes the point that the schema of metadata is made by particular groups for their own use and what happens when other groups attempt to use the same framework despite it not matching their needs. Metadata and data uniformity, the use of universal metadata templates have the potential to "…to strip cultural collections of their authenticity…" Maina still maintains that metadata has the potential to "…breathe life into collections…" and create a deeper context for digital collections.[27]

Moiloa discusses how computer algorithms are not designed to identify African names and thereby attempt to identify them as European or Japanese names. Moiloa discussed digital restitution and the problems of how white western institutions chose to prioritize objects to be digitized. Moiloa states, "…we are ghosts of the internet, haunting spaces where we have been erased…"[28] in reference to African culture in digital museum spaces describing the larger impact of collection silences. Both speakers demonstrated how being absent from the data that discusses cultural objects is damaging and how they are aware of the collection silences surrounding their cultural and historical objects.

https://youtu.be/MZRibg-0T44?start=1029;

Figure 1:Recording of the Invocations of the FOR THE PHOENIX TO FIND ITS FORM IN US exhibit, video posted by SAVVY Contemporary. Video includes a talk "For Those of Us the Algorithm Doesn't See" given by Chao Tayiana Maina and Molemo Moiloa of Open Restitution Africa.

Racial and cultural biases are not the only kinds of silence within metadata; gender bias can also present itself. At the Champaign County Historical Society Museum in Urbana, Ohio, there is a collection donated by Mrs. Ella Whitlock largely related to her husband Brand Whitlock's life. Letters and objects addressed to Ella herself as Mrs. Brand Whitlock are included. Only one of the five separate donor records listed her full name in the collection records. The remaining records described her only as Mrs. Brand Whitlock, diminishing her role and importance below her husband. While an individual example, this is a typical language and description choice that can be found in many institutions, demonstrating how collection policies can actively reinforce gender bias.[29]

Cristin Guinan-Wiley demonstrates how metadata reveals bias of museum staff as they create the metadata, "…metadata can perpetuate bias…through a use of language (controlled vocabulary) that is biased, especially in subject headings and tagging."[30] Guinan-Wiley focuses on projects that actively confront the issue of metadata bias and how these projects are creating solutions. Guinan-Wiley only discusses how metadata can reveal collection biases and does not use the terms 'collection gap' or 'collection silence.' However, this article describes how collection silences are become more entrenched with metadata choices and can be exposed through analytic analysis. The majority of the paper utilizes metadata to expose the collection biases of the Tate museum, focusing on the gender of the artists represented in the collection.

Attempts to solve metadata bias have led to ideas about automating metadata creation. Amalia S. Levi cautions against automating the creation of metadata and the use of AI. "Remember: archival silences don't disappear with each successive reformatting–they get recreated and

perpetuated."[31] As coding is created by humans, it will inevitably make the same mistakes humans do. Levi shared Eryk Salvaggio's analysis of this concept through the example of AI-generated images in an archival silences Twitter thread.[32] Utilizing AI could reenforce the bias of the metadata and has the possibility of making collection silences worse by misidentifying objects when writing the metadata.

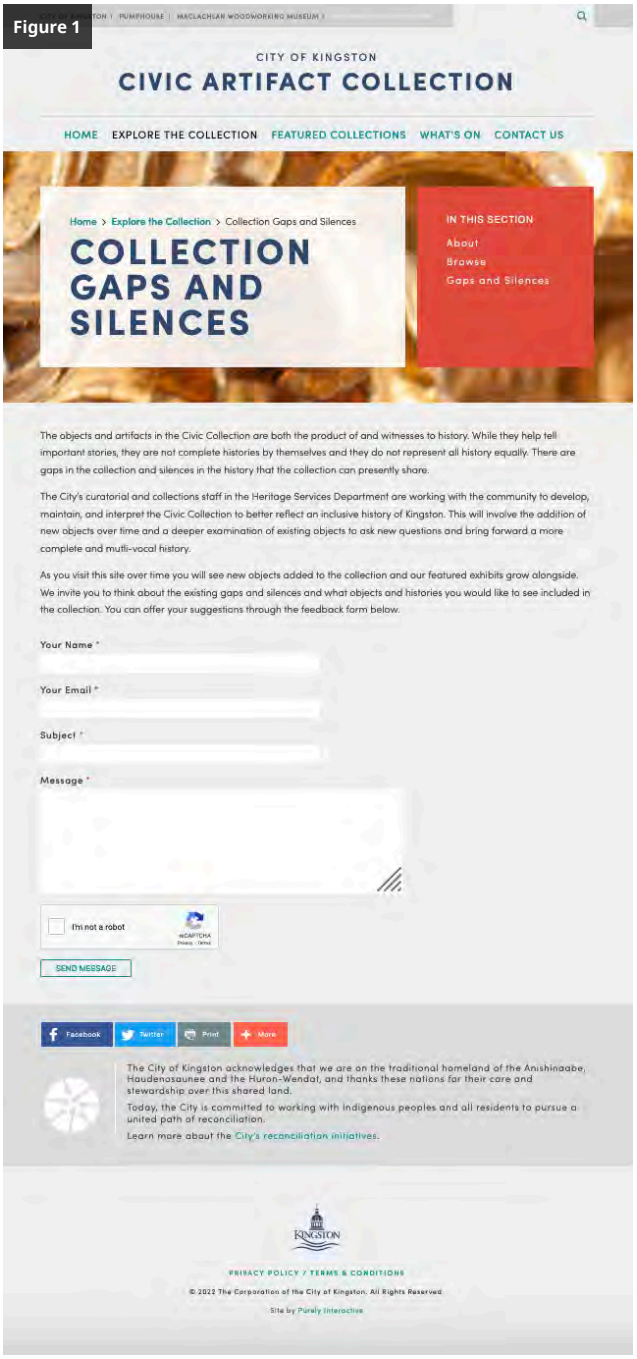
Possible Solutions

Addressing collection silences through collecting to fill these silences is an approach for the physical collection, however, this can be a slow process. The digital collection is restrained by the physical collection's silences. You cannot post an object you do not have and as previously discussed digitizing is a long process. So the question becomes how can existing museums address silences in digital spaces? One option is to provide disclaimers explaining the inherent bias of the collection.

The Paul Mellon Centre Photographic Archive discusses their collection gaps by highlighting how only "...320 women [are] represented alongside roughly 4,600 men..." in the collection. This is attributed to limited scope and a historical collecting bias; the collection ceased collecting in 2013, meaning that filling these silences through additional material will not be done.[33]

The City of Kingston Civic Artifact Collection, a museum in Kingston, Ontario, has three paragraphs in the about the collection section of the website. "...[The collection objects] do not represent all history equally. There are gaps in the collection and silences in the history that the collection can presently share." The statement says that the staff is working on this issue and welcomes community input. The page includes a 'contact us form' immediately after the statement.[34]

Figure 1

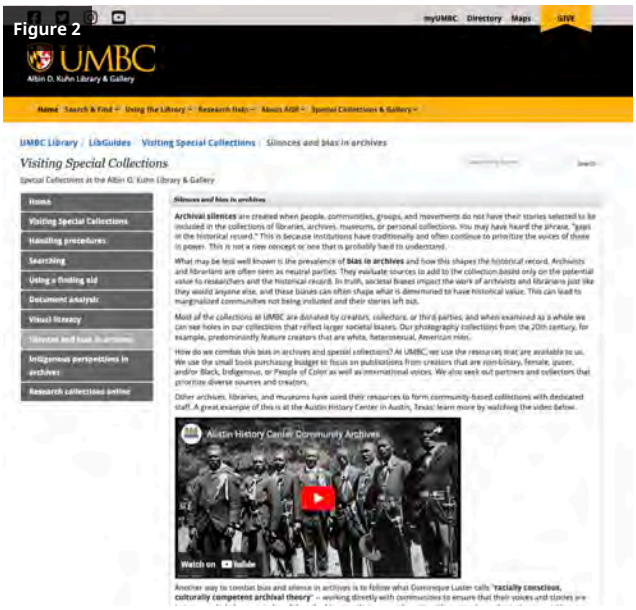


City of Kingston Civic Artifact Screenshot

The University of Maryland, Baltimore County Albin O. Kuhn Library & Gallery Special Collections statement is fundamentally different from the other two examples. This page is not written as a disclaimer but as an educational opportunity. It defines archival silences, even bolding the text of the term, and explains what bias in archives is, bringing non-neutrality concepts into the discussion. Further, the page links to and suggests sources to learn more, including sources created by other institutions with

direct links to academic papers such as .pdfs. The page outlines how the Special Collections plans to resolve collection silences problems internally and vows to do so.

Figure 2



Albin O. Kuhn Library & Gallery Special Collections Screenshot

Part of why this page is so fundamentally different from the other two examples could be that it is written for visitors and researchers of a university collection. University collections are focused on the likely visitors—namely students, faculty, and visiting researchers—not the general public. This page is written to be helpful and valuable to college students learning to do archival research; it is also extremely valuable to the general public, who are likely unfamiliar with these concepts. It serves as a deeper recognition of the issue at hand. It works to acknowledge the Albin O. Kuhn Library & Gallery collection's absences and educate about how collection silences affect real living people. This disclaimer has the added effect of constructing trust with communities and publicly demonstrating how vital this relationship is to the communities whose records they hold.[35]

A potential pitfall of these disclaimers is where and how they are included in the museum's digital space. The Paul Mellon Centre Photographic Archive's disclaimer is a blog article tucked away from the digital collection within the framework of the archive's website.

Kingston Civic Artifact Collection places its statement under "Explore The Collection,"[36] but the page is listed as a navigation option in the drop-down navigation bar. The Albin O. Kuhn Library & Gallery statement is under Visiting Special Collections and is listed in a sidebar alongside how to use a finding aid and handling procedures.

Is simply acknowledging and accepting a collection's silences enough? Is writing a disclaimer at one institution with the assumption that another institution has the resources to fill the silence enough?

Another solution is crowdsourcing research methods to find answers for objects that otherwise would continue to be labeled and described in vague terms. The main goals of crowdsourcing research for digital collections focus on corrections and expanding narratives. While an in-depth discussion and debate about crowdsourced research are tangential to this paper, the idea of turning to communities to fill silences in the collection is valuable.[37] The Walter Havighurst University Archives and Special Collections at Miami University in Ohio, a prayer book from Ethiopia, was reassociated with its name, author, and deeper history after being digitized and identified by a researcher halfway across the country. The researcher, Amsalu Tefera, came and spoke on the Arganone Mariam and shared historical, religious, and cultural context about the manuscript.[38] Knowledgeable people stepping forward and sharing what that know is extremely valuable.

Relying only on general public members to step forward is not a feasible solution; staff actively researching and being willing to learn about collections is vital as well. Greenwald explained, "museum staff are always learning new information that can result in changes to title, date, or attribution."[39] Meaning active research and collection knowledge will provide solutions to metadata silences and provide access to collections.

Research and solutions to digital collections silences should not happen in a vacuum. Partnering with other institutions and organizations to share results and create new initiatives together will provide better equitable solutions. Bergis Jules and Amalia S. Levi discuss projects, organizations, and institutions that actively work on collection silences in digital spaces.[40] Here is an overview of a few of these projects and the solutions they provide.[41]

The Race and Ethnicity Keyword Thesaurus for Chronicling America works as a search term guide, aiding researchers looking for materials when the terms attached to them have changed. The thesaurus acknowledges and addresses how language drift can create archival silences. Quite simply, when terms change, a term acceptable 20 years ago falls out of favor, or is deemed offensive, the metadata may still reflect the older term. This thesaurus helps researchers find search terms that will lead them to the sources they want.[42]

Some groups have even created their own digital museums as an answer to physical collections that don't address their cultural needs. The Digital Transgender Archive collects digital versions of and describes information on archival holdings at other institutions that have value for their specific mission. Meaning not every part of the Digital Transgender Archive is held by the Archive.[43]

The South Asian American Digital Archive (SAADA) describes itself as "…a community-based culture change organization ensuring that South Asian Americans are included in the American story: past, present, and future."[44] With a collection of 4,792 items digitally available but physically held across the country, the collection works to actively highlight the narratives and bring them to the community the collection documents.[45]

The Pacific Virtual Museum is a digital museum collecting pieces housed around the world to create a single digital space focused on the history and culture of the Pacific. Funded by the Australian Department of Foreign Affairs and Trade and organized with the National Library of New Zealand, Te Puna Mātauranga, and the National Library of Australia, the project encourages museums and other content partners to add to Pacific Virtual Museum's digital collection and help refine existing metadata.[46]

While it seems an excellent idea to get as much as possible on the internet and encourage people to inform institutions of incorrect and inaccurate data is a tempting solution, it is not always the right one. Consulting originating groups to determine if it is acceptable to share their cultural heritage is important to maintain transparency, ethical standards, and healthy relationships.

Moving Forward

Collection silences, a lack of collection materials associated with underrepresented groups, and suppressed narratives are often a result of historical bias in collecting institutions. These silences are made more apparent and deepened in the digital sphere through metadata language choices and the availability of collection data to the public. The absence of cultural materials or cultural materials described in digital collection metadata in an unfamiliar way can alienate groups from their own artifacts and histories.

There are many options for resolving collection silences in digital collections. When confronting the silences in an institution, digital collection acknowledgment is only the first step. Actively working with communities to fill collection silences, either through acquisition in the case of the physical collection or better description and contextualization in the case of the digital, makes a more profound impact. Connecting with projects and organizations that create digital collections to expressly fill collections silences about how to approach a collection and contribute to an institution's holdings is a valid approach that will increase awareness and bring forth new solutions.

I also suggest to the Galleries, Libraries, Archives, and Museums (GLAM) world that a cohesive term is applied to collection silences. This discussion is often lumped in with non-neutrality; however, this term is too broad, encompassing everything a museum does, including exhibit design and marketing choices. Sometimes this is referred to as 'collection gaps,' but this term is often applied when a museum lacks an example of a specific kind of object rather than discussing underrepresented narratives, making it the incorrect term and causing confusion. Referring to this issue as a diversity and inclusion issue is significantly more accurate but unclear. Does it refer to hiring practices or collection holdings and descriptions?

Archives have long used 'archival silences' as a cohesive term to describe a lacking of narratives due to collection bias. However, there is no currently used cohesive term to discuss this same problem in other kinds of institutions. Yet, it is a pervasive problem that many institutions have prioritized. I suggest utilizing the terms 'collection silence' or 'curatorial silence' moving forward to cohesively describe this issue, allowing for deeper conversations about solutions to develop. The suggested terms are not meant to apply to a lack of collection examples but to absences in the collection that result from collecting bias and are related to underrepresented and previously suppressed narratives.

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VIII

Beyond Zoom: Digital Museum Education Today

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As the world emerges from the Covid-19 pandemic, museums face new expectations when it comes to interacting with audiences online. During the height of museum closures, institutions turned primarily to teleconferencing technologies, such as Zoom, to deliver educational programs. However, the grace period of experimenting with virtual or hybrid museum education has passed. Now, digital museum audiences expect technological proficiency at the least and innovative features that suit hybrid lifestyles and combat Zoom fatigue at best. Amid financial strain and staff burnout, museums in the United States of all sizes require guidance for future success in digital museum education.

Scalable solutions for digital education programming at small, medium, and large museums in the wake of the Zoom boom will help museums emerge from the pandemic stronger and more in tune with their communities' needs. Rooted in a rich history spanning decades before Covid-19, successful digital museum education must learn from its own past, following standards and best practices developed along the way. With a solid foundation in accessible, sustainable, and high-quality digital education practices, museums of all sizes and abilities can build adaptable, individualized programming portfolios as they navigate post-Covid society.

In implementing the following recommendations, museums are encouraged to self-identify as small, medium, or large based on pertinent factors. Guidance and case studies for each class of museum adhere to the following rough estimates: small museums have fewer than 20 full-time staff members, medium museums have 20-100 full-time staff members, and large museums have over 100 full-time staff members.

HISTORY OF VIRTUAL MUSEUM EDUCATION

While the Covid-19 pandemic seemingly brought on a Cambrian explosion of virtual museum programming, most museums actually spent lockdown deploying distance learning techniques with decades of pedagogical precedent. In the early 1990s, museums first began using videoconferencing technology as a way of interacting with visitors remotely, primarily focusing on school groups.[1] Despite this early availability, widespread adoption would wait until the early 2010s as relevant technology, from webcams to software applications, for both museums and schools grew more affordable. By the end of the early 2010s, museums also had access to a variety of digital education tools beyond videoconferencing to choose from, including discussion forums, wikis, podcasts, and more.[2]

As smaller and midsize museums began dipping their toes into the digital education pool, larger institutions continued pushing the limits through large-scale collaborations. On the east coast of the United States, the Metropolitan Museum of Art (Met) and American Museum of Natural History joined forces exploring methods of virtual learning for students that adapted to more STEM-centered curricula, later teaming up with west-coast developments from the California Academy of Sciences and Fine Arts Museums of San Francisco.[3] These online museum learning projects, typically involving synchronous videoconferencing components as well as asynchronous online discussion forums, also developed as partnerships between museums and nonprofit organizations.[4]

Despite this flourishing of creative partnerships and experiments with novel technologies, museum digital education fell into a relatively stagnant period from the early 2010s through early 2020. With shifting priorities and low on-site visitor usage of mobile applications, cellphone-based audio tours, and QR codes, museums seemed less willing to invest in new digital education initiatives. By February of 2020, less than fifty percent of art museum directors viewed digital education as a priority.[5] Ultimately, it took a natural disaster of epic proportions to shake museum digital education back into motion.

As American life shifted into physical isolation in March 2020, museums quickly turned to the available technological tools and strategies they previously underused or neglected. Social media campaigns encouraged engagement with #MuseumFromHome content while overworked school teachers turned to virtual field trips as opportunities for escapism rather than curricular enhancement.[6] In some cases, the pandemic also returned museums to analog practices, such as the Met's meals-on-wheels-style delivery of art kits to retirement communities with roots in the 1980s.[7]

The digital scramble in the early days of the pandemic also highlighted the inequality within the digital divide between traditional museum audiences who retained access to online resources and marginalized groups who struggled with the financial demands of the global crisis. Some museums stepped up by offering relevant diversity, equity, accessibility, and inclusion (DEAI) resources to their communities, but countless others fell short of moving beyond empty statements of solidarity.[8]

By 2021, museums and their audiences found themselves in fundamentally new relationships with each other and the digital technologies connecting them. Due to increased online interaction with museums, many museum visitors expressed Zoom fatigue. [9] In an increasingly hybrid – digital and in-person – world, museums stand to gain even greater audience reach than possible in pre-pandemic times, but the grace period for technical experimentation has ended. [10] Those interacting with museums online, whether through a livestreamed program, social media platform, or other digital resources, expect streamlined experiences that deliver high-quality content.

STANDARDS AND BEST PRACTICES

Moving forward into a world forever changed by the Covid-19 pandemic, museums must follow battle-tested standards and best practices for digital museum education for future synchronous and asynchronous learning experiences. Adhering to the following tenets of accessibility, quality, and sustainability will help museums of all sizes and abilities provide sound virtual education offerings.

Just as museums champion accessibility in their on-site experiences, they must foster equally accessible environments for online audiences that go beyond legally required minimums. Museum accessibility best practices extend beyond regulations addressing physical access needs into financial access. According to the International Council of Museums' recently adopted definition, museums are "open to the public, accessible and inclusive…offering varied experiences for education, enjoyment, reflection and knowledge sharing."[11] Naturally, this mandate applies to the whole of museum experience, including digital museum practices.

Beginning with the core infrastructure of museums' online presence, museum websites, social media channels, and resources available through each must adhere to Web Content Accessibility Guidelines (WCAG). Meeting WCAG requirements includes implementing text hierarchies, alternative text captions for non-textual elements, and captioning for video content.[12] Museums should comply with these standards in all digital education applications, from synchronous videoconferencing or livestreaming sessions to asynchronous activities delivered through downloadable documents such as PDFs. Meeting these standards keep museums in step with accessibility requirements, but also increase the discoverability of their materials online, helping them reach larger audiences.

While these standards apply to physical digital accessibility, such as screen-reader compatibility for users with low vision, keeping resources free or affordable within reason help museums address needs of financial accessibility. With the economic fallout of the Covid-19 pandemic, schools facing funding cuts continue eliminating arts or

humanities resources not deemed as “priorities."[13] In response, museums should seek grant funding or other philanthropic resources that keep virtual school learning experiences free or low cost, particularly to vulnerable institutions such as Title I schools.[14] Since the pandemic also revealed the gap in technology access for those of limited financial means, museums should also consider creative methods of reaching these audiences to provide them with digital educational materials.[15] Museums can create opportunities for accessibility by partnering with schools, libraries, and other institutions capable of connecting the public with Internet access and web-accessible devices so that their virtual programming extends beyond typical museum audiences. Benefitting more than just their audiences, museums offering accessible, dependable educational resources increase public trust in their institutions, sustaining them financially as well as ethically.

Maintaining public trust in museums as reputable sources of information hinges on providing high-quality content in online educational resources reflective of high quality in-person experiences. In accordance with the standards of the American Alliance of Museums, museums must account for “the characteristics and needs of its existing and potential audiences” and must “[assess] the effectiveness of its interpretive activities and [use] those results to plan and improve its activities.”[16] Thus, museums should practice community engagement as a means of providing high-quality digital education materials that serve their intended audiences. Despite continued claims of progressiveness, museums often struggle to break out of the long-held, colonialist mold of a teacher-student relationship when addressing their communities.[17] True community engagement constitutes a reciprocal relationship built over time between a museum and a given population, resulting in projects – in this case educational programs – that value multiple ways of knowing. Conveniently, this model reflects the constructivist education approach that equalizes educator and learner used in effective digital museum pedagogy.[18] Conversations with community stakeholders should thus guide digital museum education development, from platforms used to deliver content to the formats of content present and even the scope of the content itself. Museums should also undertake evaluations throughout the various phases of development as a way of ensuring that community needs are met.

However, museums can only create high-quality digital education programming by following best practices in museum sustainability. In this context, sustainability refers to adequate staffing and resources supporting the livelihood and longevity of virtual museum education projects. The graveyard of virtual museum resources still present, but not updated since the early days of the pandemic, lingering on museum websites suggest a deficit in staff resources directed towards sustained digital content. Some museum staffs can find aid through their community engagement practices, with collaborative efforts sharing the burdens of content creation and maintenance.[19] Yet, such collaborations in and of themselves require museum staff time for building and facilitating these relationships. In the interest of budgeting staff time, museums must narrow the scope of their projects to the most feasible and impactful by first determining a community’s needs and then determining how their museum is uniquely positioned to meet those needs.

SMALL MUSEUM RECOMMENDATIONS

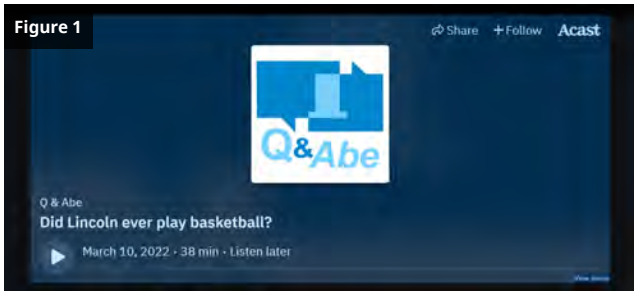
As small museums navigate the burdens of post-pandemic digital education, they should remain open-minded with their digital offerings to participate in knowledge sharing through like institutions and stretch programming already in place. Though typically focused on local audiences, small museums can use digital education strategies to reach the large percentages of museum goers continuing to engage with museums virtually.[20] Thankfully, effective digital education remains rooted in the constructivist education principles that museum educators have implemented through in-person programming for decades. At its core, constructivist education empowers learners to develop their own meaning out of an experience, supporting a more equalized environment where educators and learners share authority.[21] Teleconferencing applications like Zoom tend to promote hierarchical structure, favoring a single voice rather than allowing multiple conversations simultaneously. Therefore, museums in the post-Covid era should carefully consider the digital applications that they use to promote constructivist education approaches. For small museums, this does not necessarily require high-cost investments. As noted by museum educator Susan Bernstein, it is more important for museums to use the technology that they have in “new and interesting ways” than it is for them to simply use new technology.[22] To this end, museums can use their existing websites as a starting point for offering digital education resources and modify their in-person programming to adapt to hybrid audience needs.

President Lincoln’s Cottage serves as an excellent example of a small museum providing digital offerings suited to hybrid audiences within the scope of its resources and

mission. One simple yet effective element of their webpage for "Educator Resources" provides links to the websites of similar organizations, such as the Abraham Lincoln Historical Digitization Project, Ford's Theater, and the Lincoln Home in Springfield. [23] Without added costs beyond the Cottage's resources allocated to running their website, the museum provides learners with free choice to explore additional, relevant digital education opportunities. In the future, the museum could consider moving these virtual resources to a more publicly accessible webpage, such as the "Learn" page, to show that these resources are available for all learners, not just educators.

On a more advanced level, the Cottage also produces a podcast responding to questions posed by museum visitors.[24] Although initiated before the pandemic, this digital resource kept the Cottage virtually accessible to learners throughout the museum's temporary closure and continues resonating with listeners unable to visit the museum in person. At roughly 30 minutes in length, each episode seems approachable and can easily be downloaded and consumed as the listener goes about other tasks. While the Cottage's podcast operates as an independent project, other museums could easily adapt the podcast medium as a means of recording live, in-person programming – a practice already implemented by some large museums.[25] With the increased popularity of podcasts, recording and production materials have grown more affordable and user-friendly. Starting by adapting in-person programming into podcasts helps alleviate some time and content creation burdens, while their digital accessibility can help small museums diversify their virtual offerings beyond visually based resources.

Figure 1



Podcast episode from the 2022 season of the Q&Abe podcast from President Lincoln's Cottage.

MEDIUM MUSEUM RECOMMENDATIONS

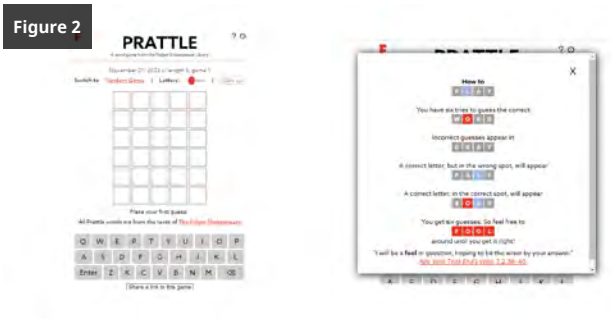
For medium or midsize museums, effective digital museum education reaches beyond the now-standard virtual museum tour into more individualized, gamified experiences through the museum's website. During the height of the Covid-19 pandemic, museums raced to produce online experiences simulating the in-person museum experience via Matterport, Google Arts and Culture, and other software and hosting sites. Unfortunately, these experiences often failed to live up to their educational goals as users struggled with navigation issues and distracting digital infrastructure. [26] In some cases, museums offering virtual tours in video format, such as The George Washington University Museum and The Textile Museum, found success with more digital views of the exhibition than in-person visitors.[27] However, these videos lack interactive features that transform passive virtual experiences into participatory ones, a necessary shift to create lasting educational value.

Thus, midsize museums should reevaluate and gamify their virtual tours as a step towards producing more meaningful digital education content. Museums with more limited staff time and resources can begin by updating their video tours to include links to specific objects on the museums' collections websites as they are referenced throughout the tour. This way, interested viewers can pause their passive experience for a more self-driven look into any given work that captures their attention, returning to the rest of the video if or when they feel satisfied. Working up the gamification ladder, museums can place their collections in the creative control of their audiences with programs akin to Minecraft Your Museum from National Museum Wales.[28] Such online activities allow independent viewer-led exploration of objects in a museum's collection or given exhibition, granting the user control over their own meaning making. This style of online museum education experience plays into the constructivist education approach that many museums strive for in their on-site experiences.[29]

With gamification presenting itself as a powerful method of creating successful, constructivist learning online, medium-sized museums in the post-pandemic era should not limit themselves to only gamifying their virtual tours. Since learning through play promotes positive motivation for learning in both formal and informal settings, museums should strive for more gamified digital learning materials that reach adult, family, and student audiences. [30] Creating these materials meets a real and present demand, as interactive online materials such as games and

quizzes remain highly requested from schoolteachers in 2022. [31] These often asynchronous virtual education materials can also offer museum education teams some respite from facilitated experiences via Zoom or other teleconferencing applications.

Figure 2



Screenshots of the word game Prattle – inspired by the game Wordle – available from the Folger Shakespeare Library.

LARGE MUSEUM RECOMMENDATIONS

As museums push their virtual education resources into the post-pandemic future, large museums can push the envelope towards fostering more inclusive communities through online educational offerings. With greater staff power and financial resources comes great responsibility, and large museums often shoulder this responsibility by serving as role models for the rest of the field. As evidenced by the American Alliance of Museum's recent announcement on including diversity, equity, accessibility, and inclusion (DEAI) standards in the museum accreditation process, museums in the post-pandemic era must reach beyond current DEAI efforts. [32] In terms of accessibility, large museums in particular should demonstrate that digital education initiatives serve communities with specific access needs, expanding upon the digital accessibility standards previously outlined in this paper. Striving for inclusivity that fosters real community proves an even greater challenge for large museums catering to broad audiences but represents a crucial shift in museums becoming more transparent and approachable in our hybrid world.

When considering the future of accessible digital education resources in large museums, the Metropolitan Museum of Art (Met) springs to mind. One of the largest and best-endowed museums in the United States, the Met's long history of serving learners with disabilities now includes dedicated virtual programming for visitors with developmental and learning disabilities, visitors with dementia, and visitors who are blind or partially sighted, respectively. [33] Each of these virtual programs recreates an in-person program that existed prior to the pandemic via teleconferencing technology. While several of these synchronous virtual programs provide interactive elements via activity kits mailed to participants that allow for individualized meaning-making, the level of social interaction is difficult to gauge. [34] On the other hand, the Met's synchronous virtual programming for visitors with dementia seems entirely socially focused, helping build community, yet lacking a physically interactive element for full constructivist learning. As a large museum, the Met should diversify its accessibility programming to fill the respective gaps of relationship building and physical meaning-making for more enriching digital education in the post-pandemic future.

Meanwhile, the Met's asynchronous, digitally accessible learning tools provide a launch point towards greater community building and inclusion. The museum runs a dedicated Facebook page, "Access at The Metropolitan Museum of Art," which serves as a virtual bulletin board announcing accessible museum programming from the Met and fellow museums as well as resources ranging from film screenings to online courses curated for their disabled community. [35] This communal sharing that extends beyond promotion of Met-sponsored events reveals a conscientious effort for inclusion, yet the page remains limited in its current state. Today, many museums and adjacent institutions explicitly use social media channels as tools for education rather than promotional marketing. [36] By operating as a Facebook page as opposed to a Facebook group, the Met serves as a broadcaster rather than a facilitator. Changing this approach could see Facebook used more directly as an educational tool with the equalized educator-to-learner relationship necessary for true constructivist education.

Moving towards a more inclusive model, the Met can look to fellow large museums' endeavors in education-driven, community-focused Facebook groups, such as those run by Colonial Williamsburg. Easily located on the museum's Facebook page, Colonial Williamsburg currently maintains five museum-sponsored Facebook groups, including two private groups created in 2022. [37] Allowing conversation between niche groups within a larger institution creates a more intimate atmosphere for informal digital education, which many large museums often struggle to produce. Creating space for knowledge sharing among affinity groups can happen on a number of platforms, so while Facebook can serve as a launchpad, large museums should look towards working with ethical platforms that support their missions and values. As large museums strive towards inclusion in our increasingly digitally attuned

world, they must continue pushing staff resources towards community-based constructivist learning.

Figure 3

Screenshot of the Groups section of the Colonial Williamsburg Facebook page.

CONCLUSION

For museums of all sizes, successful navigation of post-Covid society requires effective digital education practices that build on recent history and respect visitor expectations of high-quality digital experiences. These practices must extend beyond teleconferencing platforms to form meaningful and inclusive educational interactions that bolster museums' unique positions as trusted public institutions. By adapting current digital offerings and programming through the recommendations supplied here, museums can gradually scale up their digital education resources while avoiding the risks associated with novel experimentation. Staying true to their missions and areas of expertise, museums participating in digital museum education beyond Zoom can expand knowledge sharing and meaning making with new media, new approaches, and new ideas.

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IX

Learning Science through Digital Museum Interactives: A Case Study at the National Museum of Natural History

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Understanding science is vital to living in the modern world. Misinformation about science often spreads online, and the media can over-simplify science topics or perpetuate bias.[1] Museums can strengthen the public's science knowledge through their crucial role in informal science education.[2] Below I analyze several digital interactive exhibit elements and how they engage museum visitors to facilitate learning science. As a leader among science museums, the Smithsonian's (National Museum of Natural History)[https://naturalhistory.si.edu] (NMNH) will serve as a case study to anchor this research.

Informal education includes any educational experiences outside the traditional classroom or schooling environment. In museums, informal education allows learners to pursue diverse learning goals, seek individualized experiences, and generate interest in certain topics.[3] Informal education is closely tied to the concept of free-choice learning, which describes voluntary, learner-directed experiences such as museums.[4] Free-choice, informal learning is inherent in the museum experience, so museums must take these concepts into account when developing exhibits.[5] Visitors can often choose one of several paths through an exhibition space, and they may only engage with a subset of exhibit content.[6] Visitors generally engage with topics they already have a personal interest in, and their pre-existing knowledge and unique experiences influence their interpretation of the content.[7] Interactives, which present content based on visitors' actions, are a common way for museums to prompt visitors to engage with exhibit content.[8]

Interactive exhibits were popularized in 1963 with the Boston Children's Museum's exhibit *What's Inside*.[9] It featured everyday objects cut in half that children could touch. The Exploratorium followed soon after, aiming to give visitors an authentic, free-choice exhibit, with experience quality at the center of the museum's mission.[10] Natural history museums, zoos, and aquaria continue to follow these science centers in developing groundbreaking interactives.[11] Interactive experiences are key in engaging museum visitors, and this increased engagement has been shown to improve learning and enjoyment for visitors.[12] Interactive elements also have the potential to encourage collaboration and conversation between museum visitors.[13] At their best, interactives are also fun. Fun exhibit elements can make challenging topics easier to understand and engage with, especially for children.[14] Fun allows visitors to bond with each other and helps visitors to open their minds to new ideas.[15] Museum visitors often choose to learn for fun, an activity where learners engage in the learning experience because they

value and enjoy the process of learning, rather than because of particular learning goals.[16] Overall, interactives have been shown to improve visitor satisfaction.[17] In this context, developers should consider the full experience when developing an exhibit, not only focusing on learning outcomes.[18]

As digital technology has become a norm in museums, it has also been integrated into the learning experience.[19] Below, I break down my experience with the digital interactives that I observed on a visit to the Smithsonian's National Museum of Natural History (NMNH) in Washington, DC. I visited on Tuesday, October 11, 2022. Given that it was a weekday during the school year, there was relatively low museum traffic, and the exhibits were easy to access and engage with. I will discuss several examples of exhibit interactives and how they illustrate different strategies for visitor engagement.

