



**SCHOOL OF
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Strengthening digital engagement to provide intersectional narratives within museums using user generated metadata: a case study at Chicago's Adler Planetarium and the applications beyond.

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by

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Declaration:

While registered as a candidate for the above degree, I have not been registered for any other research award. The results and conclusions embodied in this thesis are the work of the named candidate and have not been submitted for any other academic award.

Signed: Jessica BrodeFrank

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Preface:

The following doctoral thesis “Strengthening digital engagement to provide intersectional narratives within museums using user generated metadata: a case study at Chicago’s Adler Planetarium and the applications beyond.” It has been written to fulfill the graduation requirements of the Digital Humanities Research Hub program at the University of London, School of Advanced Studies in London, UK. I was engaged in researching and writing this thesis from November 2019 to February 2023.

I am an inquisitive person, the kind who was called precocious throughout childhood. Due to this, it perhaps came as no surprise to those who know me best that after six years working in the cultural heritage field I would find a thread to pick at until it became a doctoral research question. As someone approaching their tenth year in the cultural heritage field it is exciting to be able to conduct this practice-based research.

Working in cultural heritage however often comes with silos. By pursuing digital humanities research within the field I have been able to gain more experience with collaborative working, having the opportunity to learn this valuable professional and personal lesson. It is my hope that this research escapes siloing, appealing to my fellow museum, library, and archives colleagues, but also to those who work in metadata, search algorithms, AI, and other information adjacent fields. May it help bring about positive changes to expand access, representation, and equity in our storytelling and heritage fields.

Jessica BrodeFrank

Abstract:

Cultural heritage institutions have experienced a technological boom over the last fifty years, and digital access to collections has evolved from searchable catalogues available onsite with the aid of a research staff member, to a variety of modalities ranging from web-based, publicly available databases to interaction through social media platforms. As institutions look to capitalize on the new ways in which their collections are being discovered, cataloguing visual data and expanding metadata are necessary for staying relevant, on trend, and engaged with audiences. Metadata allows people to perform various operations with data, including searching, managing, structuring, preserving, and authenticating resources. Creating metadata is a labor intensive process, and one solution to the need for more extensive cataloguing is crowdsourcing, which over the last two decades has proven not only to increase access points to collections but also to enrich catalogue data. As well, crowdsourcing presents an opportunity for museums to make what has long been an opaque back-end process more transparent, turning metadata creation into a mission-supporting activity. Using an adapted practice-based methodology, this thesis examines projects I devised and led at Chicago's Adler Planetarium, Tag Along with Adler, as a case study in the benefits of crowdsourcing projects (and metadata tagging projects in particular) within cultural heritage institutions, not as mere outsourcing of labor but rather as participatory, even transformational experiences for an engaged public that also enhance and expand cataloguing. It also explores the successes and shortcomings of this case study and what these results suggest for the field at large with respect to language and metadata production. In particular, it demonstrates that there exists a semantic gap in the language and descriptive styles of museum professionals, on the one hand, and the public, on the other, and that crowdsourcing demonstrates promise to help bridge this gap while also providing an opportunity for the public to engage with museums directly.

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Chapter 1: Introduction

Background of the Research Questions:

When I began the research and work that has culminated in this thesis in 2019, I did so after having spent five years working in the cultural heritage sector, specifically within the digital asset and digital access side of the sector. Having worked within rights and reproductions departments of various libraries, archives, and museums, I was increasingly aware of the difficulty in navigating cultural heritage collections. Issues arose both externally when researchers, academics, corporations, and the general public were continually reaching out with specific content requests they could not discover on the institutional catalog, and internally, where my own team and coworkers were coming up against unreturned searches for items we knew to be in the collections.

This experience led me to question why the process of discovery was so difficult when it came to cultural heritage institutions. In particular, it brought about additional questions of accessibility and representation: if cultural heritage collections are inaccessible due to the search terms used to describe them or the structure of cataloging itself, how do these institutions fulfill their missions to be places that disseminate knowledge to the greater public?

As digital content became a more prevalent component of not only my career but also the institutional outreach strategy of the sector, this problem became one that felt imperative to tackle. It was not only affecting users coming to the collections search portals, but also affecting what content was being used and shared via platforms like social media. Being situated at the Adler Planetarium from 2016-2022 (in itself a hybrid institution that combined an archive, a library, a museum, a science center, and a show venue) it felt appropriate to take the problem and put it to the test using an action, and practice-based research methodology. The problem was multifaceted and beyond the scope of a single thesis to solve; however, I endeavored to research and expose the ways in which the process of language production within cultural heritage sector institutions, specifically that of metadata production, has limited the representation of and connection to the communities these institutions serve by providing only limited professionally curated terms that do not align to the language or description style of the public.