CASE STUDY

Fossil Hall – The Planet through Deep Time

Touch screens were the most common type of digital interactive that I encountered in the museum. Technology such as this in museum exhibits can allow visitors to access and manipulate what is normally invisible, unattainable, or unreachable.[20] As described below, the touch screens in the Fossil Hall allow visitors to extend the bounds of reality through digital technology.

The Fossil Hall organizes exhibit elements in temporal order and takes the visitors backwards in time as they travel through it. There is also an elevated mezzanine section that runs alongside the exhibit hall, which mostly focuses on climate change. On this mezzanine, though, there were also three interactives on three pairs of touch screens, each pair featuring identical screens for two visitors to use independently. Each interactive provided a deep-dive into a topic related to the Fossil Hall.

One of these, called *The Planet through Deep Time* (Figure 1), focused on geologic time and the movement of tectonic plates around the globe. In the middle of the screen there was a three-dimensional model of the Earth that could be rotated by touching and dragging. Along the bottom of the screen, there was a timeline that could be dragged to show the Earth in a particular geologic period. Some areas of the timeline were marked, and when the timeline reached this point, the visitor could tap a blurb to reveal more information about each geologic period.

https://youtu.be/Lu1OMQpp3Ps

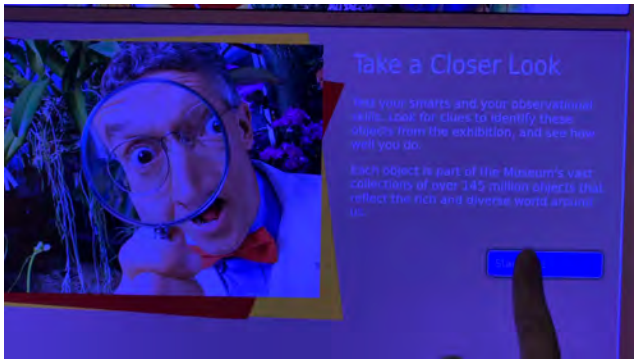
Figure 1: Using *The Planet through Deep Time* in the Fossil Hall.

This interactive contained a lot of information, and I felt like I could have stayed there all day. Allowing visitors to physically manipulate the Earth and time with their hands is a powerful aspect of this experience. Therefore, the touch screen medium is vital to this interactive experience. Many other exhibits simply use touch screens as a medium to engage visitors in another way.

Quizzes

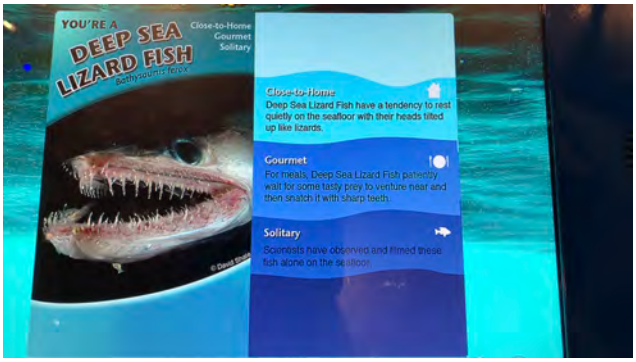
Objects of Wonder – Take a Closer Look

Objects of Wonder is an exhibit that shows highlights from the Smithsonian's collection, often displaying the objects in arrangements that allow them to contrast with each other. The exhibit had a quiz titled *Take a Closer Look* (Figure 2), which was displayed on a touch screen with four stations. It asks visitors ten trivia questions about the exhibit and then scores the visitors' performance. Gamification is a strategy where game design elements are incorporated into learning experiences.[21] Gamified learning can motivate learners, improve social engagement between people in the exhibit, and make learning transferable between many contexts.[22] The Ocean Hall and *Objects of Wonder* exhibits have quiz elements on touch screens that function in a similar way to gamified learning experiences. In addition to providing feedback to visitors, they allow visitors engage to with each other by comparing their quiz results.



https://youtu.be/vuQh2cpsbhA

Figure 2: Taking the quiz, *Take a Closer Look*, in the *Objects of Wonder* exhibit.



https://youtu.be/GZFXgf9XqFc

Figure 3: Taking the *What's Your Ocean Animal* quiz in the Ocean Hall.

The quiz was simple but decently effective. I took the quiz without spending a lot of time in the exhibit, and I got several correct and a few incorrect answers. Some of the questions were simply guesswork, like trying to identify objects from a close-up photo. The quiz then provided more information about the object when the answer was revealed.

Features like this are often geared toward children, but because I got some of the questions wrong as a graduate student, it clearly has the potential to challenge older demographics as well. The station was located at one end of the exhibit space, but many visitors, including myself, entered the exhibit through that end. This made the quiz station relatively easy to miss, and it shows that the position of interactives is an important component of their usability.

While this interactive does use the touch screen medium, the primary purpose of this interactive is to test the visitors' knowledge. Through this quiz, visitors can see how much they have learned from this exhibit, and they can gain a sense of achievement by completing the game.

Ocean Hall – What's Your Ocean Animal?

The quiz featured in the Ocean Hall was not challenging visitors, but rather asked visitors questions to determine *What's Your Ocean Animal?* (Figure 3). The visitor is then matched to one ocean animal that fits the same answers to the questions that the visitor gave. This is conceptually similar to the popular online Buzzfeed quizzes.

While the end screen does provide information about the ocean creature the visitor matches with, the main purpose of this interactive is facilitating personal connections to the exhibit content. This quiz again employs the touch screen as a medium, but the personalization and fun aspects of the experience are much more important than the use of the touch screen.

Genome: Unlocking Life's Code

The correct type of interactive for any given situation may not be the same as any other, and it may not need to be complicated, expensive, or digital.[23] A flexible exhibit with a variety of interactive elements can accommodate the various needs, background knowledge, interest levels, and experiences of the diverse museum audiences.[24] The exhibit where I saw this most effectively illustrated at the NMNH was in the exhibit *Genome: Unlocking Life's Code*.

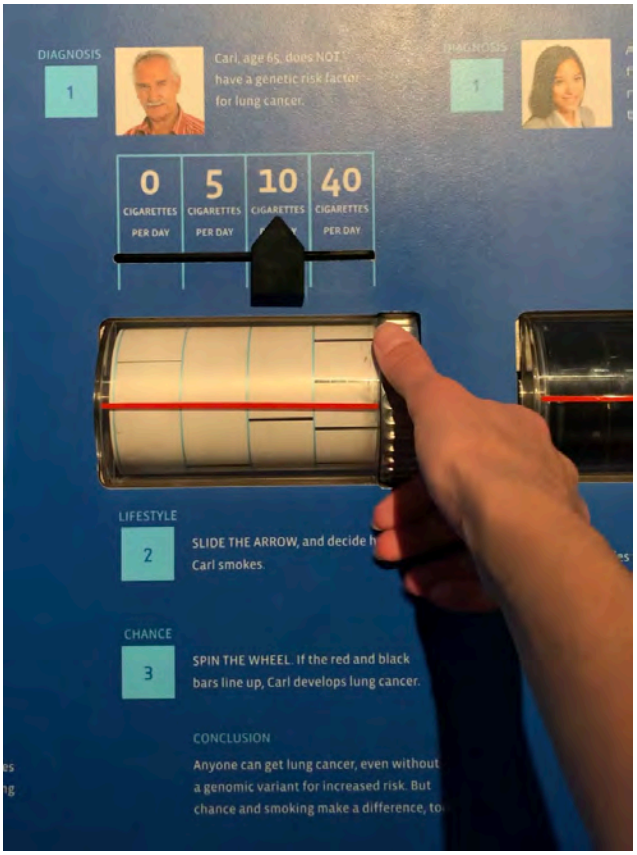
Genome was a temporary exhibit near the end of its lifespan when I visited. The exhibit's interactives greatly outnumbered the few objects on display. The exhibit had a combination of digital and non-digital interactives. Some digital interactives used a projected screen that was controlled with a touchpad. For one of these titled *Explore Your Genes* ((Figure 4)[#fig-kiss-04.png]), visitors selected a model from the home page, then a specific part of the body. The screen then showed information about the genes that control that part of the body.

https://youtu.be/V6QUwKVw0jU

Figure 4: Using the *Explore Your Genes* interactive in the *Genome* exhibit.

This interactive was engaging and provided enough content to explore that I could have lingered there for quite a while. In that sense, it was similar to *The Planet through Deep Time* in the Fossil Hall. My main criticism of this element is that the touchpad required very fine motor control to navigate, and some visitors could have had difficulty controlling it accurately.

The non-digital interactives, like piecing together DNA or spinning a wheel to explore the interaction between genetic characteristics and lifestyle choices (Figure 5), were also very effective and had a game-like quality to them.



https://youtu.be/4SuX_VIayTs

Figure 5: Using the probability wheel interactive in the *Genome* exhibit.

These interactives provide visitors with a wealth of information and interactive methods that can be personalized to their needs and interests.

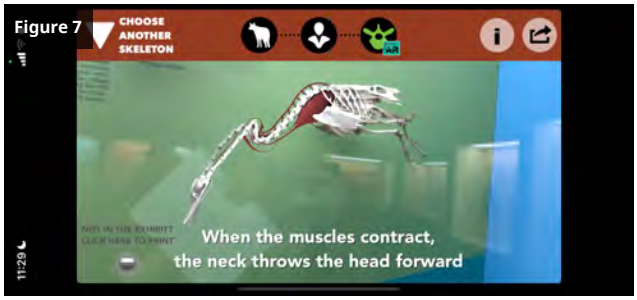
Skin & Bones – Augmented Reality Mobile App

The Bone Hall at NMNH has a corresponding augmented reality (AR) mobile app called *Skin & Bones*. In recent years, AR apps and programs in the museum setting have increasingly been explored as another possibility for engaging visitors. AR exhibit elements have been found to enhance learning, promote flow experiences, and increase the amount of time visitors spend focusing on content.[25] Experiments have explored the feasibility of wearable AR devices, and while they have also improved visitors' focus, wearable AR can also reduce visitor-visitor interactions and cause visitors to be more isolated.[26]

In the Bone Hall, there are several skeletons on display with a green sticker nearby, indicating that they are included in *Skin & Bones*. The app provides additional information on the animals, scientists, and more in video, text, and animation format. Some of the skeletons can be

scanned with the app, which will unlock an AR animation that overlays the skeleton. The design of the AR animations differed between specimens. Some of them displayed an illustration of the living animal superimposed on the skeleton, with no additional information ((Figure 6)[#fig-kiss-06.png]). Some, though, had narration and text, and some also added an animation of the skeleton. My personal favorite was the animation of the anhinga, an aquatic bird (Figure 7). The animation used the real skeleton as a base, with the muscles superimposed on top to show how the muscles and bones interacted when the bird was moving. The animation was simple, understandable, and informative.

AR swordfish on *Skin & Bones* app.



AR anhinga on *Skin & Bones* app.

The main purpose of *Skin & Bones* is to integrate interactivity into existing exhibit elements, rather than having designated interactive stations within the exhibit. While the cell phone is a touch screen, this is not a significant part of this interactive experience.

Human Origins – Becoming Part of the Exhibit

In the Hall of Human Origins, the NMNH provides unique digital interactive experiences that allow visitors to incorporate themselves into the exhibit content. Embodied exhibit elements, or physical experiences that allow people to engage with the exhibit using their whole bodies and their physical movements, have been shown to improve information recall for visitors.[27] This is similar to the concept of tangible interactions, which occur when people interact with digital technology using their bodies and physical objects, not just screens.[28] These tangible interactions allow museums to improve cultural literacy, learning, and play in the exhibit setting.[29]

The *Morph Station* in the Hall of Human Origins is an interactive in which visitors take a photo of their face in a photo booth, then choose a species of ancient human to "morph" into (Figure 8). The screen superimposes the eyes and mouth from the photo onto a model of the ancient human. The exhibit also gives visitors the option to send themselves the morphed photo, to keep a memory of the visit to the museum.

https://youtu.be/rWefKqahxYI

Figure 8: Using the *Morph Station* interactive in the Hall of Human Origins.

Much like the Ocean Hall Quiz, this has relatively low educational value and mainly serves as a fun activity that can improve visitor enjoyment and social engagement between visitors. Despite the slow day at the museum when I visited, there were several people using the *Morph Station*, often comparing results. This interactive also personalizes the exhibit experience by incorporating the visitors' faces. By physically embodying an ancient hominid, visitors can connect more intimately to the content and develop empathy for these people.

The Hall of Human Origins also has some digital Q&A stations that challenge visitors' thoughts. These have been discussed in a previous edition of *Museum Digital Practice*.

CRITICISMS OF INTERACTIVES IN MUSEUMS

Several criticisms of interactives in museums have appeared over the years since they became popular in the 1960s. I will address some of them here.

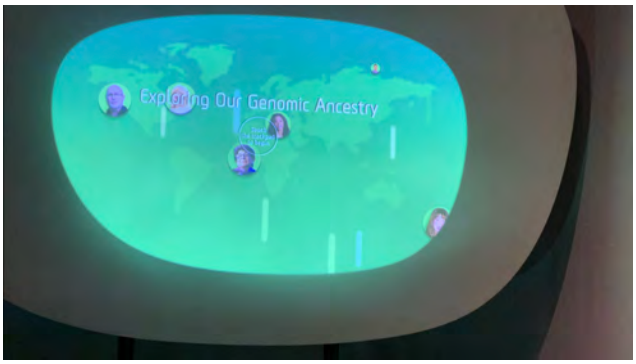
Educational Value

A common criticism is the perception that museum interactives can "dumb down" the learning experience.[30] Additionally, many believe that gamified learning experiences will be enjoyed by learners, especially children, by focusing on the game without absorbing the content.[31] While this does happen sometimes with technology, it is possible that through improved exhibit design, the interactives can be optimized for the best possible level of engagement.

These criticisms likely stem from the perception in American culture that learning and play are opposites, although museums and science centers have shown this to not be true in all cases.[32] In fact, in the context of learning science, fun has been shown to help the public to see science and scientists in a more approachable way.[33]

Cost

Another common concern about museum interactives, especially digital interactives, is that they can break easily and are expensive to develop and implement.[34] For example, some digital interactives in the *Genome* exhibit had stopped working, often not progressing past the "Touch to Begin" screen (Figure 9).



https://youtu.be/QVD6TOHZ9s0

Figure 9: A non-functional interactive in the *Genome* exhibit.

One solution to this issue is to be more mindful of the types of interactives used, since they do not need to be costly or digital to be effective, as mentioned previously in the discussion of *Genome* at NMNH.[35] Another solution is to consider durability and repairs during the development stage by understanding users and the possible ways those users may handle the interactives.[36] This seems to be the case with the *Planet through Deep Time* touch screen in the Fossil Hall, which had somewhat low touch sensitivity. The screen was likely made to be more robust to prevent damage. Despite the risks, many museums ultimately decide that the enrichment of the exhibit experience makes these investments worth it.

Digital-Specific Criticisms

There is a learning curve with any new technology, and some argue that museum visitors, especially older visitors, may be confused by the interface and therefore not be able to use digital interactives.[37] It is important with any interactive, including digital interactives, to include graphics to illustrate instructions.[38] However, these critics may not be trusting visitors' abilities enough. Digital technology has been progressively integrated into society for the past several years, and people successfully adapt to new technology all the time.

In recent years, there have been increasing concerns about screen time, with places like museums considered by many to be a reprieve from the screen.[39] Screens in museum exhibits may therefore seem unnecessary and off-putting to those looking to unplug. Experimental wearable augmented reality devices have been shown to reduce interpersonal interactions between visitors, and I argue that this can apply to any elements that require using and focusing on personal devices.[40] When using the *Skin & Bones* app, which recommends headphones for the narration, I was detached from the rest of the exhibit. While this meant I was more engaged with the content, I would have been unlikely to have conversations with other visitors if I had visited with a group.

CONCLUSION

As important sources of science education for the public, science museums have a duty to determine the best way to facilitate learning good-quality information. Many museums have chosen to include interactive exhibit elements to enhance the visitor experience, which has been shown to improve informal learning, especially for children. While not all interactives are digital, digital technology has become a more common tool in

developing interactives. In my survey of digital interactives through literature review and a case study exploring the Smithsonian's National Museum of Natural History, I have determined some common elements of digital interactive exhibits: touch screens, gamified experiences, diverse interactive experiences, and embodied experiences.

Each of these interactive experiences serve unique purposes, and the ways in which visitors engage with these interactives should be considered when choosing interactive elements during exhibit development. For example, while touch screens were used for almost every interactive in NMNH, they are best suited for empowering visitors to manipulate data and objects they otherwise could not. Gamified experiences help visitors to connect with each other, while personalization through embodiment helps visitors connect with exhibit content. These outcomes – empowerment and connection – can make science knowledge much more attainable for museum visitors.

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X

Closing the Accessibility Gap: A Look at the Smithsonian Institution's Use of Digital Technologies for Physically Impaired Visitors

Megan Williams, The George Washington University

Digital technology continues to change year after year, with new technological innovations being continuously developed, re-imagined and applied to the museum field. With these changes comes the opportunity to implement digital technology to museum exhibitions, not only to make them more engaging, but to improve involvement with individuals who have hearing, mobility, or vision issues. For the purpose of this paper, digital technologies are defined as "electronic tools, systems, devices and resources that generate, store or process data."[1] Since the 1970s, museum professionals have been actively working on the betterment of engaging museum visitors who have disabilities.[2] This movement forward is made evident by the American Alliance of Museums' Diversity, Equity, Access and Inclusion webpage.[3] This organization provides articles and resources that can be utilized by museums to aid their efforts in accessibility. Additionally, in their 2022-2025 strategic plan where they outline a projected framework to continue the furthering of diversity, equity, accessibility, and inclusion in the museum field.[4]

Following a similar route, the Smithsonian Institution has their own website dedicated to accessibility for museum professionals to use.[5] This paper will focus on the Smithsonian Institution's implementation of digital technologies to aid those with physical accessibility needs within in-gallery exhibitions. To be specific, the physical disabilities I will be covering here include visual, auditory and mobility issues. As a summation, I will discuss the challenges that come with adding digital technologies to museum exhibitions. These topics are of the utmost importance in the museum field, as we continue to work towards a more accessible and inclusive world for all.

Before continuing further, I wanted to add a short note regarding my position in this paper. Although I have no physical disabilities of my own, for the last ten years or so, a close family member has been living with severe mental and physical disabilities. Witnessing his experiences in museums and other institutions has shaped the way I approach this work. Professionals discuss the ideas of diversity, equity, and inclusion, but I feel it wasn't until recently that accessibility was added to those ideas. While my paper is strictly on people with physical disabilities, I have seen an increase in accessibility for those with mental disabilities as well. It is there that my interest started with accessibility, especially within the museum profession. For my brother, and for many other individuals around the

world, I want to create more inclusive access to museum spaces because people who are different have always been shuttered away from intellectual spaces. It's time we open these spaces up for all and continue working towards more diverse settings everywhere.

HISTORY OF ADA COMPLIANCE IN MUSEUM SPACES

In the summer of 1990, the first version of the Americans with Disabilities Act (ADA) was enacted by then President George H.W. Bush. The legislation of the ADA outlaws the discrimination of people with disabilities and affirms that they will "have the same opportunities as everyone else to participate in the mainstream of American life – to enjoy employment opportunities, to purchase goods and services, and to participate in State and local government programs and services"[6]. The United States Congress revised the Americans with Disabilities Act in 2008. Titles II and III were revised by the Department of Justice (DOJ) with regulations titled the 2010 ADA Standards for Accessible Design. These titles regard accessibility in public services and accommodations, as well as private services.[7] Museums are covered under both of these titles depending on whether they are operated privately or publicly.[8] As a federal institution, the Smithsonian Institution operates under Title II of the Americans with Disabilities Act.

VISUAL ACCESSIBILITY TECHNOLOGIES WITHIN THE SMITHSONIAN INSTITUTION

Visual accessibility in museums focuses on the needs of expanding interaction to those who are blind or have low vision so that they feel more engaged and prioritized in the cultural space. In early 2019, the Smithsonian Institution began partnering with the visual interpreting service Aira Access to provide a free verbal description resource to each of their museums in Washington D.C. via the Aira app. The app can be downloaded to any museum visitor's cellular device and the application will connect the visitor to trained real-time agents through the free Smithsonian Wi-Fi.[9] This service allows visitors who are blind or have low vision to be independent and explore the museum at their own pace, as the Aira agent objectively describes the surroundings. By doing this, the agents act as the visitor's eyes, while the visitor can create their own commentary of the objects and environment around them.[10]

In the National Museum of American History, raised wayfinding lines on the floor throughout varying galleries indicate the presence of QR codes that can be scanned by patrons. These codes bring the visitor to a Smithsonian website that is compatible with screen readers for visually impaired visitors to use to hear the information through their phone's speaker or headphones. The information available through these QR codes include photos from exhibit cases, as well as similar text to those displayed on the walls of the exhibition. Additionally, the website provides instructions on how to navigate to more QR codes, as well as detailed descriptions of touchable objects scattered around the exhibit.

Also located in the National Museum of American History, is the Molina Family Latino Gallery. The Molina Family Latino Gallery is a prime example of a new exhibit space being designed for accessibility rather than around accessibility. The Smithsonian worked with Janice Majewski from the Institute for Human Centered Design to curate the gallery space for museumgoers with disabilities to "feel welcome rather than tolerated."[11] This is an important step forward in the world of accessibility and inclusion, especially since approximately 1 in 6 of the Latino community has a disability.[12]

The QR codes mentioned earlier are also featured in this exhibit, with thirteen of them spread around the new space for visitors to scan. The gallery also features many digital screens that include keypads with braille on them for ease of use by those who are blind or have low vision.

Figure 1

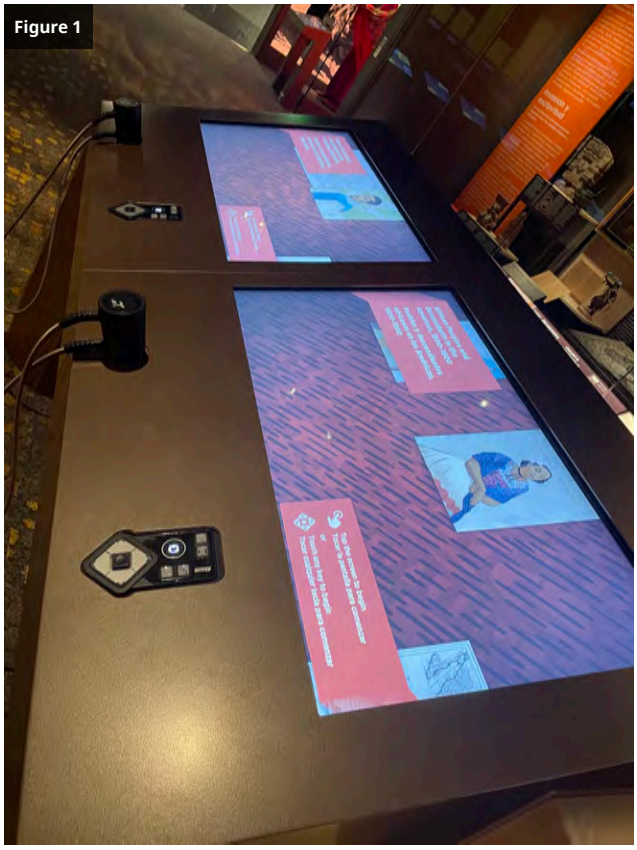

Figure 1. Photo of an interactive digital screen with keypad at the Molina Family Latino Gallery in the National Museum of American History. (Photograph by Megan Williams, November 5, 2022, National Museum of American History).

Figure 2

Figure 2. Photo of an interactive digital screen's accessibility mode keypad instructions in the Molina Family Latino Gallery. (Photograph by Megan Williams, November 5, 2022, National Museum of American History).

These digital screens and the keypads were designed as a way to permit each visitor with engaging with the exhibit. The Smithsonian worked alongside cultural accessibility consultant, Nefertiti Matos who is blind, to design the accessibility of the screens and its keypads functions.[13] The keypads have plugs for wired headphones that visitors can either bring themselves or ask staff for. By doing this, visitors with low vision or who are blind, can navigate through the gallery space and listen to the artifact and display descriptions orally. As an addition to this exhibition space, the olfactory senses are a focus for all as well with three displays diffusing the air with different scents with the press of a button.

Moving across the National Mall to the the National Museum of Asian Art, there is an interactive exhibit also created with visually impaired museum visitors in mind. Funded by the Smithsonian Accessibility Innovation Fund the Interactive Cosmic Buddha is located in a secluded hallway of the museum where the exhibit's video narrator can be properly heard.[14] Visitors can take a seat or stand next to a three-dimensional replica of a sixth-century Chinese Buddha and the narrator will voice instructions on how to interact.

Figure 3

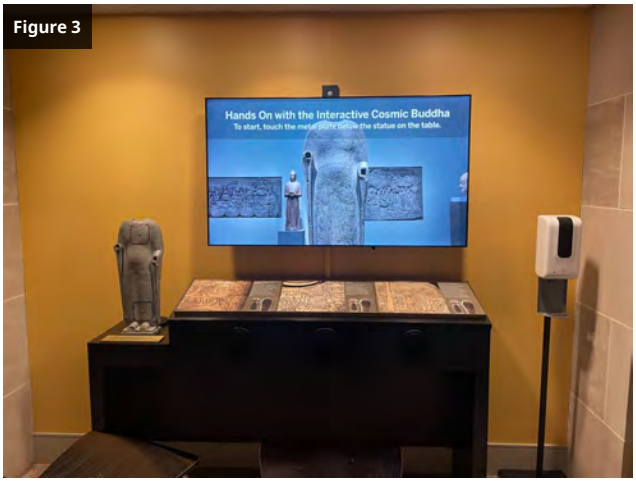

Figure 3. Photo of the Interactive Cosmic Buddha exhibit in the National Museum of Asian Art. (Photograph by Megan Williams, November 5, 2022, National Museum of Asian Art).

It is notable that the narrator uses directional terms for those who are blind or have low vision, so that they can participate in the interactive exhibit as well. Particularly, the three metal plates' locations are described for visitors who may have difficulty finding them. When touched, these plates trigger a narration of information about that specific part of the Buddha statue. Additionally, there is a bronze plate with braille at the base of the replica which the visitor is instructed to touch by the exhibit narrator so that the rest of the interaction begins. The exhibit also features three stone tablets with raised tactile illustrations depicting the three areas that have the metal plates. This is

useful for visitors, especially those with little to no vision, to get a sense of the description as the narrator describes the Chinese Buddha.

AUDITORY ACCESSIBILITY TECHNOLOGIES WITHIN THE SMITHSONIAN INSTITUTION

The Smithsonian Institution museums provide induction loop assistive listening systems through receivers for visitors to use. Induction loop assistive listening devices are used in tandem with hearing aids through a wireless, magnetic signal when the aids are set to the telecoil setting. For an induction loop assistive listening system to work there must be three components. The first is a microphone to pick up the sound or word, then an amplifier registers the signal which is sent through a loop cable that is built around a specific area.[15] For example, in the National Museum of American History's Molina Family Latino Gallery, induction loops are installed around the exhibition for patrons who are deaf or hard of hearing. Labels are shown on varying sections of the gallery to illustrate where induction loops are installed for use.

Figure 4

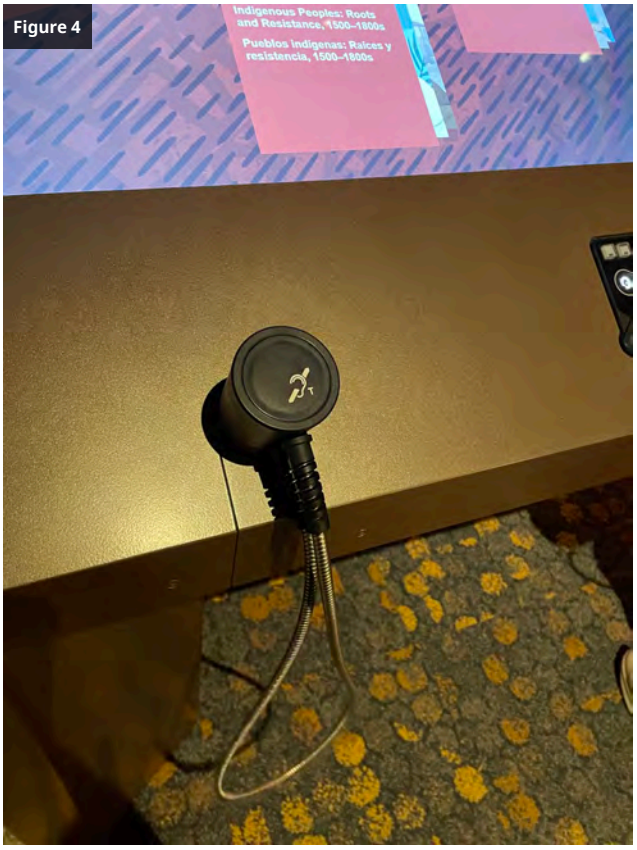

Figure 4. Photo of an induction loop symbol on an interactive exhibit of the Molina Family Latino Gallery in the National Museum of American History. (Photograph by Alyssa Barilotti, October 26, 2022, National Museum of American History).

Each of the Smithsonian Institution museums also provide assistive listening devices to those who benefit from them for certain exhibitions. Assistive listening devices use "direct sound amplification or visual or vibrotactile alerts" that help museumgoers who are deaf or have hearing loss communicate in a more effective manner.[16] These devices are typically small hand-held amplifiers that will enhance sounds around a person and into their ear through a hearing loop. Assistive listening devices can be used in conjunction with telecoils, hearing aids without telecoils, or without any hearing aids.[17]

In addition to assistive listening technologies, the Smithsonian Institution exhibits include open captioning with each of their video presentations. Open captions are labeled as such when they are "permanently embedded in the audiovisual material."[18] Open captions are incredibly helpful for museum visitors who are hard of hearing because it can help them gain the information if there is a large crowd or if the museum exhibition contains loud or multitudes of noises. In the Molina Family Latino Gallery, the captions, on the exhibits and the digital screens, are

available in both the English and Spanish language to include visitors who are fluent in either language. Captioning is incredibly helpful for people who are deaf or have hearing loss, but captions can also help hearing individuals as well. Museums often have events, field trips for children, or other noisy events that can limit one's ability to hear, so open captioning can help with these situations. Open captioning is popular among many communities, so much so that users on social media, such as Twitter, are advocating for movie theatres and movie companies to begin implanting open captions in their films.[19]

MOBILITY ACCESSIBILITY TECHNOLOGIES WITHIN THE SMITHSONIAN INSTITUTION

As previously mentioned, the Molina Family Latino Gallery does a fantastic job of accessible exhibition design. This stands true for museum visitors who have physical impairments such as mobility issues. Particularly, the Molina Gallery includes large vertical interactive screens that are able to be interacted with by patrons who have vision or hearing issues, but also those who may be in a wheelchair. These screens are enabled to have the presenter on screen be lowered or raised to any height so that they are on eye-level with the individual in front of the screen. This feature is a great start to digital technology being regularly incorporated into exhibits to extend interaction for museum visitors with mobility issues.

Figure 5

Figure 5. Photo of an interactive screen depicting a user moving the height of the digital presenter in the Molina Family Latino Gallery. (Photo by Megan Williams, November 5, 2022, National Museum of American History).

Prior to the opening of the Molina Family Latino Gallery, the Smithsonian Institution created a virtual reality (VR) component to the Renwick Gallery's *No Spectators: The Art of Burning Man* exhibit. This VR experience was a collaborative venture between the Smithsonian Institution, Intel, and Linden Lab, using the Linden Lab's VR platform, Sansar.[20] While the *Burning Man* exhibit itself is no longer available in person, the VR experience is still available online for people to continue to use for years to come. The team of contributors also wanted to create this experience so that individuals who were unable to visit the physical location could enjoy it.[21] This avenue of digital technology is crucial to explore for many reasons, an important one being the opportunity for mobility impaired museum visitors to comfortably enjoy exhibits either from their home or in an area of the gallery for a more interactive feel with mobile VR headsets.

Digital technologies, such as VR headsets, have the potential to help the mental health of mobility impaired individuals. For example, studies into virtual reality have shown that patients experience less pain and anxiety after surgery when exposed to calm scenes via virtual reality.[22]

Many individuals who have less mobility and utilize wheelchairs could use VR and VR headsets to engage in moments of respite through VR tours through museums. It is vital for the Smithsonian Institution, and all museums, to strive for more virtual reality additions in their museums because it is a key method into accessibility for mobility impaired persons.

In the same regard, virtual tours can be incredibly useful for individuals who use wheelchairs. Many Smithsonian museums offer virtual tours on their own museum websites. The National Museum of Natural History has an extensive virtual tour website for both current and past exhibitions. Designed for both the computer and mobile phones, these tours are equipped to be used by visitors physically inside the museum and for exploring at home. Virtual tours like this can be utilized by museumgoers in wheelchairs for exhibits that were not made with disabilities in mind. Particularly, people can use these self-guided virtual tours on their phones when exploring museum exhibits that have artifacts and descriptions at varying levels and locations that cannot be properly read by visitors who use wheelchairs. Additionally, virtual tours have an opportunity to enrich the museum visit experience by providing more information and links to other websites where visitors can learn more about what they are viewing.[23] This is an important quality of adding digital technology to museums because it serves the museum's purpose and provides accessibility for all to learn from the institution.

CHALLENGES WITH MUSEUM DIGITAL TECHNOLOGY IMPLEMENTATION

While I believe it is of extreme importance to prioritize digital technology implementation into as many museums as possible for accessibility needs, I understand that there are many challenges that need to be considered. It is estimated that there are approximately 35,000 museums in the United States and a majority of them are historical societies and general museums.[24] As the largest museum complex in the world, the Smithsonian Institution is well-equipped to fund digital technology implementation in their exhibits through grants and donor funding. Unfortunately, many of these historical and general museums across the United States do not have the reputation and resources that the Smithsonian Institution does, so it is more difficult for them to include digital technologies into their budgets. In addition to this, financial recessions and global health pandemics can create loss of what little revenue streams these smaller institutions have.[25] During these times, museum professionals have to work diligently to create fundraising efforts for their museums.

In addition to financial struggles surrounding the implementation of digital technology into museums, there are also issues of museums staying up to date with the new technological trend. How many times have visitors interacted with digital technology at a museum just for it to be outdated and broken? It is essential for museums to keep their technological efforts maintained. This can typically be mediated by hiring an individual or team of museum technology trained professionals for digital outreach, website design and content, as well as digital efforts within the physical museum. This is connected still to the issue of financial stability because these museum technology professionals are usually doing "invisible work," which is subject to cutbacks and layoffs when financial crises emerge.[26]

CONCLUSION

Digital technology is a part of everyone's day-to-day life and for those with accessibility needs, digital technology is a lifeline for communication and obtainment of information. As museums continue to work towards more diversity, equity, and inclusion in their spaces, it is crucial for institutions to include accessibility in those practices. By implementing digital technologies into accessible exhibit design, museums aren't only welcoming individuals with disabilities to interact, but every museum visitor to interact personally with the exhibits. To the best of their ability, museums around the country, and the world, can use the Smithsonian Institution as a guide to work towards implementing digital technology for the physically impaired museum visitors in their community. Technology will undoubtedly continue to improve, and museums will grow alongside it to continue serving their communities.

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XI

Web Accessibility for Individuals with Disabilities in Digital Collections: A Case Study of the Smithsonian National Museum of American History

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With the changes in society and available tools over the last decades, digital technologies have become one of the main gateways for museums "to provide access to content and collections" for their visitors and communities.[1] Societal expectations and the growing abilities of digital tools have played a role in the changing relationship of museums and technology during this time, such as the services they provide to the public. This has produced a range of new resources, digital collections of some or all of the objects within a museum's collection being one of them. Though such resources have provided access to a large number of people, especially during the COVID-19 lockdowns, research has shown that museums have found difficulty in improving their website's "discoverability [and] visibility,"[2] all of which can be improved with the inclusion of web accessibility, as discussed later in this paper. Through the use of digital technology, museum information and objects can theoretically be available to everyone,[3] but limitations in the layout and code of a website can lead to an inability of numerous groups to access museum resources.

One group negatively affected by these limitations are individuals with disabilities, such as people with auditory, cognitive, neurological, physical, speech, and visual disabilities.[4] In ways that non-disabled individuals may not realize, the structure and code of a webpage can have an enormous impact on the ability of this group to receive an equal quality of information and experience. Though the Web theoretically provides unprecedented access to information and interactions for individuals with disabilities, the reality is that many webpages have barriers that limit their access and ability to experience the offered resources.[5]

WHAT IS WEB ACCESSIBILITY, AND WHY DOES IT MATTER?

Web accessibility for individuals with disabilities "means that websites, tools, and technologies are designed and developed so that people with disabilities can use them. More specifically, people can: perceive, understand, navigate, and interact with the Web [and] contribute to the Web."[6] It means, in the most basic sense, that individuals with disabilities can use the Web.[7] As a point of reference, web accessibility is described by some as a subset

underneath Universal Design, a framework that promotes a focus on all users at every point–a "Human-Centered design."[8] Web accessibility, specifically, is a quality attribute given to different webpages on the Web that allow for equitable access no matter an individual's physical abilities and context at the time of interaction.[9] When it comes to modern technologies and digital tools, this especially means that websites must be formatted to allow for different types of assistive technologies to express an equitable experience, which has much to do with its code.[10] Assistive technologies include software such as screen readers that read the webpage's text or alt text aloud, screen magnifiers that allow for a webpage to be zoomed into to enlarge the text or content, and voice dictation software that allows users to have their verbal words written as text.

Because of the importance of the format of the code of a website, there are automated evaluation tools that can be used to help assess the accessibility of a webpage,[11] however, they require the addition of knowledgeable human evaluation.[12] This is because, for example, a tool may be able to judge that the code of a webpage works; however, it cannot determine if what is being said makes sense and produces an equitable experience. In light of this, the Web Accessibility Initiative (WAI), an organization that works with stakeholders such as "industry, disability organizations, government, accessibility research organizations, and more,"[13] created the Web Content Accessibility Guidelines (WCAG). WCAG 2.1,[14] published in 2018, is the most recent update.[15] These guidelines were created to fulfill the mission of this group, organized by the World Wide Web Consortium (W3C)–an international community made of "Member organizations, a full-time staff, and the public"[16]–to work to increase the accessibility of the Web for individuals with disabilities.[17]

Web accessibility is important to museums for several reasons. At the most obvious level, it allows individuals with disabilities to use museum resources to learn from the institutions and participate from home, something the COVID-19 pandemic demonstrated works.[18] This is additionally important as, even with the opening up of museums, some individuals may not be able or comfortable visiting the physical museum space, meaning the technological resources must be accessible if a museum wants to create inclusive experiences for all of their visitors.[19] With the Digital Age in museums having been underway for many years, this is an important step to continue to create equitable serve for all visitors.[20]

Web accessibility also improves experiences for those without disabilities, such as individuals who are elderly, have low literacy or fluency in the language, or do not have new technology or fast connection to the Internet, though only accessibility for individuals with disabilities will be focused on in this paper.[21] The elderly will progressively grow to a larger portion of the population, due to differing generational sizes, becoming a greater percentage of visitors to consider. They will also continue to grow in significance when considering digital technologies as current generations, who grew up with the Web, experience limitations inherent to aging and yet still desire to equitably interact with the Web.[22] In addition, the increase of web accessibility of webpages improves their search engine optimization (SEO), which, at its most basic level, increases a links chance of appearing on a search engine and so being viewed.[23] The use of digital resources has also been shown not to decrease physical visitors, but to better prepare them. This means that a greater likelihood of visitors viewing the digital site will increase their chance of visiting and having a good experience at the museum.[24] These are only a few of the benefits seen by adoption of web accessibility in digital technology.

PRACTICAL WAYS TO INCREASE WEB ACCESSIBILITY IN DIGITAL COLLECTIONS

As explained by the WAI in the Web Content Accessibility Guidelines (WCAG) 2.1, there are four main principles that can be used to judge the web accessibility of a site. These principles are perceivability, operability, understandability, and robustness. If any of these four principles are not achieved, then users with disabilities will not be able to have an equitable experience on a webpage.[25] Underneath each of these principles on the guideline is an extensive list of important practical ways to create or maintain these principles on the Web. However, for a museum to begin to move towards a more web accessible digital collection, one may look at Sina Bahram's article that lists ten basic practical methods to begin to make a museum website more accessible based on the WCAG 2.1.[26] Though this is by no means the maximum to strive to achieve, as Bahram's states, these are important initial steps, and so may be used as baseline criteria for web accessibility in digital collections. These ten practices, all of which are also included in the WCAG 2.1, are as follows:

1. Write alt text for images
2. Use heading levels on text
3. Caption, transcribe, and describe videos

4. Watch for color and contrast
5. Label controls well
6. Make your site zoom-friendly
7. Make controls accessible without a mouse
8. Label and style links clearly
9. Specify the page language in the code
10. Validate your code.[27]

To begin to understand practical ways for museums to implement web accessibility, these recommendations will be applied to the digital collection of the Smithsonian National Museum of American History (NMAH), made up of artifacts and archival material about the history of the United States.[28] Due to the content of the collection and usage of only publicly accessible knowledge, the third and tenth criteria will not be discussed. However, all of these recommendations are important to be aware of when considering web accessibility and the content on a digital collection or other online resource as the relevance of each of these may change with different content.

A Case Study: The Smithsonian National Museum of American History (NMAH)

Before beginning this critique of the NMAH's digital collection, I would like to preface that, as stated on their website, this collection is a work in progress.[29] I recognize that they are in the process of digitizing an extensive collection but achieving web accessibility can be done at any stage of the process, including from the start, making a critique appropriate. In consideration of this fact, however, the objects that I used to review the digital collection all appear to have had more extensive work done, such as having a description and image(s). These webpages will hopefully represent the NMAH's current goals and format for creating and updating object webpages. The six objects selected are as follows:

1. Country Store Shop Sign
2. Feedsack Dress
3. Battle between the Monitor and Merrimac
4. 1837 Swasey's Patent Model of a Cloth Napping Machine
5. Medal, "I Take Responsibility", 1834
6. Caster

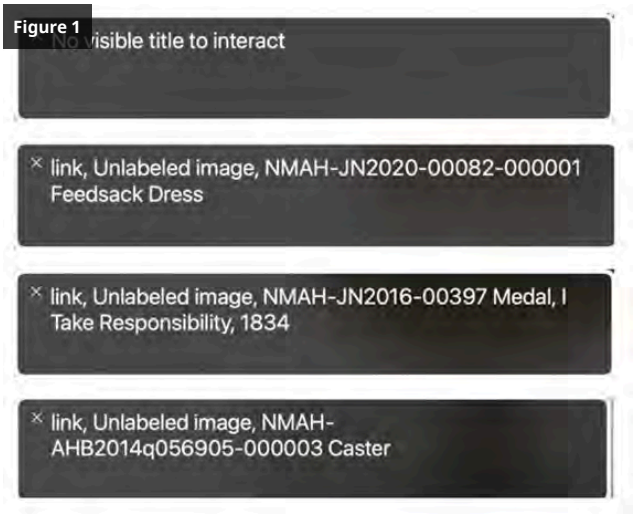
To analyze these pages, I used VoiceOver Utility[30] as well as the HTML source code of a webpage that can be accessed with no additional privileges. In addition, as an individual without a physical disability, my use of these tools included the audio and visual inputs I perceived. This was my first experience actively using screen readers; however, my hope is that this will partially assist in my critique as access should be created with new users in mind to increase web accessibility. Lastly, I had access to high-speed internet and up to date software while conducting this critique, limiting my ability to judge the influence of these factors on both the website and the tools used by individuals. All of these aspects of my experience should be considered, and, especially due to this, my critique should be used as a starting point, not in place of actively including individuals with disabilities when accessing your own digital collection.

1. Write alt text for images

Alt Text, short for alternative text, is a short description attached to visual content on the Web. This is often found on images or videos and is intended to provide descriptions of the visual content being displayed. This is especially important as screen readers will often be unable to provide this information or effective descriptions without the inclusion of alt text.

When selecting each of the images in all of the object webpages, there appears to be no alt text. When an object was selected, VoiceOver either stated that there is "[n]o visible title" or read the file name, shown in *Figure 1*.[31] Of all the objects looked at, there were only three that had a file name, but no additional information was provided. Additionally, the file name is not descriptive, containing only "NMAH," a list of numbers and letters that, to the public, has no meaning, and the object name. After reading the file name, VoiceOver then states that there is no title provided in the same way as the other objects viewed. Consequently, though the file name may provide information on the source of the image and the name of the object in it, it provides no information specific to the visual content of the image.

Figure 1



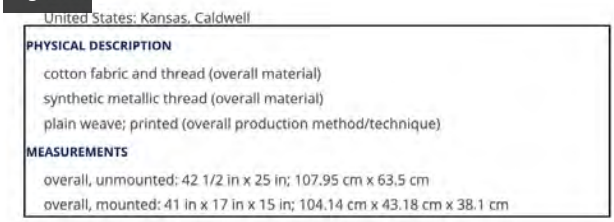
VoiceOver Utility Description of Images on NMAH's Digital Collection

2. Use heading levels on text

Especially in relation to screen readers, using correct formatting in a website's HTML code is crucial. Screen readers will identify if different levels of headings are used, which then provides context to visitors on how the text is split. Without this, crucial understanding of headers, lists, and separation is lost that can fundamentally change what is being expressed. It is especially important that this is done in the code, not just sizing or coloring of font, as screen readers may not be able to detect such changes if they are not identified in the code.

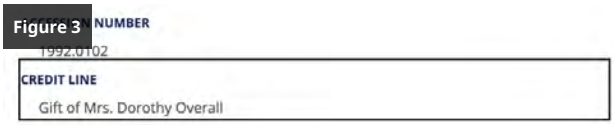
The webpages, specifically their code, does not set up conducive headings for screen reader technology. Though the name of the object at the start of the page is differentiated as a header, the different descriptive groups, such as "DESCRIPTION" and "OBJECT NAME," are not identified as sub-headers. In addition, each grouping of information is not consistently separated, as seen in *Figure 2* and *Figure 3*.[32] Though the "CREDIT LINE" was split into two separate lines, the "PHYSICAL DESCRIPTION" and "MEASUREMENTS" information were identified as a singular list, meaning no verbal information was provided to explain that these two are separate lists under these two sub-headers. This can be shown by the fact that the black box, created by VoiceOver to indicate what text is grouped together, covers multiple lists. In addition, the description in *Figure 2* stated that there were seven lines, but that *Figure 3* had two lines. In essence, no information is provided that explains that "PHYSICAL DESCRIPTION," "MEASUREMENTS," and "CREDIT LINE" are sub-headings with lists under them. This limitation could be solved through modification of the HTML code of the website. By specifying in the code that aspects such as "DESCRIPTION" are sub-headings, the screen reader would be able to differentiate the text into groups, which would be verbally specified.

Figure 2



VoiceOver Utility Indicator of Text Division 1

Figure 3



VoiceOver Utility Indicator of Text Division 2

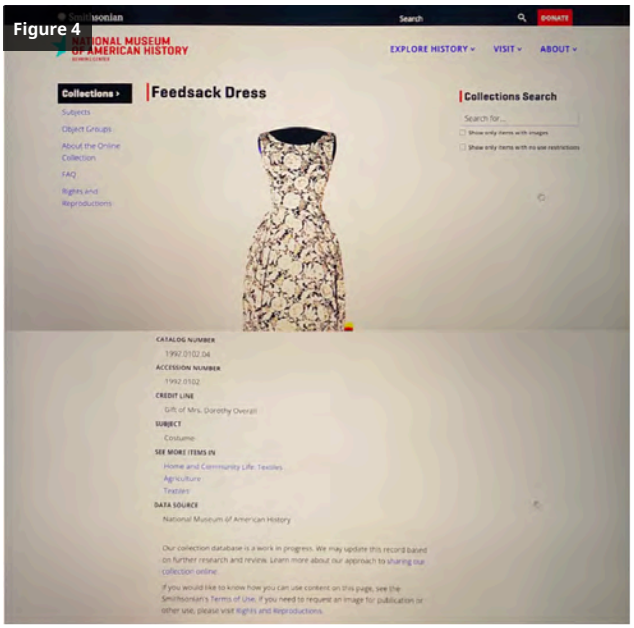
4. Watch for color and contrast

When it comes to the color and contrast of a webpage, it is firstly important to recognize that nothing should be conveyed by color alone as some individuals are not able to perceive color. Any use of color change must be joined by an indicator of that information that is not based on color.[33] However, when considering color choices, the contrast of these colors should be considered as well. At a minimum, the WCAG 2.1 states that all texts should have a contrast ratio of 4.5:1 while large text should have 3:1.[34] There are some tools that may be used to judge the contrast of a webpage, however, for this analysis, manual changing of contrast on a laptop was used.

Overall, the NMAH's website is fairly effective in the color contrast. Certain aspects were lost, however, the main functions of the digital collection aspect of the website was conveyed. As shown in *Figure 4*,[35] certain outlines that are marked by color cannot be noted in high contrast. However, these color outlines are not fundamental to understanding as the structure of the webpage and text still conveys groupings. In addition, though the color change of the headings is not distinctly shown, they are also differentiated by use of only capitalization. There is an issue with the usage of hyperlinked text due to the fact that its nature is only identified by color and no other

markers, but this will be discussed in **8. Label and style links clearly**.

Figure 4



NMAH's Digital Collection Webpage Images with High Contrast

5. Label controls well

When it comes to controls on the webpage, labeling each in the code is crucial for individuals using technology like screen readers. Labeling of these buttons will change how the screen reader verbally describes them which, especially if individuals cannot see the context of the button on the screen, is pivotal for understanding what it is used for.

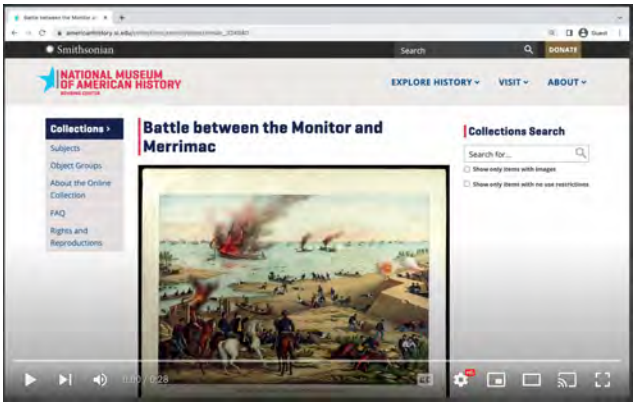
Consistent over each of the objects, the NMAH was effective in achieving this criterion. Each of the controls that I noted had descriptors attached to them specifying their usage. For example, if multiple images were attached for an object, the options to move to the previous or next image, which were marked with ">" and "<," were identified, respectively, as "PREVIOUS" and "NEXT" by the screen reader. The "+" and "-" buttons that allowed a visitor to zoom into and out of an image were identified as "Zoom in" and "Zoom out," respectively, and the option to return to the view of the image without zooming, marked by a button that looked like a house, was identified as "Go home." Though the last of these may be somewhat confusing, I would argue that this relates more to the overall experience then specific to the screen reader as I was confused by the function of the button before using this tool. The other options on the image page were also reviewed, and all appeared effective.

The only critique that could be provided is on the two separate search bars on the webpages. One found at the top of the page on the header for the website and the other found within the page specific to searching the digital collection, these were identified as "Search edit text" and "Search for... menu pop up."[36] Additionally, the button to submit a search on the header, appearing to be a magnifying glass, was identified as "Go!" Though this is relatively okay as one may be able to assume the purpose of each of these, the descriptions, especially in the header, could be clarified to indicate more directly the purposes.

6. Make your site zoom-friendly

As a general recommendation, it is suggested that all webpages should be able to achieve at least 200% magnification without effecting the ability of viewers to understand the content. A webpage must be formatted to consider this so that magnification to this percentage does not cut off portions of the content or shift it in confusing orders.

The NMAH's webpages are very effective in fulfilling this criterion. Each page allows for at least 200% magnification by changing the format of the page to still include all of the content. For example, as shown in *Video 1*,[37] the tool bars previously on the side are moved to the top of the page and the images are changed to cover the entire page. Upon investigation, the pages allow for magnification to 300% and 400% through the shifting of their format to allow for logical organization of information and the shifting of box sizes to stop any text from being cut. Though the images are not increased in size after 200% magnification, they can be selected and then magnified further.



https://youtu.be/W8rVdZrHbgg

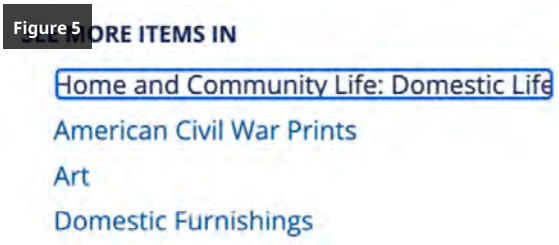
NMAH's Digital Collection Webpage from 100-200% Magnification. Recorded by author November 18, 2022.

7. Make controls accessible without a mouse

When it comes to interacting with a webpage, all controls should be usable without the use of a mouse. Those with physical disabilities may not be able to utilize a mouse, and so all functions should be accessible through the sole usage of a keyboard. An important part of this is clear indication on where the user and their controls are focused on.

The NMAH's digital collection specific controls were effective in this category. Each control, when selected, was encircled by a box-like shape to indicate where control was, shown in *Figure 5*.[38] In addition, the page was moved with the shifting of the control.

Figure 5



Control Indication on NMAH's Digital Collection

However, the header of the webpage was only partially effective as, though sometimes using the same method, its "EXPLORE HISTORY," "VISIT," and "ABOUT" selections where only indicated by a slight darkening of color. This is shown in *Figure 6* where the "EXPLORE HISTORY" button is currently being selected. In addition, no perceivable change could be found when control was on the search and "DONATE" button in the header.

Figure 6

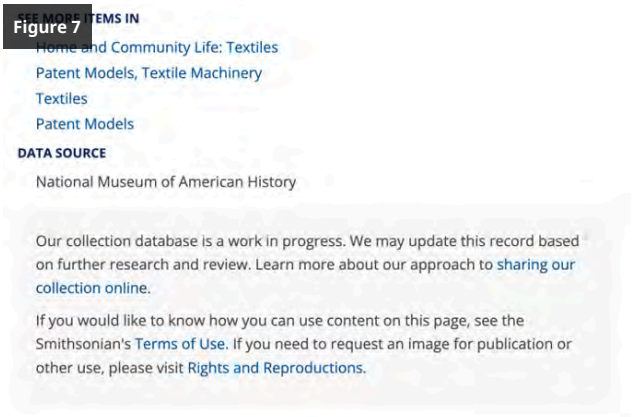
Header for the NMAH's Website

8. Label and style links clearly

When it comes to including links in text, it is important to consider multiple disabilities in how links are attached. Firstly, if screen readers are being used, the links must be attached to words that indicate what the link will go to as a screen reader only provides the information that a link is given and what words it is attached to. In addition, links are often noted by a change in color and/or formatting. It is important that color is not the only indication as some visitors may not be able to see colors but not require a screen reader. The frequent recommendation is that linked words are indicated by a change in color and underlining of the text.[39]

The NMAH's webpages fall in the middle for this criterion. Though the links used are hyperlinked to text that is descriptive of what the link is meant for, shown in *Figure 7*,[40] they are only denoted by blue text instead of a non-color-based marker, such as underlining. Though this color contrast between the black text, dark blue of the sub-headers, and linked text may be seen by some visitors, those with visual disabilities may not be able to tell the difference. While the sub-headers are also denoted by the bolding of text and the indention of text underneath each sub-header, there is no differentiation of hyperlinked text and normal text other than the change in color. This was consistent throughout all the objects.

Figure 7



Hyperlinked Text within the NMAH's Digital Collection

9. Specify the page language in the code

Especially for the usage of any screen readers, it is important to specify in the HTML code of the webpage what language is being used. This is crucial for visitors who use a different language, as a screen reader may assume the language if not provided which can produce unintelligible content for the viewer. With the global nature of the Web, this is crucial information that should be provided.

All of the webpages selected for analysis were consistent and fulfilled this criterion. As seen in the HTML source code for each, the top two lines are shown in *Figure 8*. These lines specifies that the language is in English through "lang='en'," and that the text should be read from left to right through "dir='ltr'."

Figure 8

```
<!DOCTYPE html>
<html lang="en" dir="ltr">
```

First 2 Lines of HTML Code on NMAH's Digital Collection Webpages

REMINDERS AND LOOKING FORWARD INTO THE FUTURE

When attempting to implement web accessibility in a museum, it is crucial to include all areas of the museum in this process. Web accessibility needs to be a part of the entire museum's mission to be effective and assist the most extensive number of individuals and groups.[41] Everyone in the museum should be actively participating in this goal.[42] It is also important to include diverse and overarching groups, instead of certain departments within the museum or museum staff alone, as this will increase the ability of your web accessibility methods to be applicable and beneficial to a larger group.[43] In addition to this, it is crucial to include individuals with disabilities in the creation of innovations and the judgement of their effectiveness. As Habe Girma, an advocate and the first deafblind graduate of Harvard Law School, explained—"[e]mployees with disabilities drive innovation. Disability creates a constraint, and embracing constraints spurs inventive solutions… Different lived experiences… generate the new ideas that lead to discoveries."[44]

It is also important to remember to start the process, no matter your current resources, and implement consideration of web accessibility at the beginning of and throughout new projects. There are many individuals with numerous types and combinations of disabilities, consequently, increasing web accessibility may often require numerous steps. Though a museum can include web accessibility at the start of a project, making previous projects and resources web accessible will be a process that, most likely, cannot be done all at once. Sina Bahram best summarizes this point when saying,

> *We will not get these solutions 100% correct the first, second, or tenth time, but we cannot allow fear of the lack of perfection to continue being used as a justification for doing very little. Inclusion is not a binary pursuit with a finite destination. Inclusion is a state of thinking and acting towards a shared purpose based on a commitment to iteration, refinement, and self-improvement.*[45]

This is not meant to be demoralizing or be used as a reason to deprioritize web accessibility, but instead a reminder that it is a process, to start now, and to always be open for critique.

In addition, it is important to remember that the criteria provided above is not an exhaustive list of all the methods that can be used to make digital collections more web accessible for individuals with disabilities, but instead a few initial steps that may be beneficial for sites. There is a more extensive list that can be found on the Web Content Accessibility Guidelines (WCAG) 2.1–which is intended to increase accessibility for individuals with many types of disabilities, including auditory, cognitive, neurological, physical, speech, and visual disabilities–as well as other examples and suggestions for practical ways to make digital projects more web accessible for individuals with disabilities.[46]

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XII

QR Codes and Museums: More Potential Than Meets the Eye?

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In 2022, most people are relatively cognizant of the ever-present black and white square that sits in the bottom corner of a variety of advertisements on streets, magazines, and public transport. The infamous (or rather ordinary) Quick Response code (QR for short). Now, museum visitors can often expect to see QR codes in lieu of museum maps, or if there is a map, a QR code at the bottom that leads them to certain content. Whereas ads utilize QR codes as a method to link users with their product page, museums (at least Western ones) have been trying to grapple with how to properly implement this technology into their museums since at least 2009.[1] Countries, like Japan, were experimenting with and implementing audiovisual guides in their museum spaces even in 2007, but for the scope of this piece, we will mostly be focusing on America and the Western hemisphere.[2]

Figure 1

Personal photo of an advertisement on the DC Metro, Fall 2022.

While the replacement of a physical map with a QR code is an arguably "uninspired" tactic of implementing technology, museums have also been experimenting with utilizing these phone camera recognition systems to supply more information within their exhibit spaces. Take the integration of the Hirshhorn Eye (Hi) in the Smithsonian's Hirshhorn Museum as an example.[3] This smartphone-based AR (Augmented Reality)-recognition feature is meant to act as a "revolutionary in-gallery art guide" that allows visitors to directly scan certain artworks with their personal phone camera to learn more about them.[4] When I initially tried Hi during my first visit to the Hirshhorn, I became increasingly irritated as I tried to juggle my QR-code accessed museum map and simultaneously decipher how to work Hi. In the end, I was disconnected from my museum experience only to receive an extended object label or video. This experience, and my increased interaction with QR codes in and out of museums, made me begin to question if Hi's implementation was the problem rather than merely me. Though not precisely a QR code, the lessons brought about by Hi, an Augmented Reality-based example, in 2022 are similar to the questions that have been constantly interrogated by museum experts and goers about the usage of QR codes since its early integration in Western museums. What do they truly add to the visitor experience (if any)? What does it mean to be successful?

Description Visual QR code inside the Smithsonian National Museum of American History's Molina Gallery, Fall 2022.

We are currently in an age of technological acceleration where newer, shinier technologies and experiences are being privileged by museums and inevitably expected by their visitors. Has the QR code run its course? Should it yield to Augmented Reality (AR) tools and other

technologies, as seen in the Hirshhorn, or is this a time of transformation? Not only has it been projected that one billion smartphones worldwide would now be able to automatically access QR codes, but the current pandemic, new technology, and overall push for a variety of museum experiences present QR codes with fruitful possibilities and potential for success.[5] Success, for this paper, means implementing QR codes in a way that enhances the museum's mission and visitor experience rather than being used for the sake of having it. With this in mind, how do we ensure that the QR code will live up to its potential and allow every visitor to truly "connect" to our museums?

A HOPEFUL (TURNED PESSIMISTIC) INDUSTRY

In the early 2010s, the National Museum of Scotland began implementing QR codes in their exhibition spaces in hopes to, in the words of Principle Curator of Communications, Alice Taubman,

> *not only give visitors more information about objects and stories, but also involve our visitors in adding their own responses to the objects, whether personal reflections or additional resources to let others find out even more.*[6]

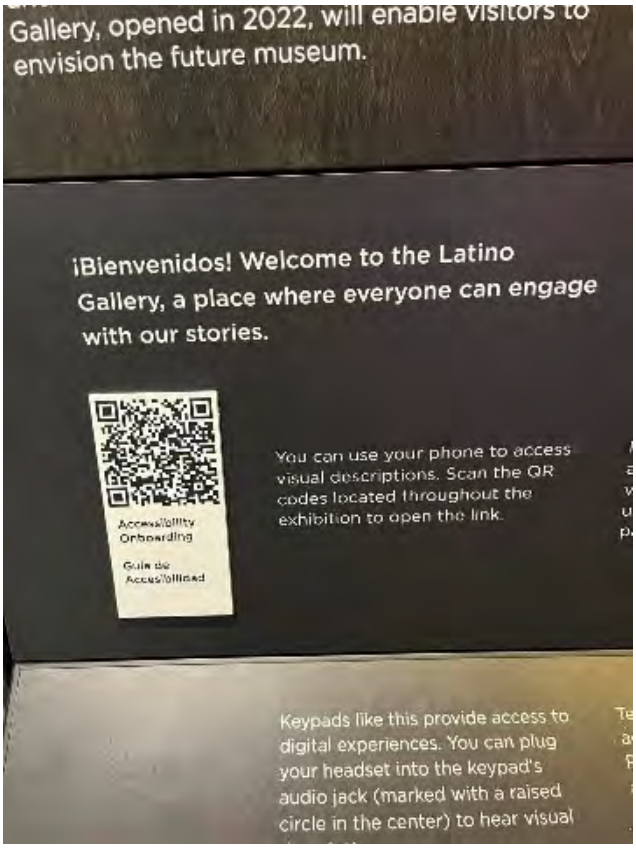
Though their process was well documented, the NMS was not the only institution that was excited about the prospects of QR code implementation in the field. The usage of QR codes has been long tried and discussed by professionals in and out of museums. The Mattress Factory in Philadelphia began using them to refer visitors to extra exhibit content via a scanner app in 2009.[7] From their initial implementation in museums, questions about the potential, and consequent challenges of QR codes have been discussed extensively by museum professionals. Keep in mind that the essentially universal access to QR code scanning technology mentioned earlier did not exist in the early 2010s.[8] Questions, speculations, and concerns were rising over the possibilities of QR codes, but so were frustrations with the lack of resources and technological literacy among the population at the time. Seb Chan said it best in his early 2009 article about QR codes,

> *If these URLs are just going to send me to a website that isn't tailored for my context and device then they are going to be just a gimmick. But if, on the other hand, they can deliver timely, mobile-formatted content to me that addressed my specific 'need' at the time then they might just work.*[9]

Does the first part sound familiar? People come to museums for a variety of reasons, however, the one thing they have in common is that they are choosing to go to an in-person experience. Chan's concerns over the misuse of QR codes were, and still are, completely valid. Gimmicks are fads. While they may seem amusing, their lifespan is short because of the reason that they do not hold sustainable value or use. Branching from his argument, if these codes are merely going to act as extended object labels, physical label replacements, or digital museum maps (with no alternatives), then of course museums would be hesitant to invest in them. Even more pressing was the growing concern of whether visitors even wanted to or knew how to interact with a QR code.

As we move towards the mid-2010s, we see more and more articles and forums (both in and out of museums) show an increased questioning of the effectiveness of QR codes. Not long after the QR code's uptake began rising in the US, a company strategist, Eric Holtzclaw released an article that stressed that our world was not ready for QR codes.[10] The most striking fact of the short article was that "97% of consumers don't know what a QR Code is."[11] While there is an notable lack of transparency regarding who was surveyed to produce such a percentage, this article and statistic represent probably one of the largest concerns surrounding QR codes – use. Though not a museum professional, Holtzclaw was not alone in his denouncement and ridicule of this technology. Many museum-related sites, and professionals in business and tech, would proceed to claim that the QR code was "dying" in general.[12] The main issue was simply that people were not using them.

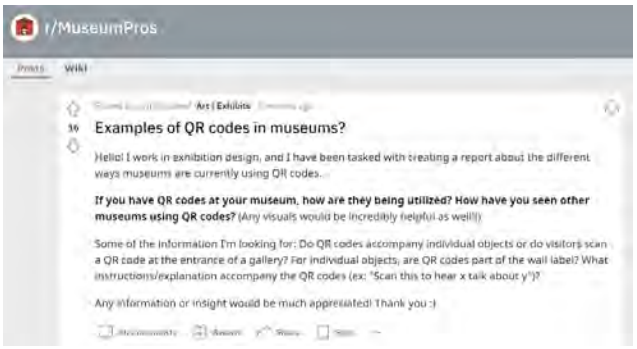
IMPROVEMENTS AND SUCCESS STORIES



Personal photo of a QR code being used for Accessibility Onboarding at the entrance of the Molina Gallery inside the Smithsonian National Museum of American History, Fall 2022.

Thankfully, some of these concerns soon lost their relevancy. Specifically, one of the primary issues of implementing QR codes, the technological barrier of downloading a scanner app, ended in 2017 for iPhone and 2019 for Android users with the integration of QR scanners in their phones' cameras.[13] Such advances helped break down the technological and convenience barriers that formerly impeded visitor experience and the use of an application. Furthermore, many of the aforementioned critiques surrounding the QR code appeared to scapegoat the technology in question rather than accept responsibility for how we have chosen to implement the technology. After all, technology is a tool, and we as users, choose how to employ such a tool. Design issues such as the size of codes, placement, and even visitor-friendly instructions could help alleviate many issues such as uptake, aesthetics, and clarity (to name a few). If any technology is being implemented and is not as successful or used as intended, the next move should be to see how they can swim in their new environment, rather than letting them drown. Technology and interactivity are all about trial and error, as documented by the Brooklyn Museum with their QR codes back in 2011, and that mindset is one that transcends any period of technological development.[14] The reason we still have QR codes in museums, and the reason I am writing this piece, is because there have been many cases where museums have been able to apply such strategies to tap into their usefulness, especially in light of the COVID-19 pandemic.