In itself, delving into the professionalization of language production and the absolute authority of the heritage professionals within the description process also necessitated a look into the inherent biases of cultural heritage professionals. When examining the institutional bias implicit in museums as it pertains to professional tasks such as curation, arrangement, and

cataloging, it is clear that the language choices of museum professionals cause a disconnect, or a semantic gap, from the general public they wish to serve. Within **Chapter 2: Contextual Review** and **Chapter 3: Literature Review** I will build on the work started by Mathes,¹ Golder and Huberman,² Weinberger,³ Shirkey,⁴ and the *steve.museum*⁵ team. By exposing the bias and limitations to searchability and discovery based on current cataloging language, as well as the impact that language has on access to—and representation within—collections, one can show the public how important it is to question search algorithms, which will prove to be an essential mission-driven activity for cultural heritage institutions to undertake.

Additionally, one can work with museum audiences to improve searchability by contributing the public's own language through tagging, disrupting the current description process that relies exclusively on the choices of professionals. This approach is based on the work of Hedstrom and King,⁶ Weil;⁷ Cameron;⁸ Cook;⁹ Honma;¹⁰ Wood, Momaya, Tisdale, and Jones;¹¹ and countless others who have published over the last two decades on biases in the professional work of GLAM institutions (galleries, libraries, archives, and museums), and in particular on the importance of language used in this work, and will be covered in **Chapter 3: Literature Review**. Incorporating this form of collaborative crowdsourcing is essential to this thesis and brings a new lens to an established activity in cultural heritage.

Crowdsourcing has been active in museums for over a decade, and the research shows that projects which involve metadata tagging have helped infuse user-generated language into

¹ Mathes, Adam. "Folksonomies - Cooperative Classification and Communication Through Shared Metadata." Accessed October 27, 2019.

<https://adammathes.com/academic/computer-mediated-communication/folksonomies.html>.

² Golder, Scott A, and Bernardo A Huberman. "The Structure of Collaborative Tagging Systems," 2005, 8.

³ Weinberger, David. *Everything Is Miscellaneous: The Power of the New Digital Disorder*. New York, NY: Henry Holt and Company, 2007.

⁴ Shirky, Clay. "Shirky: Ontology Is Overrated -- Categories, Links, and Tags." Accessed October 22, 2019. http://shirky.com/writings/herecomeseverybody/ontology_outrated.html.

⁵ Trant, Jennifer. "Social Classification and Folksonomy in Art Museums: Early Data From the *Steve.Museum* Tagger Prototype." 17th Annual ASIS&T SIG/CR Classification Research Workshop, November 4, 2006.

⁶ Hedstrom, Margaret, and John Leslie King. "On the LAM: Library, Archive, and Museum Collections in the Creation and Maintenance of Knowledge Communities," 2003, 33.

⁷ Weil, Stephen E. "From Being about Something to Being for Somebody: The Ongoing Transformation of the American Museum." *Daedalus* 128, no. 3. 1999: 229–58.

⁸ Cameron, Fiona, and Sarah Kenderdine. *Theorizing Digital Cultural Heritage*. Media in Transition 6. The MIT Press, 2007.

⁹ Cook, Terry. "The Archive(s) Is a Foreign Country: Historians, Archivists, and the Changing Archival Landscape." *The American Archivist* 74, no. 2 (Fall/Winter 2011): 600–632.

¹⁰ Honma, T. "Trippin' Over the Color Line: The Invisibility of Race in Library and Information Studies," *InterActions: UCLA Journal of Education and Information Studies*, 1:2 (2005): 27.

¹¹ Wood, Elizabeth, Rainey Tisdale, and Trevor Jones. *Active Collections*. New York, NY: Routledge, 2018

museum collections, as will be demonstrated further in **Chapter 3: Literature Review**. Yet project teams have traditionally struggled to entice users to actually participate. As it is evident that metadata tagging does indeed help to enhance searchability of and access to museum collections which will be demonstrated in following chapters, within this thesis I endeavor to tackle a solution to the known difficulty in motivating participation. This thesis will examine how changing the perception of crowdsourcing into a tool for engagement, instead of an outsourcing of labor, could expand the reach of one's collection beyond the research community and into the general public. In doing so, the work tackles access and bias in one engaging experience by providing a narrative more inclusive of previously relegated communities like women, non-Western, and/or people of color along with the opportunity to increase discoverability with more representational language and access points.