SHIFTING GEARS - QR CODES IN THE PRESENT



Original post from u/trilliumleaf on the Reddit thread r/MuseumPros. click to view full thread

Prior to the pandemic, museums were developing efficient and meaningful ways to implement QR codes into their institutions. In the Reddit thread r/MuseumPros, a question was posted asking for "Examples of QR codes in museums?"[15] The post received various comments from users who both worked at and visited museums. While there were comments describing QR codes as being extended object labels, which is a more standardized use of QR codes, there were plenty more examples of museums that demonstrated an understanding of QR codes' abilities to aid their mission as a museum.[16] U/textmarie described how their museum used QR codes to provide visitors with the choice to listen to oral histories of survivors from an abusive orphanage, a strategy which also allowed the museum to add content warnings.[17] Other users commented on QR codes being used for self-guided audio tours, collecting visitor responses for art, language accessibility, and even ticketing.[18] My personal favorite comment was from u/FluffyBunnyRemi who experienced the Q?rious exhibit at the Smithsonian Museum of Natural History where visitors could take

objects with QR codes posted on them to a computer terminal to pull up a file on the object.[19]

> *It's a really cool way to encourage folks to learn more about objects, without having to use object labels, especially considering there's hundreds and hundreds of objects, in this exhibit, and trying to include label space for all of them would be absolutely impossible.*

These examples demonstrate what it means to have a crucial understanding of your visitors' needs. Whether if it's for logistical reasons, accessibility, or experience and immersion, QR codes are meant to be helpful to their user. While everyone may not choose to use QR codes, the other essential part of their function is their contribution to visitor choice. While the Smithsonian Museum of Natural History intentionally included QR codes as a tool for their experience, the other examples aimed to enhance the visitor experience by providing options. Museums are nonlinear experiences, and the more museums embrace customizability in visitor learning and navigation, the more crucial QR codes become because of their affordability and flexibility.

These examples are not the only positive examples of QR code implementation, nor will they be the last. Much of this article has so far been focused on sharing the semi-pitfalls of QR codes in exhibit spaces, but despite the previously mentioned concerns, QR codes are still, if not more, relevant. As we move towards the present day, museums begin to move beyond integrating QR codes as part of their in-gallery object experience to use them for promotional activities for events, social media, and surveys.[20] Without the original technological barrier of downloading QR scanning applications on visitors' devices, museums at this stage (in theory) only need to design with intent in order for their QR codes to be "successful." If a museum implements a QR code for the sake of being technologically savvy or relevant, then it is merely going to fall as, what Seb Chan also feared, a gimmick.[21] However, if a museum implements their QR codes in a meaningful way for their particular institution, and is also willing to continue to update and improve them, then that would lead to more positive examples and experiences, like the ones these Redditors recalled.

MORE PRESENT-DAY EXAMPLES!

The following cases are just a few more examples of museums that demonstrate this recent, increased understanding of the potential effectiveness of the QR code. In the Fall of 2019, the Whitney Museum of American Art launched a web-based museum guide to help aid in the accessibility of their in-gallery experience.[22] To help users easily find and access the guide, they turned to QR codes. Not only did the team at the Whitney conduct the proper research to understand why QR codes would be the most effective tool for them, but they intentionally created slightly different codes in order to track and see where visitors were most likely to access their guides.[23] With the help of QR codes, around one-fifth of their total guests accessed their codes over a 7-month span.[24] In 2022, *The Louvre Fantastic* exhibit in Illinois created an app that corresponded with QR codes placed around the exhibit to create an experience for guests that would dismantle the traditional art museum experience.[25] According to the Art Curator, Joan Carrubba,

> *The idea behind the QR codes is that you can scan it, and either you hear more about the piece or there's a fun, interactive element that comes along with it.*

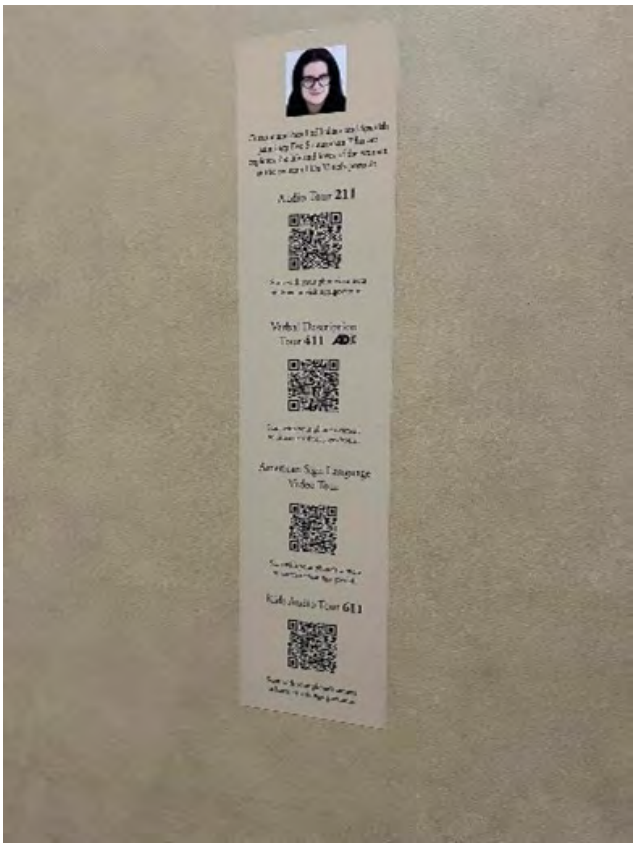
Media and experience companies contracted by museums have even developed suggestions to guide museums on how to utilize QR codes to promote fun, accessible, and of course, inexpensive experiences such as scavenger hunts and videos of restoration processes.[26] Without the technological constraints, museums have been able to reimagine the QR code's place in their museums and further demonstrate that technology is only as good as we choose to utilize it.

Immersive QR code sign made by the National Museum of Scotland for their exhibit, *The Typewriter Revolution* Click to go to original blog

Cycling back to the beginning of this piece, The National Museum of Scotland, which first began utilizing their QR codes in 2010, recently released an article addressing the state of QR codes in 2022.[27] Spoiler alert, it is rather positive. Since their first run, NMS has proceeded to continue using QR codes in their exhibits, not only to aid in the in-gallery experience but also to collect data on their usefulness. While their *Galloway Hoard* exhibition used QR

codes to show 3D models of some of the objects which were unable to be viewed in close proximity due to COVID, their *Typewriter Revolution* exhibit's QR codes showed videos of typewriters in action and were even designed to mimic the look of a typewriter.[28] This museum's continued experimentation with QR codes allowed them to rebuttal many of the early skepticism towards the codes and even provide some advice for the entire process of implementing them – from design to security.[29] Technology in museums should be treated as collections. Similar to how collection objects are selected for museums based on appropriateness and maintenance, technology should be treated with the same standards. Not only should they be used on a case-by-case basis, but museums should also remain cognizant that they are meant to be monitored and constantly renovated and improved based on audience interaction. What is so special about QR codes is their ability to be altered to fit changing visitor needs. This factor is especially crucial when considering our existence in a semi-post-COVID world.

QR CODES IN THE POST-COVID WORLD

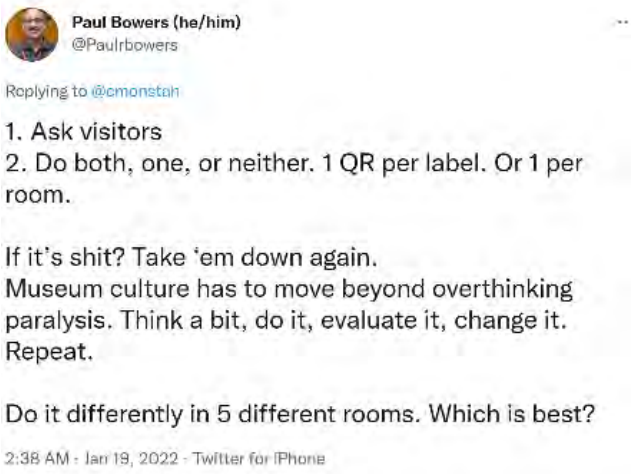


Personal photo of QR codes being used to provide visitors access to various audio tours for the Leonardo da Vinci painting, *Ginevra de'Benci [obverse]* at the National Gallery of Art in Washington, DC, Fall 2022.

The onset of the COVID-19 pandemic has also propelled the resurgence of QR codes in our general society, causing museum experts to re-evaluate their use. COVID-19 led to many industries and services redefining their experiences and distance protocols. As examined by the design firm Mather & Co, QR codes have been rising in the public sector making it an even more opportune time to continue their use in exhibition spaces.[30] Not only is this increased societal reliance on QR codes lowering barriers to use, but this means that QR codes in museums may find new types of users who may have not been interested in them prior to the pandemic. In July of 2021, Statista reported that roughly a third of their US and UK respondents had used a QR code "within the past week."[31] This indicates that a substantial number of Americans now have a newfound sense of familiarity with QR codes. Increased familiarity means we could expand the idea of QR codes as not only "COVID friendly," but also on par with guest engagement and accessibility. BYOD, or Bring Your Own Device,

features are already being experimented with in museums to allow those with vision impairments to be directed to informational object pages that are designed to cater to their needs.[32] QR codes are not merely about bringing a "unique" or "innovative" experience, but also breaking down barriers of access that were not feasible in museum spaces before. The pandemic has opened the doors for further discussion on QR codes as a necessity rather than an additive. When accessibility comes into the equation, though it should always be included, then it is no longer about the number of users, but whether the QR codes are allowing every visitor the possibility of an enriching experience.

LOOKING BEYOND



Tweet from Paul Bowers, a museum professional, about implementing QR codes using iterative design methods. click to go to original Tweet

QR codes are not going anywhere nor should they. The reason the Hirshhorn Eye was unsuccessful for my visit was largely due to unclear directions and semi-personal issues with the scanning. Though an overall frustrating experience, would I say this is the death of AR? No. It was a merely faulty, but fixable, case of implementation and design. As museum professionals, we are familiar with the idea of evaluation. An important step of such a practice is understanding A: what went wrong and B: how we can improve things. People still have gripes with QR codes in 2022 but technology, and QR codes specifically, can be revamped and re-implemented to mitigate complaints.[33] As we look to the future of QR codes to encompass more AR (Augmented Reality) features and offer more opportunities for immersion, gamification, and accessibility (just to name a few), it seems the QR code has a long life ahead of it.[34] No longer are there concerns about downloading QR code scanners, but rather in seeing how we can push the QR code beyond its limits to help provide impactful experiences in any type or size of museum. As long as museums pay close consideration to the who, how, and why factors when they are choosing to implement QR codes, QR codes will not die. In fact, they are just getting started.

Screenshot of an Augmented Reality QR code generated by Jerome Etienne using AR.js. The left code is able to be accessed by your phone's camera. Try it out! click to go to original Medium article

Thank you for making it to the end! I would love to connect with anyone who comes across my piece. Open the camera on your phone and point it towards the QR code to scan.

Made with [flowcode.com] (https://www.flowcode.com/)

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XIII

Rethinking Neighborhood Walking Tours: How Augmented Reality Can Restore Historical Landscapes

Jamie Carkenord, The George Washington University

In 2018, a New York City-based artist collective made headlines with their mobile phone app MoMAR, a program which asked visitors to the Museum of Modern Art (MoMA) to look through their phone cameras to view digital artworks overlaying the physical museum pieces. Using augmented reality (AR), the app projected tongue-in-cheek artistic commentary about pop culture and general museum snobbery on top of iconic artworks.[1] The independent group branded themselves as an "unauthorized gallery concept aimed at democratizing physical exhibition spaces, museums, and the curation of art within them."[2] The Museum of Modern Art did not respond to what news outlets called a "hijacking," or "takeover," leaving the group to create multiple unauthorized exhibits since 2018. Describing the project, MoMAR spokesperson Damjanski said, "we literally are trying to claim the space."[3] This provocative demonstration attracted widespread media attention because it illustrated how augmented reality can be used as a tool to claim space and reframe mainstream narratives about arts and culture. It encouraged visitors to question what they saw and think critically about the cultural value of the works on display. Now, in the wake of international calls for social and racial justice, many museums have embraced new strategies for presenting content which challenges narratives of colonialism and white supremacy. Just as MoMAR attempted to democratize museum spaces using augmented reality, museums themselves are considering how AR could reshape the stories they tell.

While art museums have been utilizing AR in their galleries since the early 2010's[4], history and culture museums have also taken augmented reality to the streets through mobile apps which guide users on neighborhood walking tours featuring audio, video, and augmented reality content. As museums strive to attract younger, more diverse audiences, technology like AR presents an opportunity for digitally literate visitors to utilize their smartphones to access unexpected content or perspectives. Augmented reality also creates a unique relationship between physical and digital space, asking users to consider their own interactions with the spaces they inhabit. This particular element of AR offers new possibilities for history, culture, and community museums to demonstrate how significant locations change over time and influence society. In this paper I will present a brief definition of AR and explore how museums are using augmented reality to help the communities they serve reclaim space and alter local historical narratives. I will use recent examples from the Levine Museum of the New South and the Smithsonian

Anacostia Community Museum as case studies to examine the benefits, drawbacks, and possibilities of augmented reality tours which re-center marginalized histories.

WHAT IS AUGMENTED REALITY (AR)?

Augmented reality is the integration of digital information with the user's environment in real time. Using the device camera, visual elements and sound can be overlaid onto the device to create "an interwoven experience where digital information alters the user's perception of the real world."[5] This technology allows the user to see through their phone camera as usual, with additional content like a photograph overlapping part of their screen. Most modern smartphones and tablets have the processing capability and hardware to utilize AR, making it relatively accessible to everyday users. Augmented reality can also make use of Global Position System (GPS) and digital compasses, meaning that it can identify where a user's phone is located in geographical space and how the phone is oriented. Applications can then respond to augmented reality markers in the real world and show specific content depending on the user's location.[6] Readers may be familiar with this technology as it appeared in the popular 2016 app Pokémon GO. A more thorough history of AR and its technical capabilities and limitations, along with its implications for museum education and accessibility, can be found in this course's 2019 and 2021 essay collections. This paper will focus on the use of AR outside of traditional exhibit spaces.

POSSIBILITIES FOR HISTORICAL STORYTELLING AND COMMUNITY BUILDING

This kind of AR technology could be uniquely applicable to museum storytelling related to the local or national history of marginalized communities. In the United States, physical neighborhood landscapes have often changed significantly over time due to economic changes, government-imposed relocation, gentrification, and other issues specific to the area. This means that many important residential areas, gathering spaces, businesses, religious structures, and cultural centers which fueled the arts, activism, and community development do not remain standing as they did during their past periods of frequent use.

For AR applications, these locations create an interesting dynamic for museum content, because the significant spaces discussed in a tour may not be physically preserved and viewable. In contrast to museum exhibits that employ AR to provide additional information about physical artworks or artifacts, AR tours can recall images or other content from the past to provide context for a space which may not at first appear noteworthy. Rather than learning about significant historical events through exhibit content in a museum, AR users can immerse themselves in the actual location where things happened and reflect on how (and why) the landscape has changed over time.

Of course, historical place markers and plaques already abound in major cities, reminding locals and tourists alike of the meaningful stories that took place in everyday locations. But the addition of audio, visuals, and augmented reality asks users to examine their surroundings more closely. These elements can also prompt users to directly compare historical data with present conditions in order to actively draw their own conclusions, a critical aspect of historical learning.[7] A 2015 study by a Taiwanese tourism and education research group asserts that "visitors perceive AR guidance activities as interesting, fun, challenging, and a method of achieving first-hand experience."[8] An AR application may also provide a more immersive experience and "increase people's motivation to visit and learn."[9] A common critique of AR programs is the incentive for users to pay more attention to their phones than their physical surroundings,[10] but an integrated walking tour encourages users to actively observe the landscape around them. Additionally, by taking place outside of a museum, this kind of tour doesn't detract from the experience of looking at and learning from the physical objects on display in museum collections. The following case studies explore how two history museums have approached using AR programs in their local communities to expand their neighborhood presence and contribute to collective community memory.

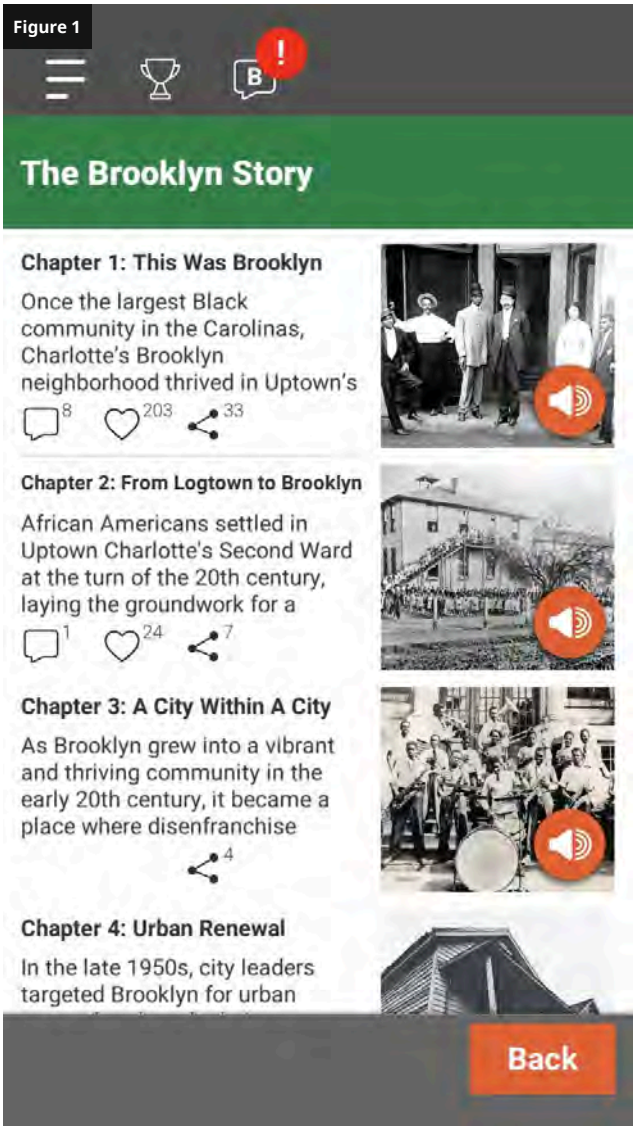
KNOWCLT: AN AR WALKING TOUR FROM THE LEVINE MUSEUM OF THE NEW SOUTH

In August 2021, the Levine Museum of the New South released a free app called *KnowCLT*, which guides users on a walking tour through the historic Brooklyn neighborhood of Charlotte, North Carolina. The app features an audio tour and augmented reality content which projects historic photographs over the user's phone camera. Brooklyn, the thriving Black business district of the early twentieth century, was largely demolished in the 1960's in a city-led urban renewal program. Through *KnowCLT*, the Levine

Museum hopes to "resurrect…significant places and see them where they once stood."[11] See the app in action and learn more about its development here.

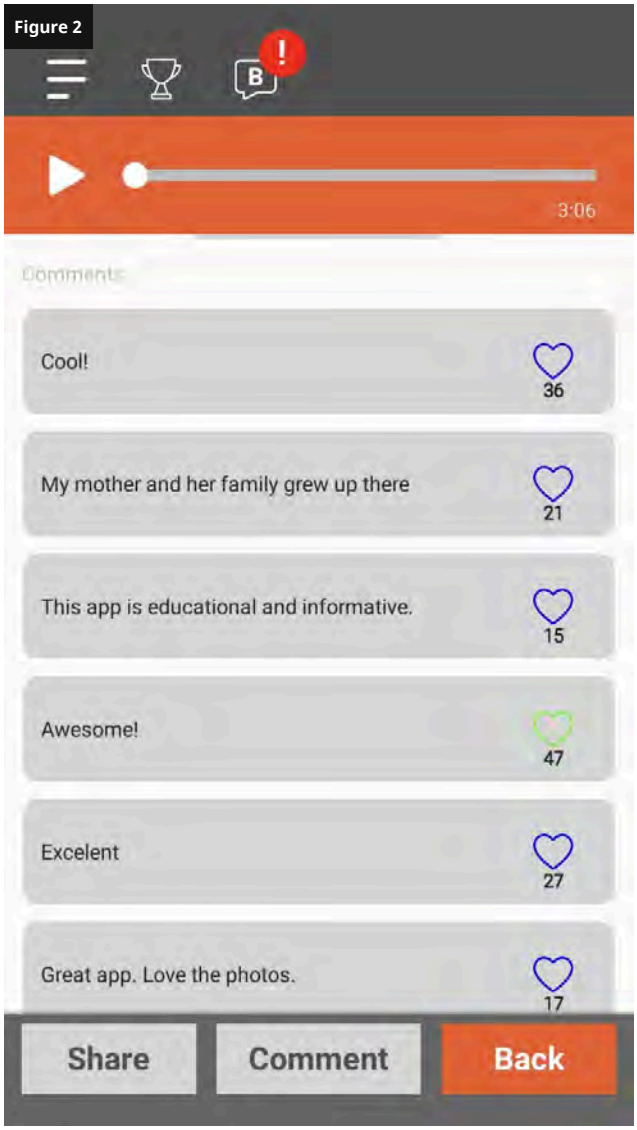
The Levine Museum walking tour is deeply rooted in community stories. Black and white photographs restore historic businesses, churches, and schools to the landscape through AR. At each stop, users can listen to short oral histories recalling memories from that location, told by the former residents themselves. This means that multiple perspectives and experiences are represented in the tour, creating a more complete narrative. The *KnowCLT* app also engages with the present-day community in Charlotte. In the app, users can publicly comment on chapters of the audio tour or oral history segments. Comments like "love the photos" and "my mother grew up here" provide feedback on the app experience and enrich the stories being told. Users sometimes recognize oral history storytellers and express their affection and admiration through the comments feature. Engagement such as commenting, liking other's comments, and sharing parts of the tour on social media is easy and encouraged in *KnowCLT.* The app even rewards this kind of engagement with links to coupons for local Black-owned businesses.[12]

Figure 1



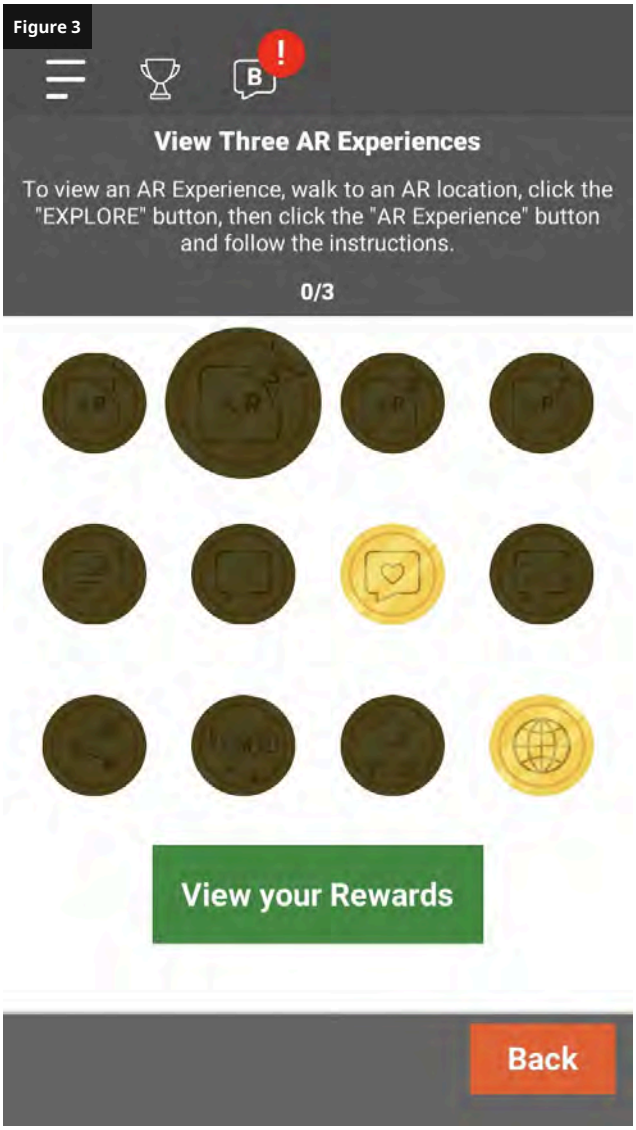
The *KnowCLT* app features multiple audio chapters which can be listened to from any location. Each chapter displays its total number of comments, likes, and shares.

Figure 2



Users can publicly comment on individual audio chapters within the app and like others' comments.

Figure 3



When users complete certain achievements in the app, they can earn rewards in the form of coupons to local businesses.

The *KnowCLT* app is a great example of a digital walking tour which creates an immersive experience. It offers multiple ways to engage with content—images, full text transcripts, audio, augmented reality, and interactive commenting—which facilitates an accessible and customizable experience. The Levine Museum and the City of Charlotte also installed physical signs, QR codes, and sidewalk markers at each of the seven augmented reality stops to inform passerby about the app. By including thoughtful details like first-person oral histories in addition to the augmented reality content, the KnowCLT app strategically uses digital technology to provide users with a visual and emotional connection to the past.

BEFORE THE BULLDOZERS: THE SMITHSONIAN ANACOSTIA COMMUNITY MUSEUM AR TOUR

This past October, the Smithsonian Anacostia Community Museum (ACM) launched a free app which guides users through a walking tour of Southwest Washington, DC. Once at the Waterfront Metro Station, the starting point for the tour, participants can use their mobile devices to orient themselves within the neighborhood, view images, and listen to audio content as they travel through a historic African American community. Three-dimensional visual content exists in 360 degrees, prompting viewers to turn about and step closer to images that interest them. Although the tour is designed to take about 45 minutes, users can spend as much time as they'd like at each stop, replaying audio or observing their surroundings. For those interested who cannot travel to DC, an online video version of the tour is available.

The focus of the tour is the federal urban renewal of Southwest DC in the 1950s, which aimed to "upgrade" the neighborhood and support development, but ultimately displaced over 20,000 African Americans whose families had lived and worked in the area for generations. As a result, the Southwest DC that exists today is "unrecognizable to former residents."[13] Combining resident oral histories with images from African American photographer and Southwest resident Joseph Owen Curtis, the tour is intimately connected with the authentic storytelling of the residents who were displaced. Director of the Anacostia Community Museum Melanie Adams stated,

> *Before the Bulldozers gives audiences eyes and ears to the historic stories that shaped Washington, DC. By moving through the Southwest neighborhood, seeing how the area changed and learning at whose cost those changes came to be, audiences better understand the role housing inequity plays out in everyday life—in DC and beyond.*[14]

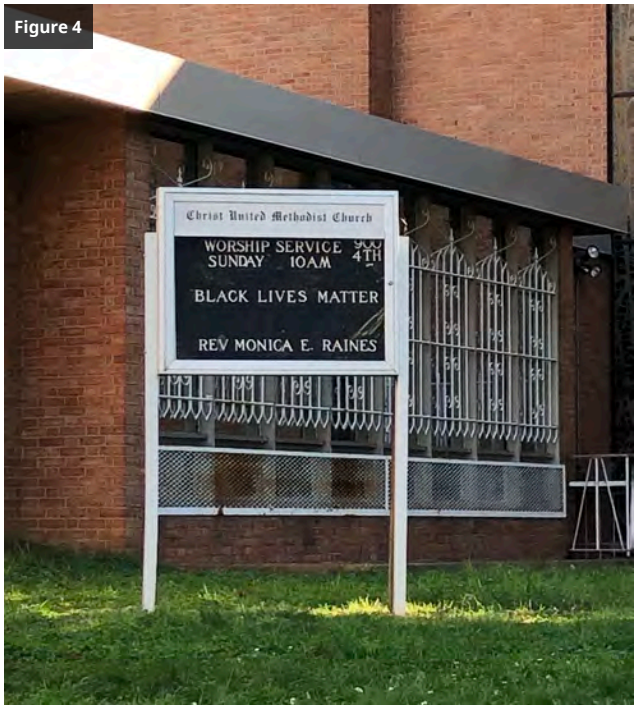
The *Before the Bulldozers* project is part of ACM's year-long feature on housing injustice, titled "Our Housing, Our Future," which focuses on racial inequality and includes community programs and educational partnerships.[15]

EXPERIENCING *BEFORE THE BULLDOZERS*

I was eager to take this new tour myself and see how the app and audiovisual materials function, and I was largely impressed. The app was easy to navigate, and the tour starts at the Waterfront Metro stop, which made it easy to access and get oriented. On the whole, this was basically an audio tour, featuring walking directions and narration from multiple actors portraying historic characters. There was much less augmented reality content than I was expecting, but the storytelling was clear, informative, and engaging. The lead narrator served as a guide who contextualized quotes from historical documents and oral histories.

The tour effectively connected me with the physical landscape and provided insight into how urban planning and architecture can direct daily social life. Walking through the Southwest neighborhood helped me to understand these concepts in a way that wouldn't be possible in a museum gallery space. I felt that the pacing and directions were especially well executed. The audio tour pointed out notable visual landmarks and street names enough that I almost always ended up in the correct location, and never felt lost. Additionally, while I listened to the story of Southwest's development, I was simultaneously immersed in the community as it exists today. As I walked past businesses, churches, and schools, I saw community postings about local politics and aid initiatives which informed my perception of the neighborhood alongside the history I was hearing. The tour also introduced me to the Southwest Neighborhood Public Library, a present-day resource for education and internet access.

Figure 4



The *Before the Bulldozers* tour takes listeners by the Christ United Methodist Church in Southwest DC.

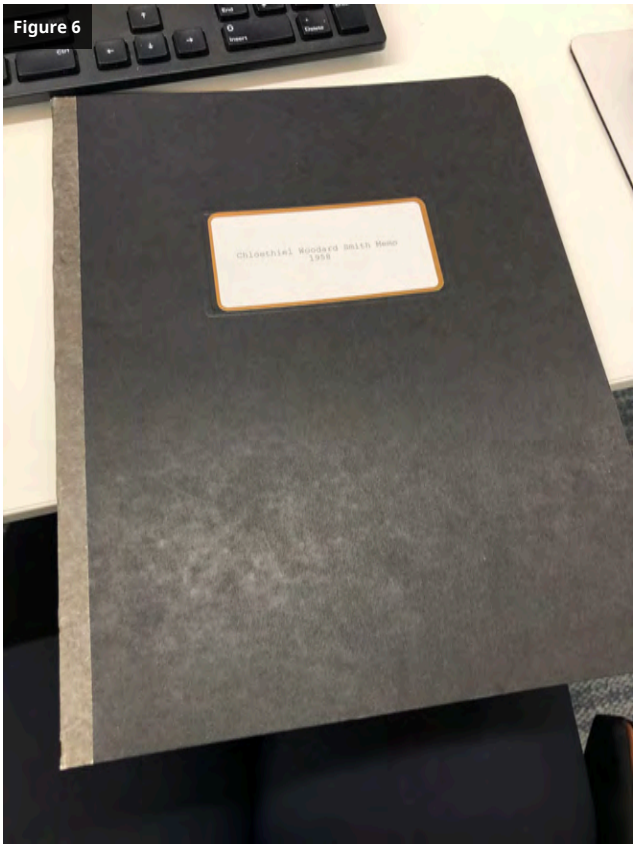
Figure 5

Signs for Serve Your City Mutual Aid, a nonprofit committed to supporting at-risk Black and Brown children in Ward 6.

One particular strength of the tour was the guided interactions with physical and print materials. Inside the Southwest Neighborhood Public Library, the listener is directed to pull a copy of a historical document off the shelves and read along with the narrator. I thought this was a great way to incorporate interactive elements into the tour, while at the same time making users aware of the resources available in the library. I was also pleasantly surprised by a mini exhibit in the library, which the audio tour guided me through. A gallery wall displayed photographs taken by 20th-century African American photographer Joseph Owen Curtis—the same photographs used to inform the tour. After walking through Curtis's neighborhood and hearing his words on the tour, seeing the physical print photographs themselves (and Curtis's handwritten notes) was a powerful experience. The impact of the photographs was significantly elevated within the context of the walking tour. This small exhibit represents an effective collaboration between the Smithsonian Anacostia Community Museum and DC Public Libraries, and the audio tour led me to resources that I might have otherwise missed.

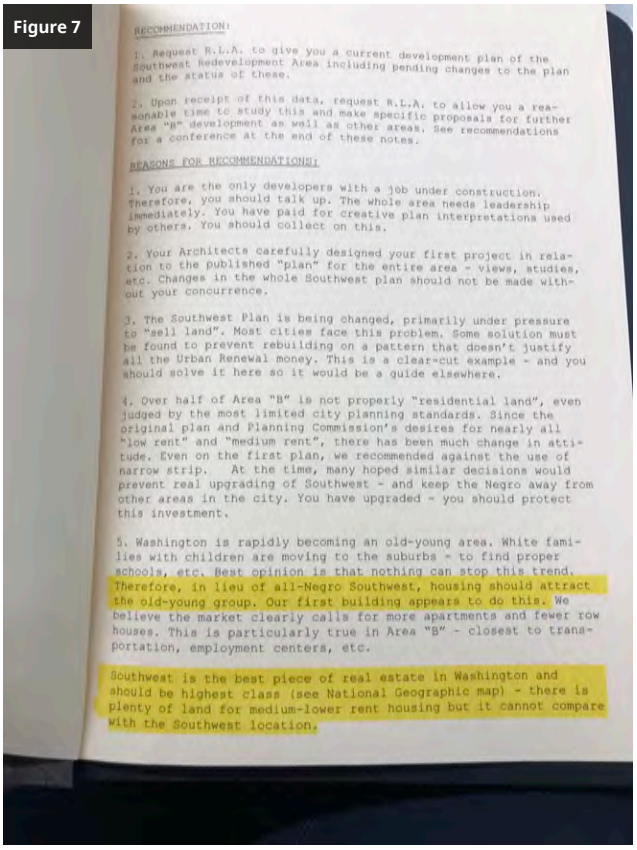
An additional note: the library offers public restrooms and water fountains, so including the library also makes these facilities available during the tour.

Figure 6



Inside the library, the audio tour gave directions for how to find a copy of a government memo, printed especially for the tour.

Figure 7



RECOMMENDATION:

1. Request R.L.A. to give you a current development plan of the Southwest Redevelopment Area including pending changes to the plan and the status of these.

2. Upon receipt of this data, request R.L.A. to allow you a reasonable time to study this and make specific proposals for further Area "B" development as well as other areas. See recommendations for a conference at the end of these notes.

REASONS FOR RECOMMENDATIONS:

1. You are the only developers with a job under construction. Therefore, you should talk up. The whole area needs leadership immediately. You have paid for creative plan interpretations used by others. You should collect on this.

2. Your Architects carefully designed your first project in relation to the published "plan" for the entire area - views, studies, etc. Changes in the whole Southwest plan should not be made without your concurrence.

3. The Southwest Plan is being changed, primarily under pressure to "sell land". Most cities face this problem. Some solution must be found to prevent rebuilding on a pattern that doesn't justify all the Urban Renewal money. This is a clear-cut example - and you should solve it here so it would be a guide elsewhere.

4. Over half of Area "B" is not properly "residential land", even judged by the most limited city planning standards. Since the original plan and Planning Commission's desires for nearly all "low rent" and "medium rent", there has been much change in attitude. Even on the first plan, we recommended against the use of narrow strip. At the time, many hoped similar decisions would prevent real upgrading of Southwest - and keep the Negro away from other areas in the city. You have upgraded - you should protect this investment.

5. Washington is rapidly becoming an old-young area. White families with children are moving to the suburbs - to find proper schools, etc. Best opinion is that nothing can stop this trend. Therefore, in lieu of all-Negro Southwest, housing should attract the old-young group. Our first building appears to do this. We believe the market clearly calls for more apartments and fewer row houses. This is particularly true in Area "B" - closest to transportation, employment centers, etc.

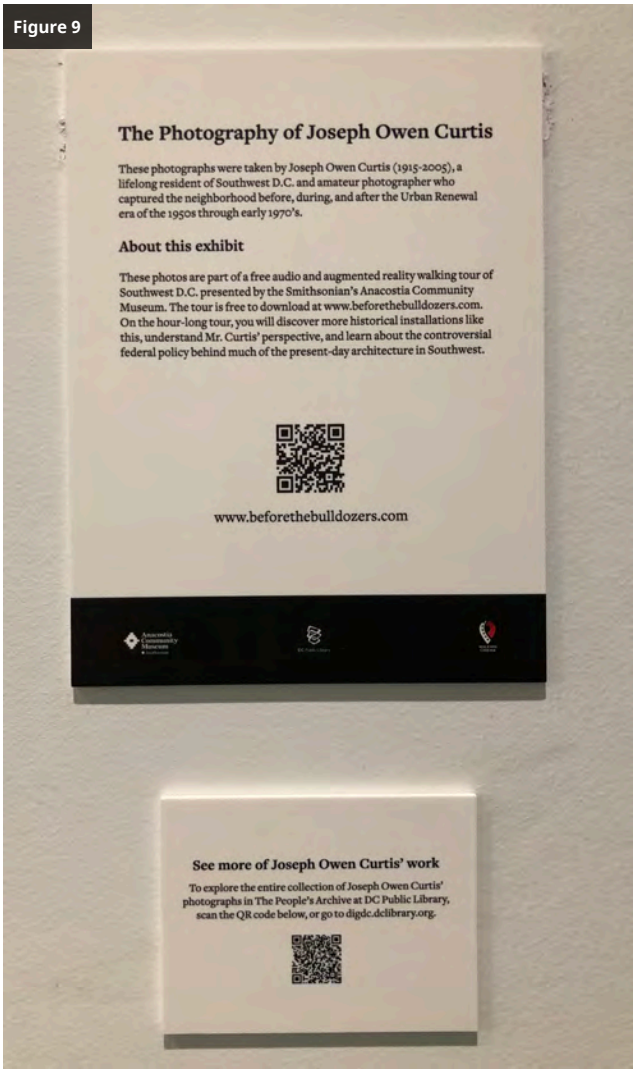
Southwest is the best piece of real estate in Washington and should be highest class (see National Geographic map) - there is plenty of land for medium-lower rent housing but it cannot compare with the Southwest location.

The document illustrates a city developer's desire to prevent an "all-negro Southwest."

Figure 8

Historic locations depicted in Curtis's photographs, such as the Ideal Barber Shop, are described in the walking tour.

Figure 9



A QR code inside the library links to the *Before the Bulldozers* app.

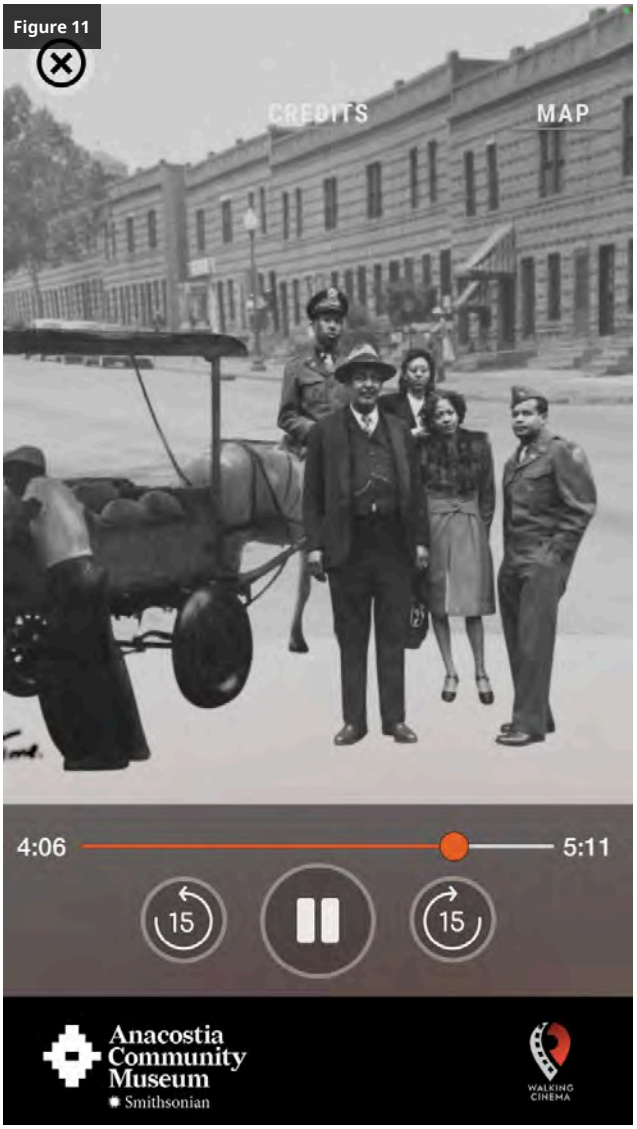
Outside of the library, the audio tour also engaged with physical Southwest Heritage Trail signs on several street corners. The lead narrator spoke about what these signs mean to those who used to live in the neighborhood or currently reside there. She says, "without the whole story, [these photos] …may land as quaint, nostalgic, markers of a lost time long ago. But now, I can't help but find them markers of a systemic and traumatic displacement."[16] The audio guide recontextualized the signs and introduced important questions about how we learn about history, which added a critical nuance to the tour.

Figure 10

Current Heritage Trail markers are dated and fading.

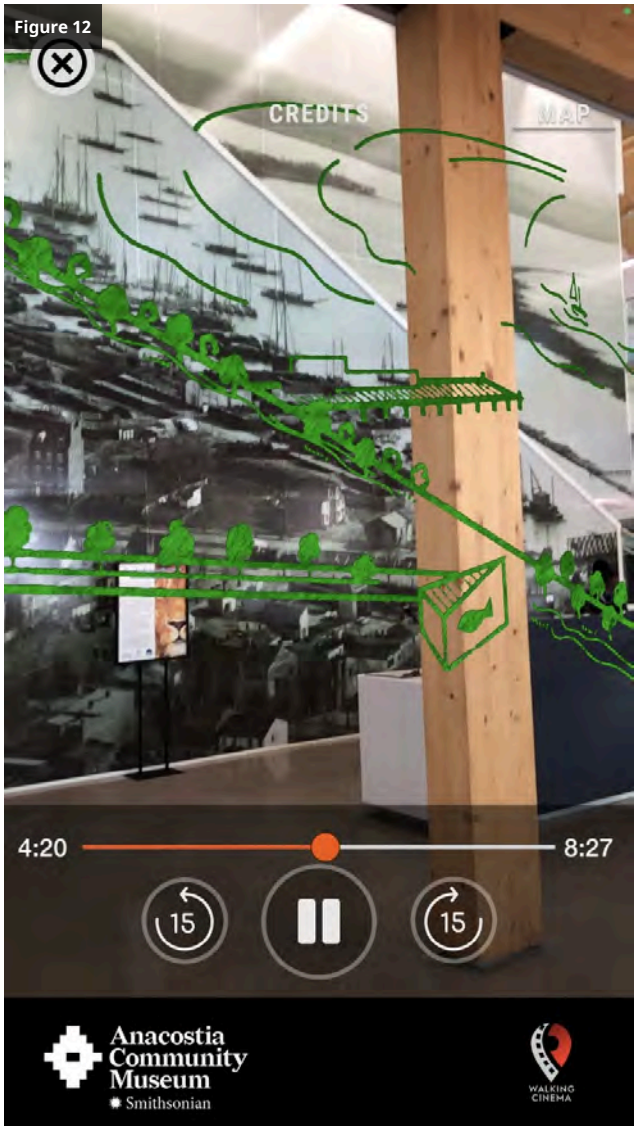
The weakest and ultimately most disappointing feature of the *Before the Bulldozers* tour was the augmented reality itself. Only three out of fourteen stops included AR content, and only one of those stops featured historic photographs overlaid on my device screen. The other two AR portions presented doodle-esque sketches on top of physical photographs displayed in the library and Heritage Trail signs. I was slightly surprised by the limited amount of AR content, because the tour was advertised as an Augmented Reality Tour. When I did use the AR feature, I also encountered a few issues. At the first AR stop, I was instructed to stand in the middle of a wide sidewalk, hold up my phone, and turn about to see photographs placed in 360 degrees. Although the augmented reality started automatically without any glitching, I had trouble seeing the small black-and-white images on my phone screen due to glare caused by the afternoon sun. I took the tour on a Friday afternoon, when the area was relatively busy, which also made me feel a bit awkward during this stop—I didn't want bystanders thinking I was filming them. At the other two AR stops, I watched city plans and landmarks be "drawn" on top of photographs, which added a novel visual element, but lacked detail. As I finished the tour, I felt that it would have been just as effective without the AR elements. The quality of the augmented reality portions simply didn't compare with the audio script. In this case, augmented reality unfortunately appeared to be used more as an attention-grabbing buzzword than as a thoughtful storytelling technique.

Figure 11



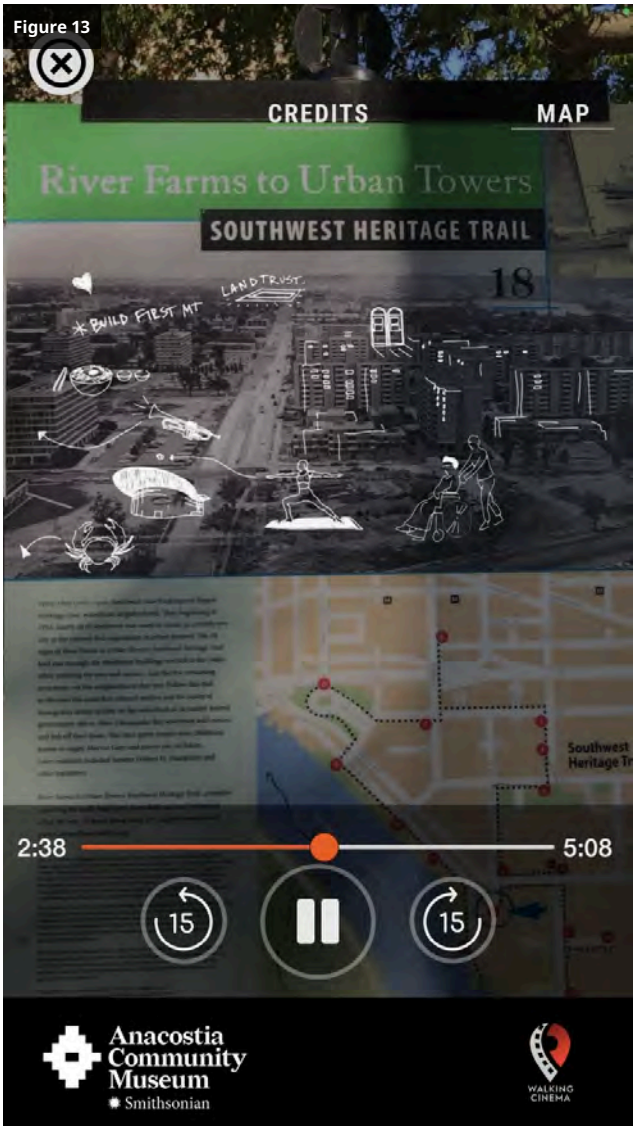
The *Before the Bulldozers* app projects cut-out figures from photographs on to the user's screen.

Figure 12



The augmented reality illustration was difficult to see around columns and desks in the library.

Figure 13



During the last stop of the tour, the lead narrator describes her memories of the neighborhood while AR images are projected on to a Heritage Trail sign.

CONCLUSION: ROOM TO GROW

Although the *Before the Bulldozers* augmented reality was disappointing, I was still impressed with the overall experience, because it introduced me to both a new local history as well as a new kind of place-based learning. The Smithsonian Anacostia Community Museum's tour app demonstrates several of the current challenges of outdoor augmented reality, such as unpredictable busy times and weather conditions. Although the app itself functioned effectively, the AR portions came off as gimmicky. Based off of the content I was able to access remotely from the Levine Museum *KnowCLT* app, I feel that it more effectively integrated augmented reality content into its program. Augmented reality technology is relatively common right

now and presents real potential for digitally restoring historic landscapes, but in practice, it must be used thoughtfully in order to effectively add to a narrative.

Augmented reality aside, my case studies illustrated other significant strategies for digital storytelling. Walking tour apps allow individuals to discover history for themselves, independently, and on their own time. Digital content facilitates the inclusion of many diverse perspectives within conversations about local history and memory. Rather than remaining permanent and unchanged like a physical historical marker, mobile apps can be consistently updated and adapted as researchers uncover new information and the public expresses feedback. The "comment and share" section of the *KnowCLT* app also demonstrates modern museums' understanding that the public can play an active role in sharing their local history. These kinds of apps encourage digital engagement with local history during the tour and beyond, creating long-term impact. Over time, I expect that traditional historical markers will continue to be updated with QR codes or information about supplemental digital content. History museums will likely continue to explore augmented reality as a tool for illustrating significant changes in neighborhood landscapes, especially because AR can gain the attention of news media (and folks interested in new tech). As museums attempt to connect to their local communities in relevant, accessible ways, digital walking tours can continue to provide innovative and immersive experiences beyond gallery walls.

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XIV

Museums, Virtual Reality, and Historical Context

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Museums are always looking for ways to integrate new engaging experiences into their galleries, often utilizing the latest technological innovations to entice visitors to learn more about the past. One emerging technology that may revolutionize how museums educate and present information is virtual reality. Virtual reality, or VR, is defined as "the use of computer modeling and simulation that enables a person to interact with an artificial three-dimensional (3-D) visual or other sensory environment" to "immerse the user in a computer-generated environment that simulates reality through the use of interactive devices."[1] These interactive devices most often include headsets with gloves or controllers. Examples of what we would consider VR have existed since the 1960s, with Ivan Sutherland creating the first VR head mounted display called the Sword of Damocles.[2]

By the 1990s, VR had reached a high point in popularity with the help of movies such as *Lawnmower Man* and the release of the first consumer VR headsets by video game companies Sega and Nintendo.[3] However, the high cost and graphical limitations of this technology demonstrated the impracticality of these early attempts at virtual reality. Computer images at the time had to "omit textures, color and lighting subtleties," creating images that were "so minimal that the end product [was] detrimentally reductivist."[4] As a result, virtual reality lost popularity by the start of the new millennium, once again becoming more science fiction than fact. When the company Oculus released their first consumer headset in 2012, VR became seen as a real possibility for public consumption. After the release of Oculus, the 2010s witnessed an explosion of new releases of VR headsets, including the HTC Vive, Playstation VR, and Samsung Gear VR.

As VR became more accessible throughout the 2010s, museums saw the opportunity to incorporate this technology into their galleries and education programs. Large institutions such as the Met, the British Museum, the Louvre, and the Tate Modern have all utilized VR to provide new experiences and educational opportunities to visitors. This paper will examine the various methods of how museums have utilized VR in their galleries and education programs in the years since the technology's resurgence. Particular attention will be placed on VR's ability to virtually recreate historic spaces, while also exploring how the technological advancements of VR help alleviate some of the common criticisms found with historical reconstructions, such as period rooms and living history museums.

One thing to note is that this paper will focus exclusively on VR and not augmented reality (AR) or mixed reality (MR) technologies. AR and MR involve placing "computer-rendered objects in the real world via a screen (or glasses or visor), and that object's three-dimensional coordinates

are supposed to be precisely calibrated within the real world."[5] An example of this would be *The Met Unframed*, an AR experience that allowed users to explore the Met's collection from their smartphones during its Covid-19 closure. Along with touring galleries and playing mini-games, the app allowed you to "'borrow' the artwork" and "place an image of a Met treasure into your own surroundings" through your smartphone screen.[6] Both AR and MR technologies are valuable tools to help museums present information and interactive replicas of museum objects to those unable to visit the museum. AR is utilized more as a tool to bring virtual museum objects into the visitor's real world, rather than transporting the visitor into a virtual world for that object. As a result, this paper will not explore AR and MR museum applications.

GALLERY RECREATIONS

One of the main types of VR experiences that dominate the museum field involves recreating a museum's existing galleries in virtual space, either with images of the galleries or full 3D reconstructions in a virtual space. Most of these experiences are extensions of already existing online "virtual tours" that make museum galleries accessible to those unable to visit the museum. While most virtual tours are intended to be viewed through a computer screen, some do offer VR support for those wanting to use their headset to get a closer look at the galleries.

An example of this can be found at The British Museum with their VR experience *British Museum React VR.* For this project, in partnership with Oculus, the British Museum took 136 high-resolution 360° panorama photos of its Egyptian galleries and combined them to allow visitors to travel through the galleries.[7] Included with this experience are "audio commentary from curators, text descriptions, and interactive 3D models of highlighted objects."[8] At the Australian Museum, the virtual tour of their First Nations exhibit *Unsettled* gives the option to view the galleries in an Oculus headset (Figure 1).[9] Adding to the immersive quality of this tour is the audio and multimedia content playing in real time as you move through the galleries. Including audio and moving visuals significantly adds more life and immersion to the tour, removing the silence and static nature seen in most virtual tours.

Figure 1

Screenshot of the Australian Museum's *Unsettled* virtual tour. Screenshot courtesy of the author.

Rather than taking 360° photos of their galleries, some museums build new gallery spaces in VR to virtually display objects from their collection. Examples of these virtual galleries can be found at "VR-All-Art," a company that specializes in building virtual exhibitions for art galleries, collectors, and museums. Instead of photographing existing galleries, VR-All-Art builds virtual recreations of galleries from the ground up. While most of these galleries are original designs by the company, others are cloned copies of existing real-world galleries. For example, VR-All-Art collaborated with the National Museum of Serbia to virtually recreate one of its galleries.[10] The exhibit space has already been used for two different exhibitions, demonstrating the benefits of utilizing these virtual reconstructions. Unlike the 360° photos of galleries, virtually reconstructing the gallery in this way allows the museum to reuse this template for any new exhibition. The objects and labels can be easily switched out for each exhibit, granting the museum more flexibility with how it uses the space.

LINEAR EXPERIENCES

Museums are also utilizing VR to create what can be described as "linear experiences." Rather than providing visitors a virtual space to move around in, these VR experiences play out as 360º films for the visitor to sit back and watch. The visuals for these experiences are often not grounded in reality and fully utilize the artistic capabilities of VR to transport visitors to other worlds. In 2021, the V&A Museum opened *Alice: Curiouser and Curiouser*, an exhibition that chronicles the history and influence of Lewis Carroll's classic *Alice's Adventures in Wonderland.* As part of this exhibit, the V&A created a VR experience called *Curious Alice*, where visitors are surrounded by "beautifully surreal Victorian-esque illustrations" of scenes and

characters from the story.[11] Visitors become immersed in Wonderland as they sit back and watch scenes from the popular story play out around them.

Another example of these VR films was created by the Louvre in 2020 for their Leonardo da Vinci exhibition. Titled *Mona Lisa: Beyond the Glass*, visitors don a headset and are placed in a dark space with various images of the Mona Lisa to give "a detailed view of [da Vinci's] painting processes and shows how they brought his work to life."[12] (Figure 2) A full body 3D model of Mona Lisa herself is then placed in front of the painting to demonstrate her positioning, clothes, and hair, details which are not as noticeable when viewing the piece in the galleries. The experience ends with the visitor being transported to a villa overlooking a landscape based on the background of the Mona Lisa and then fly over that landscape in one of da Vinci's flying machines. While these VR films do provide visitors with unique educational and entertaining experiences, they are limited by their lack of interactivity. The linear aspects of these films require viewers to stay mostly stationary, only moving their head to look around. By inhibiting the visitor's freedom to explore the virtual world around them, these programs miss out on engaging opportunities to help visitors learn more about their topics.

https://youtu.be/Au_UpzhzHwk

Figure 2: *Mona Lisa: Beyond the Glass at The Louvre: HTC VIVE ARTS*. A behind the scenes look at the creation of *Mona Lisa: Beyond the Glass* by HTC VIVE Arts.

HISTORICAL RECONSTRUCTIONS

Some institutions have used this technology to recreate historical settings for their objects, returning them to their original historical context. In fact, the first VR experience launched by the British Museum in 2015 placed visitors inside a Bronze Age roundhouse with 3D objects from the museum's collection, including gold bracelets and a bronze dagger. In an interview with the BBC, the museum's head of digital and publishing, Chris Michaels, stated that this experience "gives us the chance to create an amazing new context for objects in our collection, exploring new interpretations for our Bronze Age objects."[13] Unlike the linear VR films, this exhibit allowed visitors to move around and explore the roundhouse as they pleased. Interacting with them in their original context "further [enhanced] the real life experiences of these objects" to museum visitors, providing visitors with a better understanding of the Bronze Age.[14] The result not only provided visitors with more context for the objects, but also served as a way of "helping people to remember that what they are experiencing was actually real, a way of humanising history."[15]

In 2017, the Tate Modern released *Modigliani VR: The Ochre Atelier* as part of their special exhibition of Italian artist Amedeo Modigliani. In this experience, visitors were placed in a virtual reconstruction of Modigliani's last art studio before his death with over 60 objects and two portraits digitally recreated throughout the space. Placing these objects and portraits in this context allowed visitors to get a better understanding "about how Modigliani worked and details of his materials and techniques."[16] One of the best examples of a museum bringing context back to objects with VR historical reconstructions came in 2020 from the Grand Palais in Paris with *Pompeii: The VR Experience* (Figure 3). As part of their Pompeii exhibition, visitors don a VR headset that places them in the ruins of the House of the Garden in Pompeii. With the headset, they are able to switch back and forth between the present-day ruins and a reconstruction of the villa before its destruction 2,000 years ago. The faded and partial frescos become fully restored to their original splendor with furniture and artifacts placed around the room. Visitors are free to move around and interact with this space, creating a fully immersive environment that adds context to the ruins and the objects on display in the exhibition. All of these VR experiences serve as a proof of concept for the potential of VR to bring historical context back to their objects. However, criticisms of these types of contextualizing historical reconstructions may leave some museum professionals hesitant to see the potential of this technology.

https://youtu.be/Lx3yXysSHrU

Figure 3: *HTC Vive Arts - Pompeii, the VR experience at Grand Palais* A behind the scenes look at how the Grand Palais, Ubisoft and Gedeon Programmes created *Pompeii: The VR Experience*

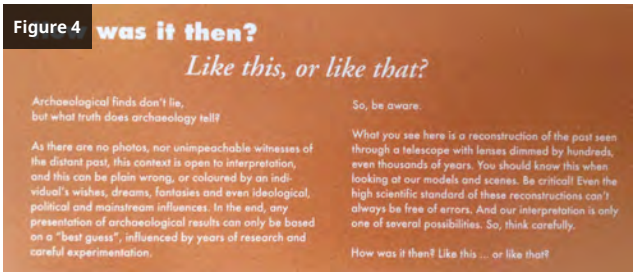
CRITICISMS OF HISTORICAL RECONSTRUCTIONS

Long before VR technology emerged, museums have utilized multiple methods over the past century to recreate historical settings and add historical context to their objects. The late 19th century saw period rooms emerge as "reconstructed historic interior[s] that [are] in some way representative of its past owner, era and/or region."[17] Objects in a similar artistic style as the reconstruction were then displayed in these rooms to provide visitors with historical context for the whole room. Around that same time, living history museums developed as "reconstructions of room settings or, usually, entire sites, including human beings within the displays to convey the human context as well as the physical objects." [18] These include sites such as Colonial Williamsburg, Old Sturbridge Village, and Greenfield Village.

For the past several decades, these contextualizing museum experiences have been severely critiqued by the museum field for their historical inaccuracies that give visitors a more fictitious view of the past. Period rooms have been referred to as "a form of fiction posing as history, for much of their fabric was 'made up' to fit the museums' needs" to display the objects.[19] Some scholars believe living history museums present historic generalizations that "creates a Disney-like view of the past - clean, sweet, pure."[20] To these critics, these types of installations can do more harm than good in trying to help visitors understand the past. VR has not been spared from similar critiques. As far back as 1997, art historian Rebecca Leuchak believed that VR reconstructions, like period rooms, were too heavily "constructed from the ideas and values of the present" to accurately depict the past.[21] More recently, virtual reconstructions of cultural sites have been critiqued for presenting a limited amount of knowledge, "as some of our cultural knowledge is neither ostensive nor directly tangible."[22] As a result, these virtual reconstructions cannot properly represent the cultures they are recreating.

The overarching idea with these critiques is that VR experiences will continue to perpetuate these historical inaccuracies and biases to museum visitors. In the case of real world reconstructions, critics tend to perceive "tourists as naïve and gullible," passively absorbing all of the information and "unable to critically evaluate heritage displays… and incapable of recognizing inauthenticity."[23] However, when Lara Rutherford-Morrison examined living history museums and heritage sites in the UK, she found that "tourists actively and critically engage with the heritage that they consume," demonstrating how museums tend to underestimate their visitors ability to understand possible inaccuracies within these reconstructions.[24]

One physical museum may offer a solution for how virtual reconstructions can help visitors understand these potential inaccuracies. On the shores of Lake Constance in Germany, the Pfahlbauten Museum, or stilt house museum, contains full reconstructions of Bronze Age stilt houses based on archaeological findings along the lakeshore. Amongst these reconstructed houses, a sign is posted on a wall that asks visitors "How was it then? Like this, or like that?" (Figure 4) The sign goes on to explain that "this context is open to interpretation, and this can be plain wrong, or colored by an individual's wishes, dreams, fantasies, and even ideological, political and mainstream influences."[25] They encourage their visitors to "Be critical! Even the high scientific standard of these reconstructions can't always be free of errors."[26] This transparency could easily be applied to virtual reconstructions in VR. Similar labels and warnings could be stated before a VR experience begins, with this text being the first thing that appears on the headset's screen. This allows visitors to understand the limitations of these immersive experiences while also giving them the opportunity to create their own interpretations of what they are seeing.



Sign detailing potential inaccuracies in the reconstructions at the Pfahlbauten Museum in Unteruhldingen, Germany. Photo courtesy of the author.

Critics are also quick to point out how period rooms and living history museums were heavily influenced by the politics and beliefs of their founders. Some of the most popular targets for these critiques are Colonial Williamsburg, founded by the Rockefeller family, and Greenfield Village, founded by Henry Ford. As a result, these museums "reflected deliberately conservative political and social views" that strived "to valorize a national past and reaffirm the values of a preindustrial heritage."[27] American period rooms in the late 19th century had roles "in furthering nationalist self-definition" and "to protect and strengthen native traditions and standards" at a time when millions of new immigrants were seen as a threat to America's cultural identity.[28] It becomes clear that the intentions behind the creators of these museums was not placed entirely on historical accuracy, but rather as tools to promote these traditional ideals. However, the VR experiences utilized by museums today are not created by the likes of Bill Gates, Mark Zuckerberg, or Elon Musk. Instead, museum VR experiences are done by museum professionals with museological and curatorial practices to build off of. All of the VR experiences and programs mentioned earlier in this report were spearheaded and finalized by the institutions they were serving. We understand how the values and ideas of the present can influence these reconstructions, and our jobs as museum professionals is to limit as much as possible their influence on the historical context.

Even if a VR experience turns out to contain historical inaccuracies, the technology behind VR allows museums to easily fix these problems than previously possible. If new information comes forward that differs from how a museum's period rooms or historic buildings are displayed, the museum must begin the long, painstaking process of redesigning the space. Labor and material costs for the renovations can also stack up as a project continues. When working with virtual spaces, this process overall becomes more simplified. Material costs are virtually nonexistent as everything will be done on computers. Any mistakes or errors that occur when creating the virtual world can easily be undone with a few clicks of a keyboard, while the real-world equivalent would result in major setbacks and delays. Period rooms and living history museums are also limited by the layout of the building or amount of space available to work with. VR, on the other hand, contains no such limitations and offers curators unlimited space to work with. Utilizing virtual spaces can also help preserve historic buildings and rooms when restoring them to a particular time period. For example, when Colonial Williamsburg was created, the year 1800 was established as the cutoff date for all structures in the museum.[29] This meant that everything on site built after 1800 was removed and all original buildings were restored to their 18th century appearance. This "selective preservation and restoration" resulted in removing newer historical elements from structures and designating these "excluded epochs as inferior and unworthy of attention."[30] On the other hand, virtual reconstructions would allow curators to recreate a building's 18th century appearance while keeping the physical structure intact for future research into its various architectural elements. In the end, the virtual world is significantly more malleable than our physical one, providing museums with unlimited potential to update and reinterpret these virtual spaces whenever necessary.

CONCLUSION

"The past is dead, and it cannot be brought back to life."[31] While written in 1974 by museum professional Robert Ronsheim, these words still ring true to those critical of contextualizing museum experiences. The historical inaccuracies and biases of period rooms and living history museums create a false sense of authenticity that makes it impossible to fully understand and recreate past structures. Virtual reconstructions in VR have faced similar criticisms. From recreating their galleries to artistic 360° films, museums have utilized VR to create a variety of experiences to engage with their visitors. However, one of the most significant potential applications for VR in museums is the ability to virtually recreate historical spaces. Despite the criticisms, VR offers museums the opportunity to take what they have learned from over a century of creating and interpreting historical reconstructions, combined with a technology with limitless creative potential, to create immersive, educational, and engaging experiences that can make the past feel more alive than ever before.

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XV

The Virtual Art Museum: The Potentials and Pitfalls of VOMA

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> *"I believe art should be for everyone. The internet is the most inclusive and democratic public space we have, and it's time we had a digital museum-style institution ready to inspire and connect online audiences with great art" Stuart Semple* [1]

The concept of a virtual museum is not new. In the late 1990's and early 2000's, museums began experimenting with online technologies, and some created CD-ROMs that contained a museum experience accessible from a person's personal desktop computer. For example, the National Museum of American Art began developing their CD-ROM in 1994. The goal of that project was to present "a rich portrait of American art in a social and cultural context - emphasizing NMAA as not only the leading repository of American art in the world, but also as a leading center in the research into and understanding of American Art in such a context". [2] In the last 30 years, technology has advanced far beyond the early iterations of the virtual museum experience. Through the case study of The Virtual Museum of Art (VOMA), this paper will analyze advantages and disadvantages of the virtual art museum model.

VOMA was founded by Stuart Semple, a multidisciplinary British artist working across painting, sculpture, happenings, technology and activism. He is best known for his sociologically engaged works that often discuss youth politics, accessibility and democracy.[3] Although Semple is the founder and actively involved in VOMA, the day to day operations are run by its Director, Lee Cavaliere. From 2007-2011, Cavaliere held the position of Senior Project Manager in Time-Based Media at the Tate. After that he was a freelance curator and art consultant, before launching his own non-profit, The Sixteen Trust in 2019. According to Cavaliere, "VOMA aims to become a hub for debate and discussion around innovation through the digital, to the end of expanding access, enabling new approaches. Through collective ownership, through innovation and debate, we can re-examine what a museum is, how it should work, what it should do."[4]

VOMA was at least partially funded by a Kickstarter campaign launched by Semple. As of October 25, 2022, the campaign had received £9,165 from 232 backers.[5] The museum "opened its doors" on September 7, 2020.[6] It claims to be the world's first entirely virtual art museum.[7] Though, this does not appear to be the case. One instance of a virtual art museum that existed before VOMA is The Kremer Museum (VR) experience, and consists of a collection of 74 Dutch and Flemish master paintings.[8] The museum is accessed through an app-download, and then a user can experience the museum through a VR headset.

Accessing VOMA is simpler. A prospective user simply visits voma.space, and clicks the "enter VOMA" button located in the top right corner of the webpage. No downloads

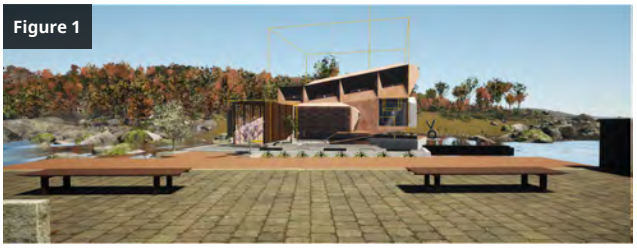
necessary. Upon entry, the visitor finds themselves facing the exterior of a building with a long hallway. The environment is carefully designed to evoke the feeling of autumn. The leaves are changing colors, and sound is incorporated to evoke the feeling of a cool, fall breeze. The environment surrounding VOMA seems to mimic the current season, suggesting the possibility that it may change alongside the external conditions. The hallway is exposed to the elements, and the illusion of natural light flows through the open ceiling. At the end of the hallway, you can see the entrance to a gallery, marked with a work of graffiti art by Banksy. To the right of the hallway is a courtyard that contains a small pond surrounded by floral landscaping. An added bonus is the inclusion of the sound of running water. The building itself exists on its own island, surrounded by water on all sides, with trees and mountains in the distance. It seems to have been built with the intention of evoking a sense of peace and relaxation.