Statement of the Problem:

When taking the problem of access to collections into consideration, a nuanced and multiplicitous problem emerges from the professionalization of language production: who is included in the description process, the language used to describe collections, and the way in which collections are described. Though each of these problems will be addressed in detail in the following chapters, it is possible to give an overview of how these three major problems affect searchability and obfuscate discovery.

Taking the authority of who is allowed in the description process first and foremost, a major issue in the professionalization of the cultural heritage field is revealed. The cultural heritage sector from its inception has been grounded in the ambitious mission to preserve for posterity and for all of humanity.¹² As Helen Graham states, even with democratic theory, the argument has emerged for authority control, specifically when a subject is contingent upon a specialized or technical knowledge base not held by the broader community at large.¹³

When thinking of cultural heritage, this reasoning can be seen in the professionalization of many aspects of libraries, archives, and museums, including the description process. However, where heritage is concerned, and in light of cultural heritage's expressed mission and purpose to preserve for everyone forever, this very advocacy for posterity means that heritage professionals cannot be the only ones to define and manage their collections.¹⁴ As Graham

¹² Graham, Helen. "Legitimate Expertise: How Decisions Are Made." *Institute of Historic Building Conservation*, no. 142 (November 2015): 1517. pg.16

¹³ Graham, Helen. "Legitimate Expertise: How Decisions Are Made." *Institute of Historic Building Conservation*, no. 142 (November 2015): 1517. Pg 16

¹⁴ Graham, Helen. "Legitimate Expertise: How Decisions Are Made." *Institute of Historic Building Conservation*, no. 142 (November 2015): 1517. Pg. 16

states, “If heritage is so important, if it is about all of us and all dimensions of our lives, then it has become clearer and clearer that significance can not be known without directly involving people who know and care about a particular place.”¹⁵

Moving from who is included in the description process, the question must also include the language used in the process itself. Access problems centered around language are symptomatic of larger issues related to the history of power in museums, the history of whose story is recorded, and how it is recorded to obfuscate what is purposefully left out. This will be addressed further within **Chapter 2: Contextual Review**. Here it is critical to frame this larger question within the disconnect between the language of the professional and that of the public. Within cultural heritage, this disconnect presents itself in language choices from the use of specialized language such as scientific names (*Rhopalocera* instead of butterfly), technical names (folio or volvelle in rare books), artistic names (tintype, melainotype, or ferrotype instead of photograph), or outdated language that has not kept relevant with the times and that may perpetuate racist, homophobic, or other problematic issues.¹⁶

As Brook, Ellenwood and Lazzaro show, “truly taking into account the ways in which spaces can empower or disempower specific groups of users would require an examination of how navigation may be 'intuitive' to one group of students, depending upon the language that they commonly use, and indecipherable to another group for the same reason.”¹⁷ In the case of professionally created metadata, the empowered group is the metadata creator or academic researcher, while the public is disempowered due to lack of knowledge and transparency of the metadata language and structure. The understanding of the narrative hinges on the use of normative codes for meaning-making that both the *creator* and the *user* can understand – a shared vernacular or transparency in the language selected.¹⁸

Further obscuring the breadth of access to collections is the way in which collections are described, not just in what objects and narratives are selected to be described, but also in *how* they are actually described. Cultural heritage professionals often focus on describing what an object *is*, not what an object is *about*. This may seem like a matter of semantics, but it is not. Unlike text-based forms of information, cultural heritage objects and their images featured online

¹⁵ Graham, Helen. “Legitimate Expertise: How Decisions Are Made.” Institute of Historic Building Conservation, no. 142 (November 2015): 1517. Pg. 16

¹⁶ “Tackling Racist Language in Collections – Collections Trust.” Accessed November 2, 2022. <https://collectionstrust.org.uk/spectrum-resources/cataloguing-spectrum/tackling-racist-language-in-collections/>.