Despite existing entirely online, Semple and Cavaliere made the decision to build a three-dimensional rendering of a museum "building". This means that at some point, the team behind VOMA must have realized the inherent importance of museum architecture.[9] VOMA's building was designed by Emily Mann, a graduate of The Bartlett School of Architecture. The structure of the building is modern in design, and terracotta in color. There are large windows that allow the everlasting "sunlight" to pour into the gallery spaces. The map is broken up into seven spaces: the Sculpture Pavilion, Shop, Gallery Zero, Charity Wall, Gallery One, Artist Space, and they even have a Café. Interestingly, there are benches scattered throughout the museum, yet there are no people or avatars present to use them.

According to Paul Jones and Suzanne MacLeod, museum architecture is always commissioned and designed with particular uses, users, and projects in mind.[10] So for what, who, and how is VOMA's museum architecture used? Jones and Macleod also acknowledge that museum buildings have been caught up in some of the most negative and oppressive aspects of the social world. They are a part of a system where social inequalities are normalized and social space is de-politicised.[11] VOMA's director, Cavaliere addressed this in an interview, where he said they are actively working against these assumptions:

> *"We started with the building. That was quite interesting because when you go to a museum, it tends to be this monolithic structure that, effectively, shouts down at you a little bit. We wanted to create something that didn't do that, and that was changeable. Our idea is that we are going to keep changing the building, and the landscape around it, which is a fun thing."*[12]

Figure 1



Exterior View of VOMA

With this museum model, you get a lot of the benefits of having a museum building, without the burdens of a "real" building. With a physical space, museums need to worry about rent, utilities, maintenance, general upkeep, etc.[13] After Amy Lee from the Arts Management & Technology Laboratory investigated VOMA, she noted that the architecture of the space the team behind VOMA created would be nearly impossible to create in person.[14] She also made the observation that new exhibitions can be showcased more easily and frequently because there are no concerns about space, transportation, or maintenance costs.[15] The team behind the museum has the ability to be agile, and change the environment to suit their needs.

However, there are costs and headaches associated with maintaining a virtual building. The site needs to be actively maintained in the code, otherwise users can experience 404 messages. As of November 8, 2022, when trying to access the information button in the bottom right corner of the museum, a 404 window popped up. This also occurred when trying to navigate the museum shop. This upkeep can be costly when considering the needed professionals and equipment. Also, there is the risk of loss of revenue, when users cannot access money-making links for the museum, like the gift shop.

There are many different objects on display in VOMA. There are graffiti works, oil paintings, sculptures, mixed media works, lithographs, frescos, photographs, music videos, and Youtube videos. VOMA is in a position where they are not limited by physical distance between artworks. They have the capability (if they have the access) to take artworks from separate continents and hang them on a wall next to each other. Semple and Cavaliere have created strategic partnerships with some of the biggest art museums in the world in order to "acquire" the artworks on display within VOMA.The Museum of Modern Art (MoMA) in New York City, the Art Institute of Chicago and

the Musée d'Orsay in Paris have been essential since the museum first opened.[16]

Not only are there many different types of objects on display, there are also artworks that span artistic periods, artists, and movements. In Gallery Zero, VOMA visitors navigate through the exhibition *Why We Shout: Art and Protest*. The exhibition has been curated by Caveliere and aims to prove that "at the centre of any moment of social change or dissent throughout history, you will always find artists."[17] In this exhibition, there are works of contemporary artists hung alongside museum pieces. In Gallery One, the works on display are much different. In November 2022, the exhibition is Degenerate Art, from the Nazi Party's 1937 exhibition. The more "classic museum" paintings in this space span 1908-1931, and many have come from MoMA.

The artworks are not simply photographed, then uploaded into the software. The partner museums send VOMA high resolution images of the artwork, and then the VOMA team creates 3-D reproductions. The result is a 360-degree object that has depth that a visitor can approach, walk around, and zoom in on.[18]

VOMA recognizes they have the opportunity to approach exhibitions a little differently than your "typical" physical museum. In many cases, Cavaliere and/or the staff have taken the time to do a virtual tour within their exhibition spaces. They use these occasions as an opportunity to explain their thought process behind the exhibition, and create an added layer of transparency. A great example of this:

https://vimeo.com/601714831

Figure 2: VOMA Director, Lee Cavaliere takes you on a virtual tour of VOMA

They record these occasions, presumably because they acknowledge that visitors will not always be available to participate at the time of the tour, but would like to watch at a later date.

The exhibitions may change within the "building", but they exist in perpetuity on their website. VOMA visitors can discover all past exhibitions on the website. As of October 2022, there are eight exhibitions visitors can visit from the past: *As We Meet*, *Breaking Into Color*, *Dani Marti*, *Reclaiming the Body*, *Martha Rosler*, Degenerate Art, *Bex Wade Dancefloors to Demos*, and *Art and Protest*.

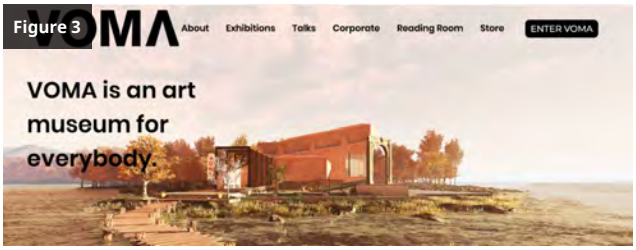


Figure 3

VOMA is an art museum for everybody

One thing that VOMA certainly delivers on is accessibility. When a visitor encounters the VOMA website, the first thing they see below the navigation headings is the statement "VOMA is an art museum for everybody".[19] Navigating the museum is pretty simple. There are white circles located on the floor, and by clicking on them, you move throughout the space. You can click directly on an object to have it enlarge on your screen. By clicking on the "i" next to the artwork, you can find the label. The label details who the artist is, the name and date of the work, what type of artwork it is/material it is made of, context, and an indication of where the original is located. Some labels give the user the option to listen to the label. There are a few labels that read the label in a different language (Spanish, and French for example), but there is no option to translate the text itself for the user to read.

An element that is lost in this virtual art museum world is scale. Deborah Kaplan, a docent from the Smithsonian American Art Museum, notes that we implicitly measure and assess the space and objects around us in relation to our bodies,[20] and we simply cannot do that in VOMA's space in the same way as we can in person. We can compare the size of objects in comparison to each other, but without knowing the scale of the building, it is hard to assume the true size of an object. When a visitor's body is in close proximity to a work of art that is immense, there is an interaction between that person and the object that cannot be replicated in interacting through a computer screen. A large piece of artwork in contrast to the body has power. It looms, envelops, or sometimes overwhelms.[21]

The museum is free to enter, and can be accessed by any of the 5.03 billion internet users in the world.[22] So who is

visiting this museum? As of January 2022, VOMA had been accessed by visitors in more than 60 countries. 50-60% of visitors are accessing the museum on their phones. One of their major audiences is 18-25 year-olds. 20% of visitors are repeat visitors. The time spent in VOMA was between 7-90 minutes. They even reach people in rural areas that may not live near any art museums.[23]

Stephen Conn in his book "Do Museums Still Need Objects?" states that he believes museums are places situated at the intersection of objects, ideas, and public space.[24] In many ways, VOMA could exist within this intersection, but it has not yet reached this potential. Their museum model uses objects from around the world to illustrate topical ideas. What is somewhat lacking is the inclusion of public space. Semple believes:

> *"A virtual viewing room can feel like a lonely place — quiet, empty, sometimes slightly uneasy. In building and curating VOMA, we wanted to get away from that feeling, which is not all that different from walking into a snooty, silent gallery space and feeling a bit self-conscious. We wanted to integrate the sense of community and buzz of going to a cool museum, where there are often so many different shows going on, and immersive or interactive experiences."*[25]

So he acknowledges that a virtual viewing room can feel like a lonely place, yet a VOMA user is alone throughout their experience. Through the statistics listed above, it is clear the site is reaching the sometimes-illusive gen-z audience that many other museums dream of having, yet there is no way for their social-media oriented psyches to react and respond to the space, in the space.

The role of the Café has the potential to fulfill the desire of visitors to interact with each other, but at this point appears to be largely ineffective. In this space, visitors can communicate with one another by leaving messages in different chats. There are different blurbs (shown in figure 4) that a user can send messages in, but there is no clear distinction for how to choose one blurb over the other. Perhaps if there were prompts to encourage conversation on a specific topic, the chat function could be more effective.

Figure 4

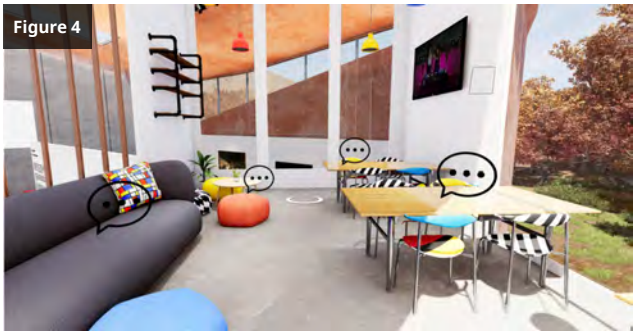
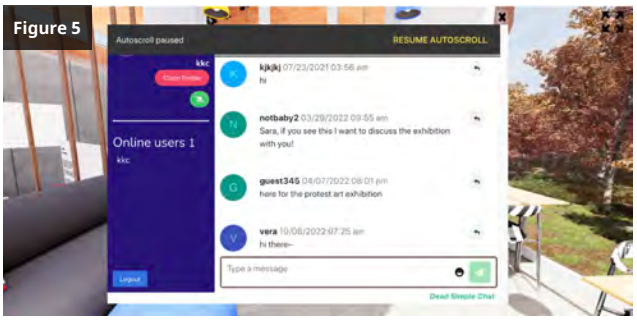


Figure 4: VOMA's Cafe

Figure 5



VOMA Café Chatbox

Although there are opportunities to interact with other visitors, the chats are segmented. It appears very rarely will you find yourself online in the same chat as someone who is also visiting at the same time as you. Figure 5 shows us just that. People haphazardly send a message to the chat, wanting to connect with others, only to have it left unanswered. The interactions as a result can hardly be called "conversations". The Cafe is also the area that the visitors finish their experience on, assuming they follow the natural flow of the space, and they see the experience through to the end.

Director Cavaliere is hopeful that VOMA can be a "listening post for developing culture. Culture and history are moving targets, and [we] must keep evolving with that."[26] Perhaps VOMA's next endeavor will help fulfill this need for a sense of public space. Creator Stuart Semple has released a youtube video describing "VOMAVERSE", created by artists, for artists to showcase their work. It seems like this iteration was due to launch in Spring 2022, yet it has not come to fruition as of November 2022.

https://youtu.be/-1-mfOdoNik

Figure 6: VOMA creator Stuart Semple announces VOMAVERSE

https://youtu.be/UGbmx6HC9Yc

Figure 7: Welcome to VOMAVERSE!

With the addition of VOMAVERSE, hopefully VOMA can deliver on the wants and needs of their audience, and exist in the intersection of objects, ideas, and public space.

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XVI

Trend or Emerging Medium? NFT's Impact on Museums

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When it comes to the world of art, the new, uncharted, and exclusive go to the top of the list. As creators expand the definition of art, incorporating digital mediums provides an opportunity to find success. Non-fungible tokens, NFTS, are one emerging way of buying and selling digital art that quickly rose in popularity to potentially transform the art world. Within museums, this new, uncharted frontier asks, how should museums adapt to include this form of blockchain art into collections? This paper will examine the history of digital art and connections to the current trend, the art world's adoption of NFTs, applications in museums, and the issues and limitations of NFTs. It argues that NFTs are an emerging form of digital art with the potential to benefit artists and enhance museum collections. However, museums may have concerns about copyright, provenance, and their long-term significance.

Within the topic of NFTs there are several nuanced issues that this paper will not address. For information on the far-right extremism prevalent on NFT trading websites please read the linked article. This paper will also not address the environmental impact of NFTs. Many of the articles referenced in this paper mention this in their research; Andrew Chow and Julia Zorthian talk about this on page 43 of their *Time* article "NFTs and the Crypto Art Revolution.

HISTORY & BACKGROUND

Academic research on NFTs is limited, and approaching the topic as a person without expertise in technology is complicated and nuanced. However, while popular discourse assumes the NFT market – and its associated discussions – are new, NFTs build on an existing framework for understanding digital art. Artists continually adopt new technologies, and museum collections serve as a resource in understanding how NFTs are connected to a history technology driven art.[1] Explaining the evolution of works with a technology-based medium aids in providing context as well as making them less intimidating. Looking at technology's impact on works over the last century, the new form of exchanging digitally-based is a natural next step in the art world's long participation in exploring a connection between technology.

In the second half of the 20th century, computer technologies and space exploration rapidly proliferated and popular culture reflected these advancements excitedly.[2] In the Buffalo AKG Art Museum virtual webinar with Assistant Curator at the Buffalo AKG Art Museum Tina Rivers-Ryan, "NFTs and the Future of Digital Art," a cultural imagination in the 1960s focused on the way future civilizations would live radically different lives, and the art of this time reflected the cultural shift and suited a new way of life.[3] At this time, an entire art movement

expressed the joint participation of the collaboration of engineers and artists. Within the movement of art and technology the idea of "computer art" emerged.[4] Artists began experimenting with computers to make art, most popularly, artists would write a software program, which generated an image and then output the image in one of two ways: send it to a plotter printer or a cathode ray tube screen and then photograph the screen.[5] The first computer generated images were works on paper exhibited in 1965, which is the first time the art world incorporated computers into this idea of art.[6] The idea of using both analog and digital machines to create art immediately captured the public imagination.[7] Museums caught on to these ideas and in 1968 ICA London hosted a major survey of art and digital technology called *Cybernetic Serendipity,* which explored the capabilities of computations using displays of computer generated art, computer sculptures, computer films, and computer music.[8]

The big story of digital art happened at the end of the millennium with the creation of the world wide web which allowed artists to collaborate globally, by sharing and making work using the internet.[9] In 1994, Douglas Davis created *The World's First Collaborative Sentence,* a collaborative web-based project anyone could contribute a sentence to by loading a website.[10] In 2012, The Whitney Museum of Art stepped up to steward preservation for the project and continues to exist in their collection in two versions: an archival and an active, which contributes to the project's continued existence decades later.[11]

https://youtu.be/63jxZqmZ0sE

Figure 1: Screen recording of Buffalo AKG Art Museum's *NFTs and the Future of Digital Art with Assistant Curator Tina Rivers Ryan* webinar. Includes information about the Museum's digital art collection, the history of digital art, and NFTs. Recorded by author December 13, 2021.

The art and technology world received little recognition after the early 2000s, and art trends focused on obsolete technologies until the introduction of the concept of NFTs in 2014.[12] The artist Kevin McCoy and technologist Anil Dash are responsible for the work Quantum (2014), "a block-chain powered way for artists to own and monetize digital work, which laid the groundwork for what is now called Non-fungible tokens (NFTs)."[13] While McCoy and Dash's work was not immediately popular, in 2017 more people became interested in the idea that blockchain-based tokens could be used as assets for buying and selling unique tokens.[14] The sector grew in popularity as more trading platforms emerged and ultimately reached its height starting in 2020 when the value of cryptocurrencies exploded in value.[15] As investors invested large sums of fiat currency into the sector, they realized one of the few things to do with cryptocurrency aside from trading NFTs.[16]

NFTs sit at an unexpected confluence of the worlds of art and technology. The technology seems almost purposefully confusing because it results from years of blockchain technology and cryptocurrency trade. Blockchain is a decentralized system allowing users to "share records and data related to transactions across a distributed, decentralized network, using encryption to ensure the data is secure and immutable."[17] Public ledgers are created from transactions, which allow users to remain anonymous while maintaining transparent transaction history.

NFTs are most commonly purchased using the breakout application from blockchain technology is blockchain currency, which is also known as cryptocurrency or crypto. In exchange for allowing their computers' incorporation as a pathway for distribution of blockchain computing, people are rewarded with "fungible tokens," a non-unique exchangeable asset.[18] The tokens are identical and interchangeable, equivalent to any government-funded currency.

The non-fungible tokens (NFTs) are a form of receipts used to transfer either symbolic or legal ownership over an associated digital asset.[19] Original artworks and parts of a limited series are both forms of NFTs, both relying on a unique identifier, similar to how those in the art world collect signed and numbered prints. The token itself usually doesn't contain the data that makes up that digital asset, it is purely a record of ownership and authenticity. The most important part of this token being "its existence on the tamper-resistant digital public ledger."[20] To save space and money on the blockchain, many NFTs contain a URL that points to the data "constituting a digital item being tied to the blockchain—if that link breaks, or the host account isn't renewed, you own … nothing."[21]

For clarity, an NFT is not artwork, rights to an artwork, or an exclusive version of a JPG. It *is* a unique digital identifier and metadata that is recorded in a blockchain, and that certifies authenticity and ownership and allows digital art to appear in this gallery's format, but remain secure. For the purposes of this conversation a complete understanding of NFTs is necessary, but it's easier to follow what is next with this information. Much of what now passes as cryptoart, a referring to the exchange erroneously suggests NFTs themselves are an artistic medium, which is ahistorical because NFTs are typically more reflective of internet culture than contemporary art.[22]

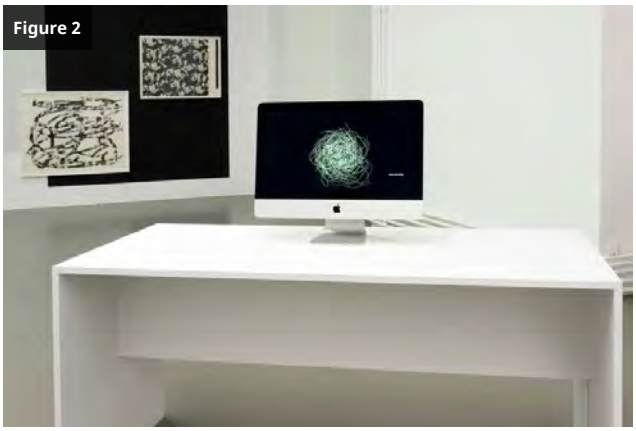
THE ARTIST, THE ART WORLD, & MUSEUMS' ADOPTION

Since the breakout of NFTs within the crypto world the traditional art world has moved toward adoption. NFTs offer the promise of greatly expanding the ability of artists to package conceptual or digital works in a way that more easily allows them to be bought and sold.[23] The secure digital format of NFTs offers the potential for museums to be alleviated from the labor-intensive process of provenance tracking. As curators move towards providing more digitally curated exhibitions, NFTs provide examples and opportunities in virtual gallery spaces. Together, artists and museums can work together to expand digital practices within the art world and find new ways for audiences to access art.

Optimists see NFTs as an opportunity for the artists not shown or exhibited in either the traditional contemporary art world or the digital art community to achieve success.[24] An example of a crypto artist is Andrew Benson, a Los Angeles-based artist, has been experimenting with psychedelic, glitchy digital video work for years; however, Benson did not have much success selling his work until a friend working for a NFT platform asked him to submit his digital work. While initially speculative, the artist agreed to send over a video. The piece, "which looks something like a kinetic, colorful Rorschach" sold for $1,250 ten days later.[25] After the success of his original sale, Benson sold ten more works in the same price range. The artist now is considering a future where he is sustained through his artistry, and has said, "Seeing this work find a context and a place where it matters makes me want to think like an artist more."[26] Hearing anecdotal success stories about living artists constructs an image of this technology being beneficial for living artists. Enthusiasts see a vast, unlimited future for living artists who can continue to benefit from future sales of their work, which frees them from the traditional means of buying and selling art where this is not the case.

Museums' serve their communities and foster diversity through their collections.[27] Within the many definitions of what exactly that means, one interpretation is supporting experimenting artists. Before NFTs were trending, museums supported the art community by purchasing the works. Artist Harm van den Dorpel sold minted editions of his work in 2015 and became the first to sell them to museums.[28] The Museum of Applied Arts, MAK, in Vienna, Austria acquired 20 editions of 100 versions for their collection.[29] Much like The Whitney Museum did with Davis's web-based project, MAK saw this emerging form of art as a stewardship opportunity and continue preservation of the works in their collections.

Figure 2



Harm van den Dorpel, 2015, *Event Listeners,* software. Courtesy of Museum of Applied Arts, Vienna.

In addition to purchasing from artists, museums are also taking existing works within their own collections and minting them for development. The Italian-based Unit museum sold "a hybrid offering of limited edition LED reproductions [of Unit's collection items] in period-style wooden frames, each accompanied by a unique NFT" as a major fundraiser for the institution.[30] The exhibition successfully made sales ranging from €100,000 to €500,000 per piece, with about fifty percent of sales proceeds going back to the licensing museums."[31] Typically, museums are restricted from generating revenue from selling off objects in their collections, but museum stores commonly sell off object reproductions for resources. As a result, Unit found freedom within the emerging technology as a way around museum restrictions. Profiting from the photorealistic LED reproductions in period frames was successful for the museum, but its implications for the future of digital collections is still unknown.

COPYRIGHT AND LEGAL ISSUES, PROVENANCE, & PRESERVATION (THE FUN STUFF)

While focusing on the positive aspects of NFTs creates the idea that this digital asset is both beneficial to artists and collectors, there are several concerns about NFTs. For one thing, in 2022, crypto does not seem to be a reliable investment. Because crypto art is closely tied to the rest of the crypto market, the value is dependent on the fluctuations of cryptocurrencies.[32] As institutions in the service of society, museums have a responsibility to invest in collection items that are likely to have long-term cultural value; something which cannot currently be said about NFTs. Nevertheless, the trend has not diminished completely and could see another spike in the future.

In a new market with few signs of stability, museum staff are also forced to establish their own policies and procedures. Each sale of an NFT is recorded on the blockchain's public ledger, which has the potential for museum professionals to precisely trace the provenance of each artwork.[33] However, because the token typically only contains record of ownership and not the data of the digital asset, "most of the assets they point to are not securely archived, effectively divorcing the concept of ownership from the responsibilities of stewardship and reducing it to bragging rights."[34] Within provenance tracking, museums require clear title and complete transfer of ownership to accept works. However, there are no determinations on its long-term success. Museums spent centuries growing the capacity to determine an object's authenticity, and have an obligation to maintain public trust, whereas, "NFT minters are under no such obligation to explain why they issued an authenticator for a piece of work."[35] Museum professionals, who typically are not crypto experts, then are still obligated to investigate each transaction and research the provenance of each work. Museums are also risking losing the public trust by acquiring works from sources not yet proven as trusted.

One solution museums have begun to establish as a solution is a separate written document, which could integrate into NFTs as a standard requirement for minting a work.[36] The document, called a smart contract, should "properly indicate the code comprising NFTs provides the barest of foundational structures" containing simple descriptions and mandatory language.[37] Currently, the data encrypted into an NFT is limited to the title, the creator or minter of the NFT, how many NFTs with the same content exist, the functionality facilitating the recording of transactions of the NFT, a link to the content, and a built-in resale royalty, which is contingent on the future transaction occurring on the same marketplace.[38] Articulating in a separate document mandatory language around how a creator's work is to be viewed, displayed, sold, maintained, and generally used alleviates some worries around authenticity, because of the limited content and function of NFTs.[39] Before contracts are written, the collecting institutions and creators need to fully understand NFTs, the limitations, and copyright laws to then have clear procedures and standardized documents in place; simple, right?[40] The best option currently is specifically drafted agreements tailored to each individual NFT and attached to the NFT the same way that the files that constitute the artistic content are attached.[41] Nonetheless, if the solution is separate documentation to prove the authenticity of an NFT, which an NFT supposedly is already, then the asset becomes convoluted.

Another concern associated with legal ownership is copyright infringement. The Rijksmuseum in Amsterdam provides open access to their collections and encourages audiences to download the images.[42] With their decision, the museum gained a global audience, infinitely larger than what they could support using their physical space alone. Unsurprisingly, works from the Rijksmuseum collection have been found on NFT Marketplaces. A group calling itself *Global Art Museum* unveiled a collection of NFTs based on paintings from famous institutions, including the Rijksmuseum.[43] By taking images from the museum's digitally available collections, the group minted blockchain versions of them. The language they used in the listing suggested the museum authorized the group and proceeds benefited the museum, but the institutions had established no partnership. While the Rijksmuseum does not require permission for creative uses of its collection, other museums do not take the same stance and have to contend with the same infringement opportunities.

When copyright infringements do occur, enforcing intellectual property rights for works on the blockchain is a bit more complicated.[44] Normally, if there is an infringement concern regarding information online, the copyright holder can submit a take-down request to the web hosting service. If the request is granted, the web hosting service simply removes the content from their servers. NFTs are coded into a decentralized system, the entire network needs to be re-coded, which is not as easy.[45] Standards and protocols are still in development, but until the articulated agreements and case laws happen, there are no reliable remedies.[46]

While becoming popular, others are worried about access to this world and long-term value of the asset. Many artists of color and women artists already feel disadvantaged within the art field and some see the process of minting as a barrier. For some artists, the most difficult part of the traditional art world is the need for artists to have galleries or a mediator in order to become successful. NFTs are marketed as egalitarian, freeing artists to sell directly to consumers, and no longer need the specific pedigrees to create a career for themselves. Artists can make their art freely accessible on the internet while still monetizing it, like the artist Andrew Benson whose art is linked above. The potential accessibility is an interesting value congruence with museums as collection digitization becomes popular in the field.

Opponents also argue against NFTs' ability to provide opportunity to new artists. Itzel Yard, a Peruvian artist, points out "White men have the advantage from the start in crypto; it's obvious that they're the first to build up the space."[47] As the digital asset moves toward mainstream adoption, there is a lack of balance between those focused on accruing wealth and those focused on equality. Most NFT collectors seem motivated more by financial opportunity or fandom than by connoisseurship and appear unaware that digital art is an expansive field with a decades-long history. Yard agrees, "There's a lot of collectors that think about this as a business and they see white men as the more secure investment."[48] Much like the traditional art world, the safest art investment is big-name, white, male artists and the vast majority of the market is limited to selling works for under $100.[49]

One of the reasons white men seem to always have been an early-adopter of technology is the financial barriers to enter. It costs money and requires tech savvy to sell an NFT, which could prevent some creators from joining in on the action. Many believe young artists of color in particular will be left out, as they have long been marginalized in the traditional world of art.[50] While Yard has risen to become a success story in the digital community overwhelmingly populated by white men, she advocates for others who have already hit the glass ceiling. As many cultural heritage institutions are concerned with issues of accessibility and representation, considering how NFTs reinforce systemic inequality is important.

DOES THIS TECHNOLOGY MAKE THE WORLD BETTER?

While museum's wrestle with finding the best way to serve their communities and democratize their collections, NFTs offer a potential solution. From displaying digital art in gallery spaces, to monetizing the museum's collection, museums are going to continue learning more of the possibilities of NFTs. Artists, too, are learning about how to find success on the blockchain. Joining together with the finance and technology worlds, NFTs are a new and vast investment. The potential impacts of NFTs in museums is vast as the traditional art world integrates blockchain technologies.

Ultimately, the technology itself is not harmful; mediums are merely an extension of ourselves. The result of this technology simply expands the limitations of humanity. In this way, NFTs are exposing a disconnect between museums, the art world, and the field of technology. While trying to integrate contemporary art, museum staff must make decisions about emerging issues such as NFTs and see if there is some way to transform this commodity into a collection item that reflects the values of the institution, meets the legal and ethical standards, and holds long term value in terms of community accessibility. For now, any claims about long-term effects to the art world can only be speculative, but as NFTs become more common, museums need to create a set of standard practices and procedures to address emerging issues. Most importantly, museums have the opportunity to influence best practices and standards in the NFT field.

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XVII

Embracing Digital Volunteering Through Crowdsourcing

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Across the world, 2020 was an extremely difficult and unpredictable year as COVID-19 became a global pandemic; the cultural sector was no stranger to the hardships being faced. A UNESCO Report outlined that 90% of museums had to close their doors during the pandemic.[1] Most museums experienced a drop in their volunteer numbers, the effects of which continue to be felt even after the return to in-person activities.[2] In order for museums to maintain engagement and relationships with their communities throughout the pandemic, there was an increased turn toward digital opportunities. Museums have reported that understanding of the value and uses of digital technology shifted within their institutions during the pandemic.[3] Although the pandemic created enormous hardship, it did provide the push that many museums needed to consider new strategies, their relevance, and how they could grow through digital experiences.[4]

As museums shifted to the digital world, so did their volunteers. Although in-person activities were no longer running, volunteers still wanted a way of supporting their museum. In addition, because so many people were stuck in their homes, people who may not have ordinarily volunteered joined the efforts in order to have something to occupy their time and be a part of.[5] A report by VolunteerMatch found that, across all fields, participation in virtual volunteering opportunities experienced significant growth during the pandemic, increasing from 17%-29% between July and October of 2020.[6] The pandemic generated a rise in the public's interest in engagement through digital experiences and platforms. In the wake of this surge in the use of digital platforms and technology, there is the opportunity and desire to offer more digital volunteer opportunities. This paper will explore crowdsourcing as an effective means of participation and engagement in an increasingly digital world.

WHAT IS CROWDSOURCING?

One area of digitally enabled participation that grew during the pandemic was crowdsourcing. The term crowdsourcing has floated around the internet for some time now, but what exactly is it? Crowdsourcing in the cultural heritage sector is a form of participation where the public engages in projects related to cultural heritage collections in a digital setting.[7] Volunteers perform various tasks such as transcribing (transforming digitized images of written text into typed text), reviewing (checking the work of other participants), tagging (adding descriptive, identifying words to an image or document),[8] cataloging (creating digital records for collection objects), creating content (ex. writing articles), correcting content (fixing the mistakes from computer generated transcription), and more.[9]

One of the more prevalent tasks in Cultural Heritage Crowdsourcing has been transcription, therefore it will be presented to a greater extent in this paper.[10] An early success in the Gallery, Library, Archive and Museum (GLAM) sector's adoption of crowdsourcing was *Old Weather*, which had volunteers transcribing weather observations found in ship's logs from the 19th and 20th centuries. It was a collaboration between multiple institutions that began in 2010 on the *Zooniverse* platform (a website where many institutions can host their projects), with the goal of improving knowledge of the environment historically.[11] In 2013, the Smithsonian created the *Smithsonian Transcription Center* where, as of March 2022, volunteers have transcribed over 1,000,000 pages of digitized historical documents.[12] The center includes an array of projects to work on such as transcribing the work of the Harvard Observatory's women computers.[13] In 2018 the Library of Congress' transcription project, *By the People* launched. The platform includes many "campaigns" to choose from, whether that be writings related to Clara Barton, founder of the American Red Cross, or African Americans in military service.[14] You can learn about more projects on Non-profit Crowd's "*Directory of Crowdsourcing Projects*."[15]

THE BEGINNINGS OF CROWDSOURCING

Crowdsourcing may seem like a new advancement brought on by the internet; however, evidence of crowdsourcing can be found long before the digital realm was even a possibility.[16] Work we now call crowdsourcing—coined in a Wired Magazine article in 2006—[17]was being done as early as the 19th century,[18] and arguably before that in the 17th century when scientists would gather collective data to form theories.[19] Even in the cultural heritage field, crowdsourcing began as something separate from the internet,[20] but when the term is used now[21] and throughout this paper, it generally refers to the work undertaken digitally.

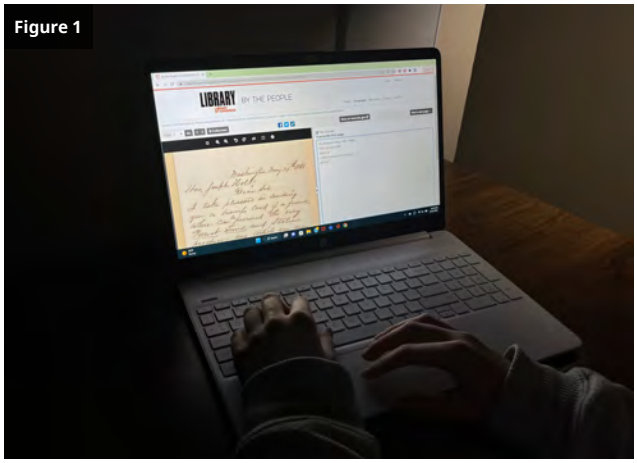
Modern crowdsourcing came about with the creation of online platforms and a shift from viewing the use of internet technologies as a way of seeking information to a means of public participation. This shift resulted in a new phase of the internet known as Web 2.0.[22] In the cultural heritage sector a movement began to try crowdsourcing as a means of increasing access and improving the quality of collections.[23] Around 2010, the use of crowdsourcing in the sector began to take hold with successful projects like Old Weather. The field has continued to grow significantly since the mid-2000s and although crowdsourcing may still seem like a relatively new digital opportunity, it is already an established method for participation and engagement in the GLAM sector.[24]

WHY CROWDSOURCE? THINKING BEYOND THE PANDEMIC

We are at a moment in the GLAM sector when many institutions have digital opportunities on their mind. COVID-19 marked a shift within institutions from hesitancy and disconnect regarding the benefits of digital initiatives, to a sense of necessity.[25] The benefits of crowdsourcing reach well beyond the span of COVID-19 and the halt of in-person activities. So before jumping into the world of crowdsourcing it is important to know the "why." Why invest in crowdsourcing? What can it do for the institution and its publics?

An important advantage of the digital platform is the increase in accessibility and diversity. With digital platforms people can volunteer without having to commute,[26] which means that volunteering is not limited to individuals in close proximity to the institutions, allowing people from across the world to participate by volunteering. People can work with GLAM institutions from different locations or time zones and are free to contribute to projects based on their passions. Additionally, digital volunteering provides the volunteer with agency over when they engage with the projects. Without the constraints of museum hours, volunteers are free to work on projects at any time and for however long they would like. Individuals with disabilities or caregiving responsibilities that prevent them from participating in person are now able to volunteer.[27] Surveys conducted in the U.S. and U.K. showed "a rise in engagement with less traditional and more vulnerable audiences" when museums increased digital opportunities for engagement.[28] During the pandemic, museums saw more people take an interest in digital projects, specifically those of a younger age such as students,[29] a change from the average museum volunteer of an older demographic.[30] These changes are beneficial to museum volunteers and to the museums themselves as their goals should include increasing accessibility and diversity within their institutions.

Figure 1



Transcribing for the Library of Congress' project, *By the People*, at night (Photograph by Rachael Price, November 2022)

The advancement in diversity and accessibility also extends to museum collections. Crowdsourcing projects at their finest involve the participation of many voices from diverse backgrounds. It is possible to help fill in areas where diverse knowledge is lacking within a collection and/or an institution, by creating projects where a diverse community can contribute their knowledge.[31] In "Participatory Design and the Future of Museums," Nina Simon remarks that a participatory museum "invites visitors to respond and add to information about cultural artifacts, scientific evidence, and historical records on display" and "showcases the diverse creations and opinions of non-experts."[32] In 2017 the Food Museum began *Search for the Stars*, a project that asked the community to help digitize their collection, but also to help them find their "stars"—objects in the collection that volunteers think should be given more attention.[33] In doing so, they are giving their community a say in the exhibits and expanding the ideas and voices of the museum beyond its staff. The work of crowdsourcing projects can also increase the accessibility of collections by improving search and generating researchable data. On the Library of Congress' crowdsourcing platform *By the People*, volunteers transcribe handwritten documents into text and create tags, so that both the handwritten and transcribed text can be more easily accessed.[34]

However, it is still important to remember that the internet is not the democratic place that many had hoped it would be at conception.[35] There are dominant voices on the internet, and we must be careful that they are not the only representation in these projects.[36] Crowdsourcing does not inherently provide solutions to access and diversity, but if projects are created with specific values and audiences in mind, and with carefully considered choices in their design,[37] then it is possible to see improvements in those areas.[38]

One of the goals of crowdsourcing has been to provide greater access and opportunity to engage with museum collections, but this is also one of the benefits of the process itself. As Trevor Owens puts it:

> *The process of crowdsourcing projects fulfills the mission of digital collections better than the resulting searches. That is, when someone sits down to transcribe a document they are actually better fulfilling the mission of the cultural heritage organization than anyone who simply stops by to flip through the pages.*[39]

When volunteers work on these projects, they are engaging with collection materials in a way that is more impactful than typical exploration. As volunteers read and decipher written text, brainstorm the best tags, or input data for an object, they are having an intensive moment with a collection. This engagement with the material can lead to such wonderful things as joy, fascination, and curiosity.[40] Crowdsourcing volunteers might even do their own research on the topics to better understand the material they are engaging with, or out of sheer curiosity. One post on the *By the People* community page, *Crowd*, details the fascinating journey undertaken by volunteer transcriptionist Charles Trentelman as he connects Teddy Roosevelt, the Pan-American Exposition of 1901 in Buffalo, N.Y., and the assassination of President William McKinley all from one letter in the Roosevelt papers. He finishes the post saying that he's "been tingling for the last hour at all the connections in this one simple letter."[41] This is not just the typical consumption of information that would ordinarily happen when the public searches the collection,[42] it goes much further in promoting curiosity and engagement.

Another benefit of crowdsourcing is its ability to empower people and foster greater trust. By way of these projects, GLAM institutions are essentially reaching out and asking for help; they are asking the public to join them in work that would have ordinarily been kept to staff. In doing so, there is a shift in the traditional structures of power that brings staff, volunteers, and researchers together in a way that positions them more as equals.[43]

Figure 2

Collection of screenshots, various news sources reporting on institutions asking for help with their crowdsourcing projects, November 2022

This is a very powerful change when for a long time, and still today, these institutions have been seen as all-knowing, all-powerful, and often unapproachable. Being trusted with this work,[44] and having the opportunity to help form the historical record,[45] can be empowering for volunteers. Additionally, this shifting relationship, and the greater involvement of volunteers in the work of the museum collections, works to build greater trust. Institutions, in opening up their work and processes, are creating an opportunity for the public to criticize the work and suggest improvements, which builds a new level of trust between them.[46]

THE SUCCESSES OF CROWDSOURCING

Through the work of past and ongoing crowdsourcing projects, we can begin to understand how to make future projects successful. The visibility of crowdsourcing may be growing because of the pandemic, but there have been many institutions and people working on previous and ongoing projects over the last two decades that have valuable insight.[47] As more GLAM institutions consider crowdsourcing, it is important that it does not become just about going digital, but about creating effective projects. It is extremely worthwhile to look to previous work as a source of guidance.

When developing and running a crowdsourcing project, it is important to keep in mind that volunteers need to know they are making a difference. A major motivation volunteers list as to why they get involved is the ability to do something for the greater good,[48] something that will help further knowledge.[49] Therefore, volunteers feel more valued and are more motivated when they know their work is being shared and used,[50] and, more specifically, when they know how it will be used.[51] The *Old Weather* About Page explains that volunteering for their project will help climate scientists learn about past weather and sea-ice conditions, help historians study the course of voyages, and may even lead to entirely new discoveries.[52] This lays out for volunteers exactly how their work will be used and create an impact. Another consideration is that volunteers are more interested in working on crowdsourcing projects if the institution has adopted efforts toward open access.[53] There are many ways of defining open access, but in this context it can be understood as removing restrictions from public domain materials and allowing copyright materials to be used under fair use.[54] As mentioned before, volunteers often participate because of their desire to do something that will benefit others, so the more an institution can incorporate open access, the more volunteers will be drawn to them. Volunteers want to give their time to a project where everyone will be able to use the information and data that they are working to produce.[55]

Through these projects, institutions should be establishing mutually beneficial relationships with the participants.[56] It is important that both volunteers and GLAM institutions are getting something from the project and that it is truly a collaboration.[57] Institutions must ensure the line between exploitation and providing people with valuable experiences is not crossed.[58] One of the benefits of crowdsourcing is the ability to empower volunteers and form trust, but this involves truly working with volunteers. When the Getty Research Institute launched their project *Mutual Muses* (a project transcribing letters connecting the lives of Lawrence Alloway, art historian, and Sylvia Sleigh, feminist artist) they realized users have the best understanding of how to make improvements to areas such as workflow and support and learned the importance of participant feedback.[59] Taking into account volunteer suggestions and findings establishes a positive relationship between institutions and volunteers.

Another important aspect is the establishment of a space for community and discussion. This provides a way for volunteers to ask questions and give feedback to the institution. Furthermore, if you supply a space for volunteers to share and help others, they will create an amazing sense of community.[60] On *Crowd*, there are endless threads consisting of volunteers asking one another for help, discussions about interesting finds, and interactions with Library of Congress staff.[61] People crave connection and a sense of community, and this is no different in a virtual space. Having a place where volunteers can share their thoughts and connect to others is important in creating a sense of community and a way of reaching out to those running the project.

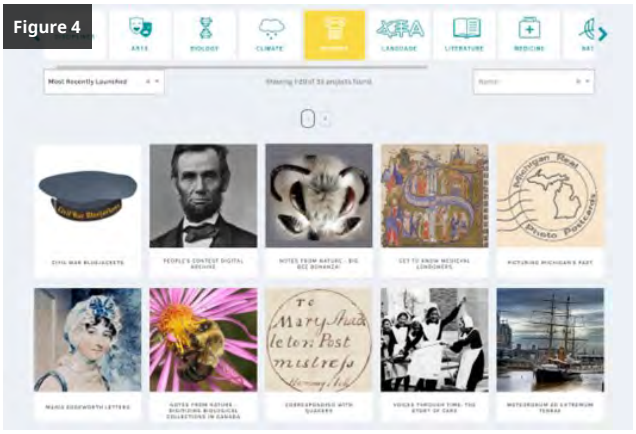
In designing and implementing a crowdsourcing project, institutions should always consider how their choices impact the ease of participation. These choices can be everything from the layout of the platform to when and how you add new material. For example, one decision that increases participation is allowing volunteers to use the platform without having to create an account, removing a key barrier to engaging.[62] Both the *Smithsonian Transcription Center* and *By the People* allow anyone to transcribe without registering. They still maintain accuracy by reserving reviewing for those with an account, but there are no barriers to initial participation.[63] Platforms have also made participation easier by providing ways to jump right into the work from the homepage. The New York Public Library's *What's on the Menu?*, where volunteers transcribe historical menus, has a spot on their homepage that says, "Help Review," which, when clicked, takes volunteers to a random page to begin working.[64] This makes beginning to participate simple and enticing because of the randomness and element of surprise.

Figure 3

Screenshot of the "Help Review" button on the *What's on the Menu?* homepage, November 2022.

When looking at successful crowdsourcing you will also find that some projects can be browsed by themes, allowing volunteers to more easily find material of interest to work on. On the *Zooniverse projects page*, volunteers can sort projects by subjects such as nature or history depending on their interests.[65]

Figure 4



Screenshot of the Zooniverse project page, November 2022.

Another consideration is when and how you add new material to the platform. When running their crowdsourcing project, *Mutual Muses*, the Getty Research Institute determined that there was a correlation between spikes in transcription rates and their release of new content, which they always tweeted about.[66] It follows that notifying your volunteers when you add more material reengages them with the platform. However, this means that the time you upload and notify your volunteers will affect what demographics you are reaching.[67] These small decisions can have unintentional but impactful implications on participation in your project.[68] Therefore, it is imperative to consider the impact your decisions can have, beginning with the initial design process.

TESTING THE WATERS WITH HOST PLATFORMS

Although some of the more well-known platforms for crowdsourcing are run solely for individual institutions, there are a growing number of platforms hosting spaces for the crowdsourcing projects of multiple institutions. Platforms such as *FromThePage*, *DigiVol*, and *Zooniverse* allow institutions to create projects using an established site, cutting down on the staff, time, and resources that would be needed to set individual sites to support their projects. The existence of multiple projects on one site also means that volunteers can be shared and combined to digitize large amounts of data.[69] In utilizing these platforms, museums are gaining new volunteers that were already on the site and bringing their own community of volunteers to other projects. Volunteers are then able to discover new institutions to engage with, and the institutions gain volunteers that may not have previously known of their existence. Although these platforms have

their limitations and difficulties because much of the design is outside of the institution's control, they can be a great place to explore crowdsourcing before creating a platform specifically for the individual institution.[70]

Within the GLAM sector, smaller institutions have a lot to gain from this form of digital volunteering. A lack of resources and acclaim means that they rely more heavily on volunteers, may receive fewer visitors, and have a narrower visitor demographic. Crowdsourcing work is a great way to expand their volunteer network given the increasing accessibility and potential to reach a worldwide set of volunteers. Smaller institutions are also generally farther behind when it comes to providing digital access to their collections, making crowdsourcing extremely beneficial. However, we must remember to maintain a mutually beneficial relationship and not fall into the trap of thinking about it through a lens of outsourcing.[71]

CONCLUSION

The push of the pandemic turned a spotlight onto digital initiatives that is unlikely to fade. People have grown accustomed to the increased digital access to museums that has been provided, and museums cannot turn back.[72] In her article "How the Pandemic Changed Museums Forever (or Did It?)" Rachel B. Levin says that "the museum visit of the future will likely be one that straddles both in-person and online realms."[73] In the coming years, more museums will start diving deeper into the potential of digital platforms, with crowdsourcing being an important contender. Crowdsourcing is extremely beneficial for GLAM institutions and their communities because it can expand demographics, increase diversity and accessibility, empower and build trust, and allow for deeper engagement with collections.

Crowdsourcing, like much of the work done in the museum tech field, may feel like a recent development, but this is not the case. There is now extensive literature, the precedent of successful projects, and the vast knowledge of museum tech professionals to learn from.[^75] As museums feel the pressure to provide these opportunities, it is important they take the time to seek guidance from the work that has already been done within the field.

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XVIII

The Value Proposition of 3D Scanning

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In 2017, The British Museum uploaded the first complete 3D scan of the Rosetta Stone, allowing anyone worldwide to view and manipulate the ancient artifact from their computers. Published on Sketchfab, a 3D modeling platform website to publish, share, buy and sell 3D models, viewers now had free access to a high-resolution model of the stele, 218 years after its original discovery.[1] Articles about the upload included phrases like "You no longer have to visit the British Museum in London to see the Rosetta Stone."[2] As of November 2022, the object has been viewed on Sketchfab 380,000 times and downloaded 7,600 times.[3] Comparing those numbers to the recorded 5.9 million visitors the British Museum had in 2017 alone, it is safe to say that visitors were still coming through the doors.[4] As technology has progressed, it has become commonplace to find 3D objects like this embedded all across the web, enabling it to be seen far beyond the Sketchfab original.

Digitization projects like this are now a standard part of museum practice. Digitization is the process of creating a digital representation of an analog object.[5] Since the 1960s and the creation of the Museum Computer Network, one of the primary goals of digital collections has been to share knowledge virtually between institutions.[6] With public access to the internet, these collections became accessible beyond the researchers and management of museum staff. Digitization of 2D objects such as paintings and manuscripts can often be accomplished with cameras or document scanners. 3D objects, however, like the Rosetta Stone, require additional technology to capture and store the extra dimension.

The process of 3D digitization is accomplished with 3D scanning. A relatively new technology, 3D scanning emerged towards the end of the 20th century. The first 3D scanner was created in 1960 and used projected light to capture objects without color.[7] The process was long and it struggled to achieve a high level of detail. In 1985, advancements in technology saw the use of lasers that could more quickly and accurately measure and capture details, including color.[8] These new scanners were deployed in the industrial and animation fields with the first capturing measurements of physical spaces and the latter capturing human figures. Companies such as Faro and Cyberware Labs were integral in making the technology more affordable in the late 1990s, allowing the technology to enter more fields.[9] 2012 saw 3D scanners receive attention from museums with publications such as this one from Museums and the Web commenting on the "multitudes of opportunities ripe for exploration" within the museum space.[10] Since then, 3D technologies have become a major talking point in the digitization of museum collections.

FOR YOUR CONSIDERATION

With so much advancement in such a relatively short time, the market for 3D technologies has never been larger. A variety of factors can determine what technology is best

suited for a specific museum's work. In terms of the collection, the scope of the project, both in terms of the size of objects as well as the number of objects awaiting digitization. Equally important are the material makeup of the object and the desired final product.[11] For museum logistics, the choice may be determined by the price of the technology, which includes both hardware and software. Museum staffs vary widely, so hiring or training skilled professionals can shape a decision. This is by no means an exhaustive list to consider, but it provides the context for the following capturing technologies most deployed in museums.

STRUCTURED LIGHT SCANNING

Structured light scanners combine a camera, projector, and computer software to create 3D objects with both depth and color. They are typically either held in the hand or mounted on a tripod. These systems project a series of grid patterns and colors onto the object, using a dark background to identify the object's edges.[^12] The software then uses trigonometric data based on the fixed position of the projector, camera, and light bouncing off the object to create a 3D object file.[12] In general, structured light scanners are fast and can even be used on live subjects with minimal risk (compared to lasers). These scans can be incredibly detailed, but the light-based nature can lead to struggles with clear or reflective surfaces.[13] The common need for an object to be rotated in place without moving makes this technology best suited for collections that have multiple objects of similar size and material. The learning curve in structured light scanning comes in the fine-tuning of settings within the software to obtain the ideal scan. Other considerations include the need for a space for the components to be set up, the ability to control light in that space, and having a computer powerful enough to process the data. Structured light scanners rarely exceed $30,000 and highly effective scanners can be purchased for as little as $699.[14] Increases in price typically account for the accuracy of the camera and the effectiveness of accompanying alignment software.

LASER-BASED SCANNING

Laser-based scanners come in handheld and mounted forms and measure by projecting a line that has a definite length. This line is used to trigonometrically calculate the shape of an object while cameras on the device capture the color.[15] These measurements are recorded as a point cloud and texture map that can be used to assemble the object in 3D space. The nature of laser scanners leads them to struggle with reflective and transparent surfaces, as the measurements are based on the reflection of light.[16] They are incredibly fast and mobile, making them suited for scanning large objects that cannot be easily moved. Prolonged exposure to lasers can be harmful to body parts like the eyes, making them a potential hazard to living subjects. Laser scanner prices typically fall within the range of $200 to $50,000, with accompanying software on a subscription.[17] As the price increases so do the accuracy and range of the scanner.

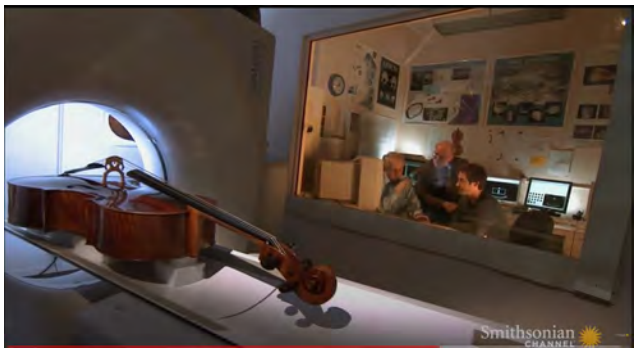
PHOTOGRAMMETRY

Photogrammetry is the process of creating a 3D model by taking images of an object and using overlapping points and mathematical angles to align the photographs.[18] This is the process that the British Museum used to create the Rosetta Stone object.[19] The software can use data from the image to rapidly stitch together thousands of images into a single, cohesive model. Depending on the quality of the camera, models created with photogrammetry can reach an incredibly high level of detail, though they may lose out on depth and texture relative to the number of pictures taken. Photogrammetry can be used on objects of any size including entire buildings, though this may require access to a camera mounted on a drone or aircraft.[20] Scanning museum objects with this method is usually accomplished with a high-resolution digital camera, but even a standard smartphone camera can create a 3D model with little to no additional cost. As with other scanners, reflective objects can create glare that negatively affects results, but the use of a polarizing lens can reduce this.[21]

https://youtu.be/aTpmESD-zrU

Figure 1: A YouTube video from the University of Michigan College of Lierature, Science, and the Arts showcases how students used photogrammetry to further paleontological research. Posted December 10, 2018.

One parallel of photogrammetry is a computerized tomography or CT-Scan. The process involves the use of stitched x-ray images to create a 3D object.[22] This type of scan requires technology ranging in price from $50,000 to $2.1 million.[23] The machines are primarily medical tools, making them rare to find directly in museums. CT-Scans have been used by natural history museums around the world to create images of mummified remains without having to unwrap them. Other delicate objects like ancient pottery and glasswork can be viewed inside and out with little to no risk to their safety.



https://youtu.be/JJZ7iZQVBe4

Figure 2: A YouTube video from the Smithsonian Channel that shows researchers using a CT Scanner to scan and measure the internal dimensions of string instruments. Posted November 17, 2017.

In addition to scanners, when working with 3D models there is the consideration of how best to manipulate and store the files. A powerful computer with substantial memory is a necessity to process scanned data and operate scanning software for the highest quality images.[24] For example, a 4K resolution image used in photogrammetry takes up an average of 24 MB of space depending on the file format.[25] Multiplied by 40, 100, or more, and the file can quickly become hard to manage. Sketchfab limits its basic users to uploads less than 100 MB, while business accounts can upload files up to 500 MB, so it is additionally important to know how to compress files.[26]

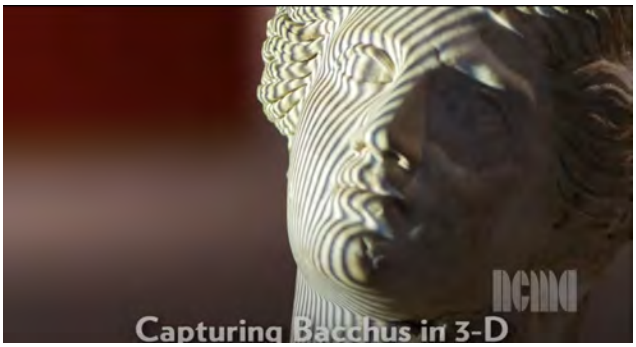
Even with accuracy increasing rapidly as the technology evolves, a scanned 3D model may require manual editing, sculpting, and color correction to achieve the most accurate result. This means the use of additional software and skills to do things like remove rendering errors or account for lighting discrepancies.[27] However, more and more of this software is becoming free and open source, reducing the need to purchase proprietary software and increasing the number of users to teach and learn together.[28] This makes 3D scanning more accessible to museums with limited budgets and less technical skill sets.

TAKING THE LEAP

Once a scan is completed and a 3D model created, there is more a museum can do than simply upload it to Sketchfab. Since 2012, there has been a spotlight on 3D technologies in the museum field that has led to a diverse number of use cases from museums of all sizes. The following examples are intended to showcase the creative opportunities museums have undertaken using 3D scanning technology.

CONSERVATION, PRESERVATION, AND RESTORATION

Museums can use 3D scanning for the conservation, preservation, and restoration of museum objects. In 2018, the North Carolina Museum of Art began a two-year conservation and restoration project on an Ancient Roman statue of Bacchus.[29] The statue was in several pieces, and a sketch of the unbroken statue revealed it was missing pieces as well. Using a structured light scanner, the pieces of the statue were rendered as 3D objects, allowing the state of the statue as recovered archeological components to be preserved as well as paving the way for reconstruction. The scans, sketches, and a human model were used to create the statue's missing arm and complete the statue.



https://youtu.be/k6C6iu_6OW4

Figure 3: A YouTube video from the North Carolina Museum of Art details a statue of Bacchus that was scanned using a structured light scanner as part of a reconstruction project. Posted August 14, 2020.

Researchers used laser scanning to digitize the Qatar Museums' watercraft collection, creating 14 photo-realistic models with the use of photogrammetry and laser scan

data.[30] Typically stored on the water in a private dock, the watercraft ranged from 6m to 36m in length and had not been fully documented. The researchers used this as an opportunity to compare traditional measurement techniques to those of 3D scanners and found that scanners offered "exceptional speed, detail, and accuracy in the recording of complex watercraft."[31] The data from the scans was used to create highly detailed and accurate naval sketches with cross-sections of each craft. The 3D models would go on to be used in animations featured within the public museum.

RESEARCH AND NEW DISCOVERY

In addition to preserving a collection, 3D scanning can reveal new insights into objects that had not or could not have been seen through other research methods. In 2015, the Smithsonian National Air and Space Museum began the arduous task of 3D scanning the Apollo 11 capsule that famously completed the first moon landing in 1969.[32] The capsule had long been on display, but the delicate nature of the craft kept visitors at a distance, with only limited views of the interior. The goal of the project was to digitize the entire capsule in all its intricate detail, inside and out. What the staff was not counting on was finding "hand-written notes and markings in areas of the spacecraft that have been hidden from view for more than 40 years" inside the capsule.[33] The scrawled text included calculations and a calendar that the staff had never known existed. What started as a conservation project turned into an entirely new research project.

Beyond surface details, scans can also be used to uncover the hidden histories of works of art, virtually peeling back their outer layers. In one case, the Rijksmuseum in Amsterdam was scanning Francisco Goya's *Portrait of the Spanish Judge Don Ramón Satué* and found another unfinished portrait underneath.[34] Based on the time period, it is theorized that the painting was covered up as canvas was expensive, and the original portrait was of Napolean Bonaparte's brother, who had fled France during Goya's time. While the truth may never be known for sure, the new layer adds narrative and context to the already magnificent piece.

When assessing the authenticity of a Qing Dynasty vase, the Walters Art Museum asked a radiologist to help them date the object.[35] The museum had previously worked with the radiologist on mummified remains and wanted to see what a scan of the art piece might reveal. As it turned out, the piece had an even more complex design than originally believed, with interlocking components that explain how the piece was created. This example shows how 3D scanning can be used to reverse-engineer objects without having to physically deconstruct them. What the scans also revealed was a carefully completed and skillfully hidden repair at the base of the vase.[36] As the piece was a gift for the royal family, it is considered unique for having a disguised defect as opposed to being flawless. Without the scans, these hidden gems would have remained undiscovered and unstudied.

ACCESS AND ACCESSIBILITY

One of the main goals of digitization is the sharing of knowledge among both researchers and the public. 3D scanning has allowed more objects than ever to be shared online. The British Museum has 277 models on Sketchfab.[37] each able to be viewed and downloaded for free. What is more, the files can be used in combination with 3D printers to create physical versions of 3D models. In the same 2013 article that covered 3D scanning, Museums and the Web also discussed the introduction of affordable 3D printers to the market.[38] Originally developed for rapid prototyping in the fields of engineering, 3D printers use cheap materials to quickly create 3D models in accurate physical form.[39] In most cases, the material is plastic, though some printers can print with materials such as clay or metal. The reduced cost of this technology allowed it to enter the museum field and unlock additional possibilities for 3D exploration.

3D prints can enhance the visitor experience in museums by combating the idea that touch should be forbidden when it comes to objects and artifacts.[40] The Manacor Museum of History in Spain created 3D prints of 12 objects within their collection that had previously only been seen within glass cases.[41] As an effort to combat the "hands off" ideology of museums, the chosen pieces were created in incredibly high detail so that visitors could experience the tactile feel of objects like hand-shaped pottery. They even went as far as to paint the printed objects to the point that they were nearly indistinguishable from their originals. This both protects and preserves the original objects while allowing visitors to experience the texture, size, and weight of objects they had only been able to view before.

Beyond general access to 3D objects, 3D technology also provides accessibility for individuals with disabilities. Prints like the ones in the Manacor Museum allow visually impaired individuals to experience the museum's collection first-hand. The Uffizi Gallery in Florence invites visually impaired visitors to access famous paintings like

Sandro Botticelli's *The Birth of Venus* by featuring a 3D printed model of the painting next to the framed original mounted on the wall.[42] The piece was created by exaggerating the shadows within the painting to add depth and texture that could be felt in the model.

In a similar vein, 3D scanning and printing can be used to reach people that are unable to attend a museum in person. The Victoria and Albert Museum brought their collection to children in the isolation ward of Great Ormond Street Hospital with touch screens and 3D printers.[43] The children were shown the museum's collection of sculptures and given workshops with 3D sculpting and modeling software. Using the museum's collection as inspiration, the patients created their own works of art that the museum then 3D printed for each child to keep. The 3D printed material could also be kept sterile to protect the patients while they learned about the technology.

COMMUNITY ENGAGEMENT

While 3D scanning is important to the museum's internal goals, it is equally important to involve the public with these tools. This builds connections with visitors and can even be used as a means of furthering the museum's mission. For example, The Derby Museum of Making used scanners to promote digitization through a program that educated volunteers in the use of a handheld scanner.[44] This was part of the ongoing process to digitize the full collection of historical tools and machinery that exemplify human innovation. One content expert trained a team that has published 154 objects to their online collection. Educating volunteers allowed the museum to go beyond the limitations of its own staff in digitizing its collection.

Inviting a community to participate can lead to entirely new results. The Metropolitan Museum of Art encourages its visitors to use their personal smart devices to create their own 3D models. Online, they offer guides and propose strategies for museum-goers to create their own models or remix existing models into their own works of art. In 2012, the MET had a two-day Hackathon centered on 3D scanning.[45] They invited digital artists and technologists into the museum to explore the possibilities of 3D scanning. This invitation to technologists broadened the demographic of the museum beyond art enthusiasts, encouraging them to ideate on the ways the technology can be used.

CONCLUSION

While the dive into the expensive and complex technology of 3D scanning can be daunting, it is no less the perfect time to integrate 3D digitization into standard practice. The market for 3D scanners and printers has been opened to the public, making them more affordable than ever. 3D technology is widely available, and the community of educators and students is expanding all the time. Identifying the goal of any digitization project is key to choosing the right tools for the job. Understanding the limitations of an individual museum can be daunting, but hopefully from the examples, it is clear that there are many avenues to explore with even the most basic devices. 3D scanning provides an opportunity for museums to further their internal goals while also allowing the chance to connect to their audiences by sharing the collections they hold inviting the audience to participate in learning about the opportunities provided by 3D tools.

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XIX

Museums and Online Learning

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We live in a society that is fully immersed in technology. It's used to communicate, complete work both professional and educational, bring joy and entertainment, among a slew of other purposes. It has become very difficult to go through the average day without using technology. This was the status quo, until the Covid-19 pandemic hit the world. Many people were home bound and if you were in a public space, you were strongly encouraged to practice social distancing. This brought much worry to businesses that thrive off public interaction, museums being a significant example. If businesses and institutions didn't think quickly about how they were going to continue to reach their audience from their homes, they risked the institution shutting down indefinitely. Schools also had to worry about how they were going to educate their students from their homes, and thus began the immediate rise of online learning, creating new opportunities for museums.

When first introduced, online learning was looked at as a "poor substitute for the traditional classroom learning."[1] Luckily, with the advancement of technology and the internet, web-based learning has significantly improved, thus becoming a useful tool for museums and their outreach initiatives. It became clear that if students could effectively learn from home temporarily, so could museum patrons that missed wandering around their favorite museums. The pandemic and online learning also allowed for those who didn't have the means or ability to visit these locations to still get valuable information, which significantly broadened institutions' audiences. To reach these broader audiences, some museums have begun offering distance learning programs. These programs allow museums to increase their reach through technology that is becoming more ubiquitous.[2] In 2021, when discussing museum education in general, the American Alliance of Museums stated that in the "United States, museums spend more than $2 billion a year on education…[and] provide more than 18 million instructional hours for educational programs."[3] This statistic shows that museums across the nation have put in a great deal of time, energy, and money to effectively run educational programs that'll best serve the public. Once it became clear that there was a population of adults who were interested in visiting museums but did not have the access, many museums opted to redirect their focus and money towards online/virtual learning.

This paper will explore the early origins of virtual learning, it's beneficial qualities, and discuss examples of how some museums have included virtual learning as a public program. Notable examples include the Frick museum and the creation of their YouTube series "Cocktails with a Curator"[4] and Italy's Gallery of Modern and Contemporary Art creating a radio show that can be listened to via Soundcloud.[5] Online learning has a significant role in maintaining the legacy of a museum while promoting its mission statement, and Covid-19 has only propelled its importance. For this essay, I will be considering any museum program conducted by an educator via the

internet with audiences at offsite locations. This includes virtual tours that offer information presented to the audience by an educator both live and pre-recorded. Although the utilization of virtual tours vary based on each institution, arguably, they have the potential to hold the same amount of educational value as any other online program that the museum provides.

HISTORY OF MUSEUMS AND ONLINE LEARNING

Museums utilizing online learning was a gradual development that surely did not first appear when museums began crafting their institutional websites. "Distance learning is often used as a blanket term that includes online learning, e-learning, technology mediated learning, online collaborative learning, virtual learning, web-based learning" and so on.[6] In the early 1990s, some museum websites were initially conceived to be used as "additional display cases" that showcased images of collections or basic visitor information.[7] After a few years, museums began to use their websites to interact with their visitors. About 20 years ago, the concept of online learning was introduced, but in the beginning it was not much more than impersonal text-only bulletin boards.[8] Museum professionals started to see the benefits of learning through the web when they realized resources like live webinars and asynchronous collaborative environments allowed for learners and educators to interact and work together through an online social presence.[9] This realization was emphasized during the winter of 2006 and 2007, when the Metropolitan Museum of Art (MET) noticed school group visitation was very limited. The museum decided to seize the opportunity of using their digital resources and the tools that were needed to access such resources by creating their first blended professional development workshop for elementary school teachers where they could meet both online and onsite. The development of the workshop had created new challenges and shifted their thinking beyond the traditional lesson plan, but by partnering with the New York Institute of Technology and the Educational Enterprise Zone (EEZ), solutions were crafted for the problems.[10] Starting from the initial experiment conducted at the MET, up until the publication of the article in 2010, the MET had "offered 6 multi-week blended (online/onsite) programs and 15 single-session webinars, reaching over 500 educators from 26 states in the U.S. and 14 countries. [The museum has] also begun to collaborate with other institutions to offer cross-disciplinary online programs."[11] Today, the MET museum's primary focus is on the in-person experience but the initial experiment had shown the museum the value from both an educational and economic perspective.

IMPACT OF THE PANDEMIC

The closure of museums due to the pandemic forced many to think outside the box in order to keep their audience engaged while still maintaining the goals of their mission statement. The online resources of The Frick Collection, located in New York City, achieves what they strive for in their mission statement: "To provide access, understanding, and enjoyment of the Collection to the public through special exhibitions, publications, education, research, and public programs of the highest caliber." The Frick Collection created a YouTube Series titled "Cocktails with a Curator." In this series, viewers can watch "a Frick curator offer insights on a work of art in the collection with a complimentary cocktail."[12] The most recent upload of "Cocktails with a Curator" was a year ago, and unfortunately, there is no further information on the continuation of the series on the museum's website.

During the pandemic, Italy's Gallery of Modern and Contemporary Art (commonly known as GAMeC) created an online radio show, where listeners can receive "information and analysis featuring news, art, literature and society, with both Italian and international voices." Each episode is a little under or over 40 minutes long. The radio show lasted about 2 months with the first episode airing on March 22, 2020 and the last episode airing on May 26, 2020. The radio show has been discontinued however the episodes are still available on soundcloud.[13]

As seen in the above examples, the pandemic prompted museums to create alternatives that temporarily replaced in-person visiting. Now that many restrictions have been lifted and museums have continued on with their normal business practices, they must now decide if they want to continue working with the ideas they've created during the pandemic, or put an end to them. Based on the discontinuing of many online learning programs, it seems as though many of the programs that were implemented during the pandemic were temporary. However, the online programs that were already in motion prior to the pandemic are still active and are a great resource for many who are home or can't access the museum.

For staff, particularly the education department, online learning has meant "expanding the role of the educator beyond the traditional role of a museum educator. While educators act as facilitators both during face-to-face and online presentations, the pedagogical strategies used in distance learning programs differ because the forms of

interaction have been altered."[14] The pandemic forced many museum educators to expand their role and responsibility significantly, leaving some feeling "overwhelmed, overworked, stressed and undervalued."[15] Although grappling with new technology and programs originally came with difficulties, museums have been presented with the unique opportunity to gather resources and potentially put a digital plan in place, if they decide that it is in the best interest of the museum.