¹⁷ Brook et al, ‘Denaturalizing Whiteness,’ pg. 260

¹⁸ Robinson, “Remembering Things Differently”, p. 424

have not traditionally been described according to subject matter, the *aboutness*.¹⁹ Descriptions often focus on things like who made the piece, what it is made of, what size it is, when it was made, and what materials it is. Though helpful, this information does not help when a person is querying a database looking for a butterfly but the record is titled *Rhopalocera* or for a Civil-war era photograph that is labeled as a ferrotype.

For this reason, this thesis looks to tackle the layered problem of language production including who is involved in the process, what language is used, and how objects are described, which leads to the proposed solution of crowdsourcing or co-production. Crowdsourcing will be covered more in depth in **Chapter 3: Literature Review**, but it is important to note that this research and thesis specifically look to address the activation of the public in the process of crowdsourcing, specifically in taking the engagement expertise of cultural heritage institutions and applying it to the process.

In 2013, Mia Ridge published an article in *Curator: The Museum Journal* focused on deepening engagement with cultural heritage through crowdsourcing. Ridge wrote, “crowdsourcing is a useful framework for inviting audiences to help with the resource-intensive tasks of creating or improving content about collections...I argue here that participation in crowdsourcing should also be recognized as a valuable form of public engagement with cultural heritage.”²⁰

I believe this is of particular importance to museums and cultural heritage institutions, many of whom expressly state within their missions that they are committed to engaging the public with their specific brand of cultural heritage. By focusing on crowdsourcing as a form of engagement with the institution and the public working towards a shared, significant goal, the institution can ask the public to undertake certain tasks that they cannot do themselves (either because they cannot be automated or due to limited budgets or staff time), and the public understands the importance of why they are being asked to do this work.

It is this emphasis on engagement and doing for oneself that are integral to my own thesis. My argument is that description and metadata production can be incorporated into crowdsourcing most effectively when viewed as an engagement technique through public projects that transparently lay out the lack of accessibility in professional documentation practices and the semantic gap present, calling for users to help fill that gap and learn more

¹⁹ Rossetti, Alyx. “Subject Access and ARTstor: Preliminary Research and Recommendations for the Development of an Expert Tagging Program.” *Art Documentation: Journal of the Art Libraries Society of North America* 32, no. 2 (September 2013): 284–300.

²⁰ Ridge, Mia. “From Tagging to Theorizing: Deepening Engagement with Cultural Heritage through Crowdsourcing.” *Curator: The Museum Journal* 56, no. 4 (October 2013).

about the collections and the bias of information retrieval sites in other parts of their lives. As Wood, Tisdale and Jones stated, “if people outside museums were invited to enhance, contribute to, or even redefine these identities, items could be given lives outside the expected museum narrative and objects could be experienced, appreciated, and known in a new light.”²¹

Purpose of This Study:

This thesis builds on decades of research into the inherent biases within the processes of cultural heritage institutions (museums as well as libraries and archives) that persist across institutional procedures, but particularly within the cataloging/description of collections and the impact this has upon online collections search and discoverability by the public. Within this thesis, I will assert that the rapidly developing field of crowdsourcing, and more particularly that of the citizen science movement, can be leveraged to create a level of trust and transparency between the institution and the public, increasing the diversity of metadata and search terms, and further increasing representation and accessibility all whilst engaging the public with the institution’s holdings.

By centering this thesis in a practice-based action research methodology, it is possible to not only review the research on these issues from a literature perspective, but also to put the theory of using crowdsourcing in this way to the test. A look into other institutional crowdsourcing projects will also help to provide context outside the single institution case study run here to provide an understanding of the field’s reaction to this work. Part of this study will test ways in which to optimize engagement and participation through user experience design, platform choices, and targeting of various publics.

In particular, this thesis will take the crowdsourcing of metadata tags first piloted in the mid-2000s by projects like the *steve.museum* and attempt to test such a project outside of the narrower scope of art museums. This thesis specifically will base the practice-based action research within a science institution that includes holdings of archival, library, and museum objects, making the results more applicable to the cultural heritage sector at large. By focusing on where this research is based (a science institution) and what collections are utilized, the scope of impact for this thesis is expanded to a previously underrepresented sector of cultural heritage.

A major component of this thesis is to demonstrate the ways in which these description-based metadata projects can enhance discoverability of collections, but how they also serve as an entry point for institutions to begin relevant and timely discussions with the

²¹ Wood, Elizabeth, Rainey Tisdale, and Trevor Jones. *Active Collections*. New York, NY: Routledge, 2018

public regarding searchability on the web, algorithmic bias, and the need to critically consider their everyday experiences online. By incorporating AI and machine learning into the projects used in this thesis, it is possible to highlight emerging technologies as both an incentive into project participation, and as a learning objective.

Research Questions:

As this thesis examines how inviting volunteers and the public into the traditionally professionally controlled process of describing collections and assigning metadata can help to create engaging experiences for the public along with a more representative and diverse set of terms to describe the collections themselves, a number of important research questions must be identified and discussed. The question that sparked this thesis was a consideration into what ways curatorial control of GLAM data and the creation of metadata has limited the representation and connection of communities to cultural heritage institutions, and whether this control was enforcing an inherent bias within cultural heritage.

This question evolved as the problem itself was broken down into various aspects, and as my own experience as a cultural heritage professional grew and changed. The curatorial control of GLAM data became the consideration of how the professionalization of language production has impacted the ability to discover and the ability to provide diverse narratives. This impact on the ability to provide diverse narratives and discovery also led to the further questioning of trust the public holds for cultural heritage institutions, and whether, in creating a more transparent process for description and metadata production, cultural heritage institutions can increase the trust of the public and attract more diverse audiences.

As this thesis looks to crowdsourcing as this transparent process for description, the research questions posed grew to include whether the crowdsourced descriptions/metadata provided more representational and diverse entry points to collections, and also how the transparency of the crowdsourcing process in stating and revealing the biases of language production and its impact on discovery can increase participation of the public with these projects and thereby the diversity of both users participating and the search terms added to the metadata.

By framing these projects as a central part of the institution's public engagement programs instead of seeing them as an outsourcing of cataloger labor, the next research question of this thesis considered the way this could also change from the previous two decades of crowdsourcing projects in museums. This question became, how can using

crowdsourcing as an engagement tool increase the diversity of voices surrounding cultural heritage object interpretation to create a more inclusive narrative?

Finally, in looking at the long history of crowdsourcing projects in the cultural heritage sector and examining the implications of the successes, failures, and limitations of these projects, the last research question emerged. If we are to begin viewing crowdsourcing projects of object descriptions as a central mission-driven activity engaging the public with the institutions, then is there a 'best way' to optimize the chances at creating diversity within the project participants and the metadata/descriptions that they create?

Over the course of this thesis, I will endeavor to provide clear and data-driven answers to my posed research questions. To reiterate, these questions are:

1. How has the professionalization of language production impacted discovery?
2. How have the limitations in discovery of collections impacted the trust of the public?
3. How have crowdsourced descriptions/metadata provided more diverse entry points to collections?
4. How can framing the crowdsourcing projects as a mission-centric engagement program of the institution entice participation in the process by a more diverse public?
5. What are the best ways to create a project that optimizes the chances of creating diversity within the project participants and the descriptions they create?

Significance of This Study:

This thesis and study sits within a two-decade long struggle to engage the public, non-subject matter experts, with cultural heritage collections, and to increase access to cultural heritage collections by tackling biased professional language. Definitions of non-subject matter experts can vary but for this thesis the adoption of United States Government vernacular will be used. The U.S. Department of Energy's Directives Program, Office of Management, defines a subject matter expert as "an individual who is knowledgeable about the professional standards, requirements, and practices used within the discipline he/she represents" as well as an individual who by education, training, and/or experience is a recognized expert on a particular subject, topic, or system.²² In particular, when describing the cultural heritage public, the focus

²² Johnson, Diane. "Subject Matter Expert (SME) — DOE Directives, Guidance, and Delegations." Definition. Accessed November 27, 2023. https://www.directives.doe.gov/terms_definitions/subject-matter-expert-sme.

on a non-subject matter expert as someone who is not knowledgeable about the professional standards and practices of cultural heritage institutions, is integral. The goal of this thesis is not only to test and determine how best to optimize access, participation, and tag creation, but also to provide an engaging experience through which user-generated language is created to help enrich museum metadata. The significance of this study is therefore not only a quantitative and qualitative reflection on the current limitations of professional language description programs but also a critical look at the data to support the need to include the public in the description project in order to create additional, and nuanced, descriptions.

Additionally, this study provides a practical roadmap for how to replicate the results reported in this thesis. By focusing on best practices for project design, looking at the optimization of project designs to best encourage diversity in participants, diversity in the description produced, and critical mass in participation, this thesis helps the cultural heritage field at large in changing the current description/metadata production processes. Including collections and descriptions from library, archives, and museums, this study is unique in its reach across the sector.