SHARING ONLINE RESOURCES

As mentioned previously, switching to online learning was a very stressful time for many educators. Trying to create and understand new temporary curriculums that would be taught online proved to be a big adjustment. School educators were searching for reliable online resources and programs while museum educators were figuring out how to get the word out about their museum's new programs. Databases that allowed the public to add resources and blog posts written by other educators became an extremely useful guide for both museum educators and school teachers. The Journal of the American Association of School Librarians website hosts a blog forum where authors can write about various topics. Margaret Sullivan wrote a blog entry titled " Online Museum Exhibitions as Virtual Learning Resources" [16] and in her post she details her experience looking for resources as well as listing what she found. She lists museums with online programs that she found useful and provides ideas on how others could also utilize those programs. [17] In March of 2021, the website Ecobnb published an article titled "The Importance of Online Museums for Modern Education." In the article, the author discusses the impact of "Innovative Digitalization" and the role museums play in "today's world."[18] Towards the end of the article, there are two examples of museums that have provided online exhibitions as well as a link to other free online museums. Many blog posts and articles that discussed museums and online learning would also provide examples of museums that offer online programs and exhibitions.

In April of 2022, under their Eduction Professional Network, the American Alliance of Museums (AAM) created a "Distance Learning Database." The database allowed students and teachers to share their distance learning programs and resources.[19] "Users could pull down filters to find the best programs and resources for their needs." [20] As of February 2021, there were more than 1,350 resources listed in the database spanning across 6 countries and 8 languages. Unfortunately, the database is no longer active but the information can still accessed by contacting the email that is listed.[21] This is not the only website that lists resources. MCN's website provides what they call "The Ultimate Guide to Virtual Museum Resources, E-Learning, and Online Collections."[22] This database has an extensive list of history, art and natural history museums that provide virtual tours, E-Learning, programs catered specifically to kids, etc. If a museum is missing from the list, there is the option of filling out a google form with the museum's information so it can also be added.

CONCLUSION

Online learning has become a staple in the way many museums share information with the world. Although it had a slow start, it now provides access to exclusive web-based content (as well information available in person) for a wide range of people. Online learning particularly reaches those who don't have the means to visit the museum in person thus significantly broadening the museum's audience. Covid-19 has only amplified virtual learning's importance. The pandemic has forced most museums to re-evaluate their online learning programs and some have responded by putting in the extra time and money to ensure that their online programs are of the highest quality and to continuously improve them when needed. It also showed the field that although there may be challenges with curating online content and it does take a bit of patience, the benefits outweigh any opposition.

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XX

The Immersive Gallery Phenomena: teamLab's Borderless World of Art and Technology

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The teamLab Borderless permanent Museum of Digital Art opened in Odaiba, Japan in June of 2018. The museum was designed to house a "borderless" world in which visitors could fully immerse in breathtaking and kaleidoscopic borderless art that allows them to wander and explore a digital new world with others.[1] Following its opening, the museum welcomed half a million visitors, in its first 85 days of operation with entrances constantly being sold out every day and attesting to the public's response to the new immersive digital art.[2] The Borderless deviates from a traditional gallery by allowing its artworks to interact with each other and with the visitors directly and eliminating the conventional boundaries of contemporary art galleries. To accomplish this, teamLab employs a digital projection-based exhibition paired with algorithmic programming that creates light effects to change ambient colors and brightness to effectively transform the space installation and generate an immersive experience where the visitor can help in shaping the overall experience.[3]

The philosophy and approach of teamLab as an organization dedicated to the creation and advancement of art creates curiosity to further explore their approach to the creative process in their artworks as well as the details of its internal structure in relation to what has made them succeed in their field. Their unique composition and interdisciplinary approach make them an ideal subject for exploring the advantages and constraints of approaching a vastly specialized subject from multiple angles. The non-hierarchical laboratory like structure of teamLab's organization seems to be key in the development of effective workgroups where each specialists fulfills a key role in the creation process centered on the collaboration between artists, programmers, animators, designers, and engineers.[4] Founder Inoko Toshiyuki started with a vision that encompassed the power of working as a team with the efficiency expected of a laboratory setting to develop a cross disciplinary collective team initially consisting of schoolteachers and students.[5] From its creation, teamLab focused on targeted development to attain its current working methodology and with time the team began expanding to include an increasing number of artists, programmers, engineers, animators, mathematicians, and architects that managed to work collectively while sharing ideas on a level field. Team director Daisuke Sakai sought to enhance the existing teamLab base by incorporating experts in the field of engineering, product design, and robotics resulting in a team of over 400 members focused on the combination of technology and imagination through experimentation and the construction of large-scale light installations.[6]

A UNIQUE ART EXPERIENCE

The uniqueness of teamLab's composition can be best experienced in the stories presented by their exhibits and their focus on delivering multisensorial experiences unique to each visitor as teamLab creators purposedly designed interactive environments that engage visitors individually. One can appreciate teamLab's approach to immersion by examining their *Forest of Resonating Lamps* exhibition as it showcases their approach to art and exhibition design. This exhibit aims to present a seemingly infinite space filled with lamps of various colors that react to the visitor's proximity in real-time by changing their intensity and emitting sounds. This changing in light intensity and resonating sound then travels to adjacent lamps allowing the visitor to follow a path of lighting and sound determined entirely by their interactions with the space. The apparent vastness of the space and seemingly random arrangement of the lamps instill a sense of timelessness in the visitors and immerses them in teamLab's concept of a world without borders. Similarly, the Flutter of Butterflies exhibit employs an approach where digitally rendered butterflies appear to fly around and interact with visitors. The digital butterflies seem to react to visitor's touch by changing color, position, intensity, and even dramatically disappearing. This experience is paired with an accompanying music track that follows the butterflies' behavior and accentuates the multisensory experience. teamLab repeats this approach in their Universe of Water Particles. where computer generated images are rendered in real time and immerse visitors on another unique experience. Traditionally, the art market has developed closely around the traditional concept of collecting habits and holding static exhibition displays to showcase a collection and provide a uniform experience.[7]

To achieve high levels of individuality and interconnection, teamLab creates a sort of digital language that combines various elements of nature while analyzing them in terms of lighting, color, and movement.[8] The result carries visitors through vastly personalized experiences based on their individual appreciation of the exhibit and their level of interaction with the environment and with each other. In addition to the technical and artistic features of the exhibition, the individualized nature of experiencing teamLab's works allows for the exploration of the social and psychological effects of their work in relation to the concept of participatory experience.[9] As indicated by researcher Jane McGonigal, a rewarding participatory experience can result from satisfactory work, a feeling of accomplishment, interpersonal relationships, or being part of a larger cause.[10] Generally, a teamLab experience includes an opportunity to connect with other visitors through a shared interaction with the exhibit that produces unique results based on the inputs provided an can so be considered a participatory experience. Observing the relative success of an exhibition in terms of attendance one can then assess the effectiveness and quality of the participatory experience being provided and incorporate these findings into the design of future exhibitions.

TEAMLAB'S SUCCESS

Exploring teamLab's motivations and vision allows one to study the significance of developing a kind of specialized museum conceptualized entirely around a single focal point and built for that specific purpose. The emphasis teamLab places on the interactive aspect of their artwork installations arises from a concept of multidimensionality aimed at imprinting a long-lasting impression on the viewer while presenting a reinvented artistic experience through cutting edge art, culture, and technology.[11] Although there exist other exhibits or institutions that have attempted various levels of similar digital artwork exhibitions, I believe that teamLab's unique methodology has been able to surpass similar offerings in terms of scale, success, and execution. teamLab's approach manages to include the input of many professionals from various fields that provide valuable perspectives for the creation of concepts, management of design, and execution of the final work.[12] Moreover, the tremendous emphasis on the interactive aspects of their exhibitions and the scale of their work allows teamLab to surpass other offerings that rely on digital displays since these cannot compete in terms of magnitude, interactivity, and overall execution. Approaching digital art from the collective perspective of scientists, engineers, mathematicians, managers, and artists has allowed teamLab to deliver unique experiences of tremendous scale. While the scale of their work and the complexity of their design and execution have been key in their success, these aspects also represent the most difficult to properly maintain in the long term and so one must also explore teamLab's plans for the future.

TEAMLAB'S FUTURE

Lastly, I would like to also explore the overall long-term effects of teamLab's approach to digital art as one must consider aspects such as financial requirements and restraints, long-term project viability, facility size requirements, and overall rentability. Although one can perceive teamLab's digital art approach as innovative, unique, and multilayered, one must also explore critically

analyze their approach and philosophy to better gauge teamLab's effectiveness and contributions as a museum institution and an art creator.[13] Although visually appealing and greatly focused on the implementation of the latest advances in technology, one can suggest that teamLab's future may become uncertain when dealing with physical constraints such as their building size requirements and location access as well as fluctuating economic factors that may render their vision unfeasible or their requirements too expensive to justify from an institutional perspective.

Even though teamLab's first digital art museum in Odaiba enjoyed significant success over its initial four years of operations, it had to close its doors in August 2022. Due to the increased number of visits, specially foreigners coming to Japan, the lack of planning and infrastructure of the city of Odaiba to receive such a volume of visits, the decision to relocate the digital art museum was imminent. Although currently unconfirmed, a permanent museum location is expected to open in Tokyo in 2023.[14]

Additionally, teamLab's commitment to offering multisensorial experiences resulting from interdisciplinary collaboration has gain them an opportunity to develop "teamLab Phenomena Abu Dhabi" in Saddiyat Island where the government of Abu Dhabi aims to strengthen their commitment to inspire innovators in their country and region. This cultural development in Saadiyat Island was first announced in 2007 and aimed to design and construct cultural buildings on the island. teamLab Phenomena will be the second museum after the Guggenheim Abu Dhabi to open on the island of Saadiyat cultural district. teamLab Phenomena will be a large windowless building housing a vast space for galleries of various sizes displaying TeamLab's digital art.[15] Despite the challenges ahead, I believe that exploring teamLab's vision, philosophy, structure, and approach to art serve greatly to understand the potential and challenges faced by museum institutions in years to come. Although teamLab started operations without a defined profit model, founder Inoko Toshiyuki has managed to develop a rather successful business model that takes advantage of today's era of rapid technological development to present a seemingly boundless offering of digital art experiences.[16] The continuous growing demand for projection equipment and greater involvement of computer technology in art design will continue to drive the demand and participation in projects that will follow the boundless vitality of the teamLab approach.[17]

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XXI

A Technology with Untapped Potential: The Use of Computer Animations in Cultural Institutions

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Everyone in our modern world is familiar with computer animation. Whether it is the movies of Pixar Studios, animated television programs, or videos posted on the internet by YouTubers, most people are intimately familiar with digital animation in one form or another. Increasingly computer animations are used in places like classrooms in order to teach students subjects such as science, math, and language studies. While not a place that the wider public traditionally imagines computer animations to be, the same is true of cultural institutions. For as long as they have existed, museums have been experimenting with new technologies in order to further their mission goals. This willingness of museums to innovate holds true with digital technology, for which computer animations are no exception. However, innovation has the ability to be found even in the most established of practices. Despite decades of their use within museums, it is my belief that computer animations, as educational and immersive tools, still have untapped potential within the museum context.

Before I dive deeper, I find it necessary to define some terms and narrow the scope of this discussion, as the forms in which computer-created visual imagery can manifest varies wildly. For instance, some of the common types of computer-generated imagery include: virtual reality (VR), augmented reality (AR), digitization of real-world objects into 3D models, 2D visual graphics made in software, and classic computer animations built entirely within software. The differences between these types of computer images are relatively self-explanatory, though virtual and augmented reality are certainly the newest and most nuanced types in this list. Charlotte Coates provides a great working definition of augmented reality in an article on MuseumNext.com: “Augmented reality is the process of using technology to superimpose images, text or sounds on top of what a person can already see. It uses a [smart device] to alter the existing picture, via an app… [to show users] an altered version of reality.” Virtual reality, meanwhile, uses specialized goggles or headgear to project images and sounds directly to a user’s eyes and ears.[1]

For the sake of this paper’s frame of reference, I shall be limiting this discussion of animations in a museum context largely to conventional computer animations. I am defining “conventional” animations as virtual images created within computer software and intended to be displayed on two-dimensional screens installed within a gallery space. With this definition I am therefore excluding any computer imagery that necessitates the use of additional equipment (such as headsets or smartphones), but not computer imagery that happens to transform real

physical objects into a virtual environment for a final visual. In my view, there are two main types of animation relevant to this discussion: educational animations (which primarily intend to relay factual information through graphics and voice narration) and narrative animations (which primarily use artistic style to tell a more visual story).

Finally, I want to make a distinction between two additional types of animations: those that were created by the museum for public educational or entertainment purposes and those that were created by outside artists and then brought into the museum as part of a display, such as they might be in an art museum. The Computer History Museum did exactly this earlier this year when it exhibited a gallery of early artistic computer animations from the 1960s and 1970s. [2]To be clear, this paper is focusing on the former, not the latter. I only have an interest here in addressing animations as they pertain to their use as an educational or entertainment aid for the museum field.

In order to support proper grounds for comparison later in this paper when I lay-out how I believe the current use of animations in museums is lacking, it is necessary to establish the current uses of computer-generated imagery in museums. Firstly, a very common use of computer imagery in museums is in the creation of three-dimensional models of physical artifacts. The Smithsonian Institution is a very good case study of this ever-growing museum trend. Smithsonian 3D is the program and website that the Smithsonian uses to share with the world artifact digitization projects that the institution creates. One of the more famous examples in recent years of the Smithsonian's digitization efforts is seen in the digital model that was created of the Neil Armstrong space suit which was used the Apollo 11 moon landing on July 20th, 1969.[3] In a similar vein, as explained by Zhen Guo of Shanghai University in China, artifact digitizations can act as surrogates for actual physical artifacts that are too fragile to display and are a great accessibility tool for audiences. Guo describes a series of Chinese historical murals that have been digitized by the university and are on display for the public through this digital medium for these exact reasons.[4] Meanwhile, AR is being increasingly integrated into museum spaces. A great case study, also from the Smithsonian, is the Skin and Bones app that was developed by the National Museum of Natural History. The app utilizes the smart devices of museum visitors to add virtual skin and musculature to some of the fossil displays within the halls of the museum.[5] Although these computer-generated images are fascinating and at times quite innovative, they do not fit my stated definition of a computer animation. In fact, I could find few true examples of animations in the way I have defined them for the purposes of this paper.

There is but one animation I can think of that fits my definition: the "St. Roch Wheelhouse Experience" exhibit at the Vancouver Maritime Museum (VMM). This exhibit, a collaboration of VMM with Haley Sharpe Design and Vancouver's Centre for Digital Media, has visitors piloting a simulation of the famous ship St. Roch (the second ship to successful navigate the Northwest Passage) through an Arctic Sea pass. The St. Roch is a permanent exhibit at the VMM housed within its own purpose-made building. VMM visitors are able to enter the St. Roch and tour its rooms, including its wheelhouse where the captain once directed the vessel through artic waters. The Wheelhouse Experience is an exact replica of the wheelhouse, with five screens replacing the windows and displaying a CGI representation of the hull of St. Roch amidst the ice flows of the Arctic. Visitors are encouraged to take the wheel and navigate through this simulation of the sights, sounds, and wild animals of the Canadian Arctic. I got to experience this simulation and its computer animations myself when I visited the VMM in August 2019. What impressed me most about the exhibit is that the animations filled in a major immersive gap of the St. Roch exhibit: standing within the actual St. Roch wheelhouse, all I could see was the interior of the VMM building. However, the Wheelhouse Experience allowed me to truly picture the St. Roch in the Artic Sea, including the terror of bumping one's ship into sea ice![6]

While there are countless examples of museum exhibits containing short films that might feature a few animations, few utilize the full potential I see with animation technology for museums. For the rest of this paper, I would like to lay out the potential I see in animations for museums, using public research and real-world examples. By far one of the most obvious uses in this type of multimedia is in the improvement of engagement with museum visitors. Research done by the Department of Computer Science at the University of York has demonstrated this phenomenon. In their study they found that the use of multimedia was by far the most notable improved visitor experience metric when compared to exhibits that did not make use of any multimedia.[7] In a different case, old physical dioramas at the University of Michigan Museum of Natural History that were removed and replaced with digital surrogates. The dioramas were recreated as dynamic computer animations displayed on flat-screen televisions that could be interacted with by visitors through touch screens. As reported by Michael D. Cherney and Adam N. Rountrey in a blog on the website of the American Alliance of Museums, the new dioramas significantly reduced the footprint of the exhibit, saved a

popular exhibit from permanent removal, and has, "...the potential for future enhancement with moving computer-generated elements, user-controlled interactivity, virtual reality experiences, and mobile manifestations."[8] A comparable promising development in the utilization of animation technology comes from Portuguese researchers at the University of Lisbon. They created a prototype museum interface system called "Open Sesame" that made use of touch technology on a console that visitors could interact with. Depending on the sequence, selection, and number of button presses, various interlinking animations would play on a unique timeline on large television screens to explain the history and process of sugar production in Madeira Islands. The researchers reported extremely positive reception of the system from participants in the study.[9]

This particular case study is much more in line with the vision I see of animations and their utilization within future museums. However, perhaps the most thought-provoking use of animations within a museum context I found comes from a conference talk given by Alison Green and Birgitta Hosea entitled, "Reanimating the Archives." In short, they talk about their experience in creating an exhibition called CUT! at the Old Operating Theatre Museum in London. The museum collaborated with students from the University of the Art London and the London Guildhall School of Music and Drama on a semester-long project that saw students creating artistic narrative animations describing various stories of historical figures that worked in the hospital. In the talk, Hosea described the challenges and possibilities of this type of project for other museums considering such an exhibition. Hosea spoke about how these animations were a great creative outlet that enabled artistry in the exhibition space, how they expanded curatorial authority, and were a great way to introduce human elements into the storytelling process of the exhibit.[10] From my standpoint this case study reflects the difficulty of harnessing the talent of what Green described as "creative practitioners," in the same talk. In a word, this case study is a reflection of the difficulty of utilizing talents from across multiple disciplinary fields - commonplace in any industry. However, as demonstrated by the success of CUT!, the potential in combining these talents from across multiple disciplines has great promise for substantial rewards. Sometimes the extra effort is worth it for the results it brings.

At this point I would like to highlight some historical animations from a variety of sources that I feel exemplify some of the hallmarks of good computer animation that I believe have the potential to transform future museum experiences.

https://youtu.be/FE6GZuUONmM

Figure 1: The History Channel: Battle 360: WWII Begins in the Pacific (S1, E1)

The first animation I have included here comes from an old History Channel program known as Battle 360. This documentary program, which lasted 10 episodes and was first aired in February 2008, follows the history of the ship USS Enterprise (CV-6) through the Pacific Theater of World War II. Battle 360 makes extensive use of computer animations to visual warships, planes, and their movements in historic naval engagements. The series also includes interviews from veterans of the Enterprise and WWII historians.[11] Although the visuals of the animations are a bit dated, the clean aesthetic of the program still holds up well. Overall, the program tells its narrative very well and is reminiscent of in-gallery films, but utilizing animations to a high degree. I view this program as being a bridge between the strengths seen in documentary programs and the visual storytelling of computer animations.

https://youtu.be/61SYvhojGvg?start=1353s;

Figure 2: Epic History TV | HMS Victory: Total Guide

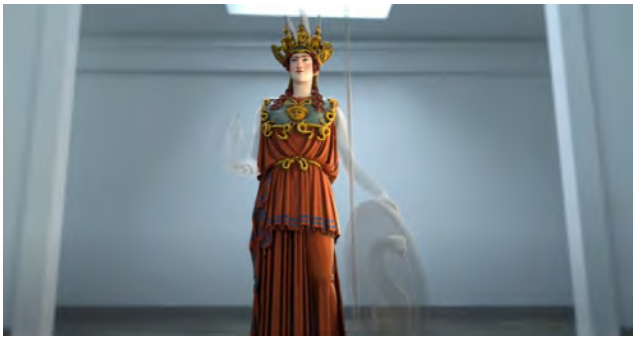
The next animation I would like to showcase comes from the YouTube channel Epic History TV, which focuses on historic battle programming, particularly on the Napoleonic Era and the World Wars. This mini-documentary teaches viewers the history, construction, and terminology of 19th century naval warfare and the

famous ship-of-the-line HMS Victory. Epic History TV made their video in collaboration with the National Maritime Museum in Greenwich, London. This documentary demonstrates the evolution that computer animation has undergone since Battle 360 was made 14 years ago; the animations in HMS Victory: Total Guide are far more sophisticated and visually appealing. Highlights of this animation are the incredible use of digital cross-sections to explore the ship's construction and aid in the explanation of naval terminology. Other notable features of the animation are its extremely informative nature and its use of primary sources such as paintings and photographs between animations. The use of these traditional documentary resources is very reminiscent of the historical documentary film techniques of Ken Burns, with pans and zooms across the historic images.[12] Although this video is a fantastic documentary, I see it as having limited potential in a walking gallery setting: it is far too long. However, I see a shorter version of it having a place within a mini-theater in a museum. This documentary distinguishes itself from many current in-gallery films, of the type Battle 360 is reminiscent of, with its smart use of animation. When HMS Victory: Total Guide utilizes animated visuals, it is to show and explain things that would be impossible through simple still images pulled from archives. The professional nature of this documentary and its impressive use of animations were, in fact, the inspiration for this paper. From my own experiences at maritime museums and as a naval history enthusiast, the potential for animations as educational tools were blatantly highlighted to me by Epic History TV.

https://youtu.be/ILbcWgP76vA

Figure 3: One World Trade Center: Elevator Ride

This animation does not actually come from a museum; it comes from One World Trade Center and is the animation played in the elevator ride from the ground floor up to the public viewing platform at the top of the skyscraper. The elevator animation is displayed on the walls of the elevator which are floor-to-ceiling screens and shows the transformation and industrialization of New York City from wilderness to a modern cityscape. There is no narration for this video animation and the only real quantitative information given to visitors is the year of the city as the virtual landscape transforms over time. Another element of the animation is the use[wc] of a couple of illusions; the animation portrays the construction of One World Trade Center around the elevator at it nears the peak of the skyscraper and, on the return trip, the elevator itself is shown as flying out from the skyscraper and circling around the tower before flying back into the elevator shaft as the elevator reaches ground level.[13] The entire experience is very similar to what one might experience on a roller-coaster ride. What is striking to me about the animation is that it is a true augmentation of the physical space. It creates a "wow!" experience for guests that is incredibly memorable and unique. I see the potential here for similar animations to be used in historic structures and other similar spaces. An example, for instance, could be the demonstration of industrial processes in long dormant factories or then passage of people and vehicles that have long since left local streets. The possibilities to augment a physical space are endless.



https://youtu.be/1KIpXsesmSQ

Figure 4: MFA Boston: Athena Reveals Her True Colors

The final example of an animation I would like to highlight does actually come from a museum, specifically the Boston Museum of Fine Arts. The animation, entitled Athena Reveals Her True Colors, is a reconstruction of how one of the marble statues in the MFA collection, a marble statue of the goddess Athena, would likely have looked back in antiquity with its full range of intact colored paints. The video is short, to the point, and beautifully rendered. This animation was a product of – and it itself helped facilitate – new research on the statue in question. The research included light and pigment analysis as well as historical investigation in order to get an initial 3D rendering, and

then this animation, as accurate as possible.[14] What stands out to me about this animation is that it not only contributed to historical research that might otherwise not have been done, but it transforms the visitor interpretation of the statue of those who view it. Although the animation currently only exists on the MFA Boston website, it strikes my mind as the perfect kind of animation for a simple video screen in an exhibit with the statue. Though the narrative for the animation would probably not be played audibly in an art gallery, it seems to me that subtitles or wireless headsets could easily resolve that issue. Athena Reveals Her True Colors is to me an almost perfect example of what animations can bring to museum in the near future.

From the examples highlighted in this paper the underutilized potential of computer animations in cultural institutions is evident. Animations have the power to show the impossible: vast stretches of time, internal cross-sections of large structures, or objects and people that have long vanished. It's striking to me that so much of the animations that do exist are regulated purely to the online presence of museums or are simply displayed themselves as art pieces. As has been demonstrated by this exploration of museum animation, they have incredible capacity to act as educational and narrative devices in an exhibit setting. Computer animations have the power to grant visitors unforgettable experiences. Although museum professionals continue to innovate with digital technology, the modification of practices surrounding this pre-existing digital technology has the promise to transform museum practice as a whole.

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Contributors

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Suse Anderson (she/her) is an Assistant Professor, Museum Studies at The George Washington University, and host of Museopunks – the podcast for the progressive museum. For more than a decade, her work focused on the intersection of museums and technology, culminating in the 2020 publication of The Digital Future of Museums: Conversations and Provocations, with Dr. Keir Winesmith. More recently, Anderson has become concerned with investigating contemporary ethical dilemmas confronting the field. She holds a PhD from The University of Newcastle, Australia. Since moving to Baltimore in 2014, Anderson has fallen in love with the city she now calls home. You should visit her there.

Alyssa Barilotti

Alyssa Barilotti is a second-year graduate student at George Washington University, pursing a degree in Museum Studies with a concentration in Public Engagement. She holds a dual bachelors degree from Arcadia University in International Studies and French, with a focus on Conflict Resolution and Peacebuilding. Alyssa believes museums can be powerful agents for change, and has focused her studies on how museums can harness their soft power resources to address the most difficult global challenges. Connect by email.

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Grace Bautista

Grace Bautista (*she/her*) is a second-year museum studies student at the George Washington University, where she also received her BA in American studies. Through her concentration in public engagement, she has worked at the intersection of digital media, education, and public programs. Grace is currently an intern at the Smithsonian Asian Pacific American Center, where she is interested in building community through digital education resources. Email: gbautista@gwu.edu.

Andrew Bessler

Andrew Bessler is a graduate student at George Washington University, pursuing a degree in Museum Studies with a focus on exhibition design. He earned his B.A. in Emerging Technology in Business and Design from Miami University. He is interested in the adoption of digital technologies within museums to augment and enhance education.

Kirstin Canner

Kirstin Canner (she,her) graduated from The George Washington University's Museum Studies masters program in December 2022 with a concentration in Exhibitions and Visitor Experience. She also holds a Bachelor of Arts in Studio Art from High Point University. Prior to her GW journey, she managed The American Treasure Tour Museum, a small pop culture museum outside of Philadelphia. Kirstin has just concluded an internship with the Education Department at the Capital Jewish Museum, and is looking forward to her next quirky museum job. Connect via email: kirstincanner@gmail.com or LinkedIn.

Jamie Carkenord

Jamie Carkenord is a first-year Museum Studies graduate student with a concentration in Exhibitions and Visitor Experience. Originally from Farmville, Virginia, she received a B.A. in American Studies from the College of William and Mary. She is interested in public history education and inclusive representation within art and history museums.

Elizabeth Day

Elizabeth Day is currently a museum studies graduate student at The George Washington University. She attended Saint Mary's College, Notre Dame, IN, and received B.A.s in communication studies and history, and then Elizabeth worked as Assistant Curator & Collections Manager at the Peoria Riverfront Museum in Peoria, IL. Elizabeth dreams of restoring a Chateau in the South of France and giving historic tours of the property. In the meantime, she is open to any opportunity in the museum field.

Sarah Farver

Sarah Farver is a Museum Studies graduate student at the George Washington University. Her current role at The George Washington University Museum and The Textile Museum focuses on communications and the visitor experience. Farver pursues her passion for museum education as a volunteer at the National Archives Museum and her love of the performing arts as an usher at the Kennedy Center. She holds a BA in History with a certificate in Public History and a minor in Art History from The College of William & Mary. Connect on LinkedIn.

Joseph Ingrum

Joseph Ingrum is a second year Museum Studies graduate student at George Washington University with a concentration in collections management. He received a B.A. in history and archaeology from Lycoming College in 2018. He has worked with museum collections at Old Sturbridge Village, Montgomery History, and the Smithsonian Museum of American History. His goal is to one day help museums adopt methods to improve their full cataloging and inventorying projects.

Sophia Kaminski

Sophia Kaminski is a second-year graduate student in George Washington University's Museum Studies program with a concentration in Collections Management. She earned her BS in History and minor in Sociology from Grand Valley State University located in Grand Rapids, Michigan. Currently, Sophia is an intern with Smithsonian's National Collections Program. Sophia's strong passion for museum ethics has and continues to guide her work. connect via email

Raeana Kiss

Raeana Kiss is pursuing an M.A. in Museum Studies at George Washington University, with a concentration in Exhibitions and Visitor Experience. She recently graduated from Cornell University with a B.A. in Biological Sciences, with a concentration in Ecology and Evolutionary Biology. In addition to her academic pursuits, Raeana's other passions include painting and hiking. She hopes to use her future museum career to help bridge the knowledge gap between scientific research and public understanding.

Diego Mountin

Diego Mountin is a graduate student in George Washington University's Museum Studies program on the Collections Management track. He earned his Bachelor's degrees in History and Anthropology (Archaeology) at the University of California, San Diego in 2019. Diego previously worked as a book repair assistant at the UCSD Library and interned at the Maritime Museum of San Diego. He is currently the Historic Site Assistant at Woodrow Wilson House in Washington DC. In his free time, Diego enjoys playing board games and tabletop RPGs with his friends.

Rachael Price

Rachael Price is a first year Museum Studies graduate student at George Washington University, focusing on collections management. Originally from Metro Detroit, she received her B.A. in Anthropology and International Studies from the University of Michigan, Ann Arbor. She is interested in community engagement and the power of objects in fostering connections and greater understanding. Connect on LinkedIn.

Anissa Santos

Anissa Santos is a first-year graduate student in the Museum Studies program at The George Washington University with an emphasis in Exhibitions and Visitor Experience. She graduated from the University of Southern California (USC) with a Bachelor of Arts in Media Arts + Practice and a minor in History. She hopes to combine her digital media design experience and research expertise to pursue curatorial work, exhibition design, museum education, or public programming in the museum field. Email: amsantos@gwu.edu Website: anissamsantos.com

Megan Snyder

Megan Snyder is a first-year Museum Studies Master's student at George Washington University. She earned her Bachelor of Arts in History with minors in Anthropology and Museum Studies from Miami University in Oxford, Ohio. She is passionate about engaging the public with history through physical objects, interactives, and digital collections. Her experience digitizing archival collections, preventative conservation, research, and public engagement drives her desire to facilitate educational opportunities about history in museums. LinkedIn: https://www.linkedin.com/in/megan-snyder-history/

Hannah Spiering

Hannah Spiering is a second-year Master's candidate in Museum Studies at George Washington University with a concentration in Museum Management. She earned B.A.'s from University of California, Los Angeles in Art History and Anthropology prior to pursuing her passion in museum work. She values the power of policy and currently interns with the U.S. Department of the Interior Museum Program in museum administration. Email: hkspiering@gmail.com

Elsa Tolman

Elsa Tolman (she/her) is pursuing a M.A. in Museum Studies at George Washington University with a concentration in collections management. She received her B.A. in Anthropology from Brigham Young University (Provo), with a focus on socio-cultural anthropology and archaeology. She has a particular interest in increasing inclusion and accessibility in digital and physical museum collections to better serve our communities. Connect on LinkedIn or through email: tolmanelsa@gmail.com

Marisa Velarde

Marisa Velarde was born in Lima, Peru and is pursuing a Masters in Museum Studies at George Washington University with a concentration in Collections Management. Marisa holds a B.A. in Graphic Design and MBA in Marketing. She has previously worked at the Art Museum of the Americas promoting Latin American artists. Marisa aims to continue her research on diversity in the museum field to implement inclusive programs that engage with communities through conversations on traditions, storytelling, and contemporary issues.

Sam Waltman

Sam Waltman is a graduating MA student in the George Washington Museum Studies MA Program with a focus in collections management. Sam graduated from Dickinson College in 2020 with degrees in History and Educational Studies. Through internships at Fort Ticonderoga, the National Museum of American History and the National Endowment for the Humanities, Sam has developed a strong interest in the tools that museums use to manage and fund their collections projects. Sam has a special interest in how different mediums effect audience interpretation of information. Sam currently works full time as a Collections Technician at George Washington's Mount Vernon.

DiDi Wiles

DiDi Wiles is a Museum Studies graduate student at the George Washington University. Originally from Michigan, she moved to Connecticut with her family and now lives in Baltimore, Maryland. With her passion for history, DiDi received a B.A. in history and sociology from the University at Albany. She really enjoys researching anything that involves film history, pop culture history, and historical homes. In her spare time you can find her roller skating, watching and creating documentaries, or exploring museums in DC and Maryland.

Megan Williams

Megan Williams (she/her) is a first year masters student at George Washington University, pursuing a degree in Anthropology with a concentration in museum training. She earned her B.S. in Anthropology from Kennesaw State University in Georgia. She is focusing her career on the decolonization of the museum and anthropology fields and how to create a more inclusive environment for all in these spaces. LinkedIn

Museum Studies at GWU

The *Master of Arts in Museum Studies* program at The George Washington University responds to the evolving museum profession by combining hands-on training with future-focused theoretical engagement. Students gain foundational knowledge about the state of museum work today, practical skills and the ability to critically engage with developments in the field. Our location in the nation's museum capital offers a unique opportunity to connect to national and global conversations at the cutting edge of museum practice.

Coursework offers both breadth and depth in *Collections Management*, *Museum Management*, *Exhibitions and Visitor Experience*, and *Public Engagement*. Our students come from a range of academic disciplines, from history and anthropology to art history and the natural sciences.

The MA program of study is flexible so students can personalize their academic experience to help accomplish their own goals. Our 36-credit program can be completed by full-time students in two academic years. Part-time study is also permitted, but the program must be completed in a maximum of four years

PROGRAM REQUIREMENTS

All students complete:

- one core course entitled Museum Ethics & Values
- one internship
- five (5) courses as required in the selected concentration
- five (5) electives, which may be drawn from within Museum Studies (including a second internship) or from outside the program. Up to four (4) non-museum studies courses are permitted.
- a Museum Studies comprehensive exam in their concentration
- the graduate writing requirement
- an oral presentation related to their internship

Throughout the program, students work with an advisor to ensure that they will meet program requirements and their own career and educational goals.