The results of this study will not only further enhance discoverability of collections for the public, but also create an experience of participation that instills knowledge into how cultural heritage collections are cataloged, and how language can enhance or impair search. As Alemu and Stevens stated, “However carefully and meticulously crafted, the cataloguer could only provide a single interpretation of information objects.”²³ This thesis and this study will help expose the limitations in professionally curated metadata, and show how user-generated tags can provide additional access points to cultural heritage; while exposing limitations and future research questions.

Assumptions and Limitations:

As laid out above, the impetus for this research came from my own experience in the cultural heritage field working with image request programs. It is important to note that as such, there are assumptions and limitations to the framing of this project that are infused with my own biases. I am a professionally trained cultural heritage worker, having completed a Master’s of Art degree in Museum Studies with the George Washington University in 2013, and with that comes the ingrained biases within the training I received and the best practices I worked within for the

²³ Alemu, Getaneh, and Brett Stevens. *An Emergent Theory of Digital Library Metadata: Enrich Then Filter*. 1st ed. Chandos Publishing, 2015.

last decade. Additionally I am a White woman in the United States, which brings with it privileges, assumptions, and limitations. As I look to tackle diversification of collections' descriptions and access to collections, it is therefore critical to note that my own positionality has been within the groups who have perpetuated exclusionary practices, and I must recognize my own privileges as a limitation.

Within this place of privilege, the research questions described above, though grounded in a vast literature review as shown in **Chapter 2: Contextual Review** and **Chapter 3: Literature Review**, do reflect my own assumptions about user experience and interface with cultural heritage collections. Though I will demonstrate in future chapters that there is a range of research that supports the presence of a semantic gap between the general public and the professionally cataloged description of collections, it is my own experiences and assumption that this gap contributes to the issues of representation and participation of diverse communities within cultural heritage institutions. I will attempt to demonstrate the grounds for these assumptions throughout this thesis, but they must be recognized within the context of a White American woman with ten years of professional experience herself.

Additionally, this thesis does specifically look to center practice-based action research within a United States-based organization, using a pre-existing third party platform. Both of these factors come with limitations to the scope of this research by enforcing an English-only language requirement for participation. Though additional limitations to the project design will be discussed in **Chapter 4: Methodology & Project Design**, it is important to note within this introduction that these limitations do exist. With this in mind, it is also important to note that this research took place during the COVID-19 pandemic years of 2020 and 2021, which came with limitations as many cultural heritage institutions were forced to shutter their physical doors. Not only did this cause upheavals socially, economically, and personally for many participants of this research study, but it also limited participation to those with home access to broadband internet.

Conclusion:

As a cultural heritage professional with a decade of experience within the field, I come to this doctoral research with my own biases, assumptions, and limitations, but I also come to this research with the passion to create change within my chosen field – change that can be replicated by practitioners across the cultural heritage sector. By grounding this research in a practice-based action research methodology, the scope of this study and the impact of its results are applicable to the sector at large through a mix of both quantitative data sets and qualitative data sets.

I will endeavor to answer these questions over the course of this thesis. I will begin by setting the stage for the very real biases and exclusionary practices enforced by cultural heritage institutions and the impacts these practices have upon the public's trust in these institutions with **Chapter 2: Contextual Review**. From here, I will provide an overview of the previous two decades of crowdsourcing projects within cultural heritage institutions to lay the framework for my own research with **Chapter 3: Literature Review**. Next, I will provide a detailed look at my own methodology, including the reasons for the platform and design choices, as well as the limitations within the project itself with **Chapter 4: Methodology & Project Design**. This will lead to **Chapter 5: Data & Results**, which presents the quantitative and qualitative data collected during the case studies run at the Adler Planetarium between 2020-2022. I will then bring all of these chapters together in **Chapter 6: Conclusion** to answer my previously stated research questions, while also providing a look at the limitations and implications of this research and where the field of research could go next.

Definition of Terms:

Cultural Heritage - Cultural heritage includes artifacts, monuments, a group of buildings and sites, museums that have a diversity of values including symbolic, historic, artistic, aesthetic, ethnological or anthropological, scientific and social significance. It includes tangible heritage (movable, immobile, and underwater), intangible cultural heritage (ICH) embedded into cultural, and natural heritage artifacts, sites or monuments. The definition excludes ICH related to other cultural domains such as festivals, celebrations, etc. It covers industrial heritage and cave paintings.²⁴

Archive - Archives serve a specific institution more than the general public, first and foremost attempting to track the history of an institution by maintaining the original order of sources. Archives may allow outside access to these collections, but it is not as much a part of their mission as their museum and library counterparts.²⁵

²⁴ UNESCO Institute for Statistics, 2009 UNESCO Framework for Cultural Statistics
<https://uis.unesco.org/node/3079731>

²⁵ Hedstrom, Margaret, and John Leslie King. "On the LAM: Library, Archive, and Museum Collections in the Creation and Maintenance of Knowledge Communities," 2003, 33

Library - Libraries serve the public as institutions that offer knowledge-based resources (books, articles, periodicals, tapes, videos, etc.) to patrons, providing free access.²⁶

Museum - Museums are public institutions that collect around a specific theme, varying from art, to history, to cultures, to sciences with the expressed mission to share these themes with the public using the collections as boundary objects.²⁷

Gallery - Within an American context and the scope of this thesis, the primary difference between art museums and art galleries is that while one goes to an art museum to view and appreciate art, one goes to an art gallery to view art with the intent or ability to purchase said art. A gallery within the GLAM moniker is specifically a for-profit arm of the cultural heritage sector that does not require a guest to make a purchase to attend an exhibition, but holds their exhibition with the intent to sell the pieces.²⁸

Metadata - Metadata is a set of data that provides information about other data. A piece of metadata typically consists of a set of properties (elements or fields) and a set of values for each property. For example, Title Field: "The Mona Lisa", Accession Number: "2010.030.0001", and so on. Metadata allows people to perform various operations with data, including searching, managing, structuring, preserving, and authenticating resources.²⁹

Crowdsourcing - Crowdsourcing in cultural heritage draws on the efficiency and productivity of the broader field of crowdsourcing, but also has its roots in public participation in science, arts, and history, and is closely related to online volunteering and digitally-enabled public engagement.³⁰

²⁶ Hedstrom, Margaret, and John Leslie King. "On the LAM: Library, Archive, and Museum Collections in the Creation and Maintenance of Knowledge Communities," 2003, 33

²⁷ Hedstrom, Margaret, and John Leslie King. "On the LAM: Library, Archive, and Museum Collections in the Creation and Maintenance of Knowledge Communities," 2003, 33

²⁸ Haja, Nilofar. "Understanding Museums and Art Galleries: Commonalities and Differences." Accessed June 22, 2020.

https://www.academia.edu/1085332/Understanding_Museums_and_Art_Galleries_Commonalities_and_Differences.

²⁹ Steven Miller, *Metadata for Digital Collections* (New York: Neal-Schuman Publishers, 2011), 179.

³⁰ Ridge, M., Blickhan, S., Ferriter, M., Mast, A., Brumfield, B., Wilkins, B., ... Prytz, Y. B. (2021). *The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage* - community review version. Retrieved from <https://britishlibrary.pubpub.org/pub/introduction-and-colophon>

Citizen Science - A set of practices in which unpaid volunteers provided input to professionally coordinated research projects. This has been going on in domains such as field ecology, conservation, and habitat studies since at least the 17th century, predating the 21st century professional scientist.³¹

Public - “Public” as a term is used within the museum field as an almost monolithic term; however, the public of museums is not singular. It is, in fact, multiplicitous. As early as 1997, the use of the term “public” by museums was being questioned by scholars like Stephen Weil,³² and it is important to note that as I use the term throughout this thesis, I do so with a recognition that members of the public at large will vary in what they want, who they are, what they expect, and in almost every way they interact with the museum. However, for the purposes of this thesis, the “public” refers to people outside the museum itself and outside the museum field who willingly engage with the museum, whether as tourist, fan, researcher, or casual observer.

AI - Artificial Intelligence - a theory and method of data analysis that automates analytical models to perform tasks that typically require human intelligence to undertake; such as visual perception, speech recognition, translation, and more.³³

Machine Learning - Seen as a part of Artificial Intelligence, machine learning allows computer algorithms to find hidden insights without being explicitly programmed where to look, using algorithms that iteratively learn from data the algorithms can learn and make inferences on their own.³⁴

³¹ Hedges, Mark, and Stuart Dunn. *Academic Crowdsourcing in the Humanities: Crowds, Communities, and Co-Production*. Chandos Information Professional Series. Chandos Publishing, 2018.

³² Stephen E. Weil (1997) *The Museum and the Public*, *Museum Management and Curatorship*, 16:3, 257-271, DOI: 10.1080/09647779708565852

³³ Brendan Ciecko, “Examining the Impact of Artificial Intelligence in Museums – MW17: Museums and the Web 2017.” Accessed February 24, 2020.

[<https://mw17.mwconf.org/paper/exploring-artificial-intelligence-in-museums/>](https://mw17.mwconf.org/paper/exploring-artificial-intelligence-in-museums/)

³⁴ Brendan Ciecko, “Examining the Impact of Artificial Intelligence in Museums – MW17: Museums and the Web 2017.” Accessed February 24, 2020.

[<https://mw17.mwconf.org/paper/exploring-artificial-intelligence-in-museums/>](https://mw17.mwconf.org/paper/exploring-artificial-intelligence-in-museums/)

Practice-based - Practice-based research is work where, in order to explore their research question, the researcher needs to make things as part of the process. The research is exploratory and is embedded in a creative practice.³⁵

Action Research - Action Research refers to a type of research methodology which works towards a kind of change whether social or professional. Because its goals are oriented toward change rather than knowledge-gathering alone, active research studies are often based in everyday issues, and concern themselves with the creation of practical solutions to these problems in participatory, collaborative, and cyclical ways in order to produce both knowledge and action.³⁶

Trust - A belief in the reliability, truth, ability, or strength of someone or something, based around the expectation that arises within a community of regular, honest, and cooperative behavior, based on commonly shared norms, on the part of other members of that community. In the case of this thesis, the public's trust in cultural heritage institutions to serve and benefit their needs.³⁷

Aboutness - Refers to the style of description for an object that focuses on subject matter or visually, the process of describing what is represented or depicted in an object.³⁸

Is-ness - Refers to the style of description for an object that focuses on an objects' materiality: the date it was created, its creator, location of creation, etc. It is the process of describing an object's physicality.³⁹

³⁵ Candy, Linda, and Ernest Edmonds. "Practice-Based Research in the Creative Arts: Foundations and Futures from the Front Line." *Leonardo* 51, no. 1 (February 2018): 63–69. https://doi.org/10.1162/LEON_a_01471. pg. 63

³⁶ Herr, Kathryn, and Gary Anderson. *The Action Research thesis: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015.

³⁷ Huotari, Maija-Leena, and Mirja Iivonen. "Managing Knowledge- Based Organizations Through Trust," 2004, 29.

³⁸ Alyx Rossetti, "Subject Access and ARTstor: Preliminary Research and Recommendations for the Development of an Expert Tagging Program," *Art Documentation: Journal of the Art Libraries Society of North America* 32, no. 2 (Fall 2013): 284–300.

³⁹ Alyx Rossetti, "Subject Access and ARTstor: Preliminary Research and Recommendations for the Development of an Expert Tagging Program," *Art Documentation: Journal of the Art Libraries Society of North America* 32, no. 2 (Fall 2013): 284–300.

Chapter 2: Contextual Review:

Introduction:

Over the last 50 years, the museum field experienced a technological boom. Access to collections expanded online. Online access to collections evolved from searchable catalogs on museum websites to social media platforms. Overall, reaching the public expanded from guided experiences in galleries and in reading rooms to unfacilitated content posted anywhere the public is connected to the internet. Experiences also expanded from passive viewing to interactive opportunities, such as contributory social media campaigns, video games, and crowdsourcing projects. As audiences discover collections through various online experiences, the importance of describing the visuality of objects has only become more imperative for increasing access to collections, and as museums look to capitalize on the visual nature of social media trends,¹ cataloging data that describes visual qualities of collections is a necessity to stay relevant, on trend, and engaged with audiences.

In this chapter, the language and standards used in cataloging are called into question, proposing a need to expand metadata to include language that adequately describes the visual aspects of these objects to better serve audiences online who encounter a single image of an object oftentimes divorced from its original format and an expert to explain its context.² One solution to this cataloging problem is crowdsourcing. Crowdsourcing in museums has proven over the last two decades to not only increase access points to collections and enrich data,³ but also take a long-obfuscated back end process (metadata creation) and make it more transparent, turning it into a mission-centric engaging activity.⁴

This chapter will explore the various advantages of crowdsourcing, including the ability to create a transparent process that exposes not only the choices made by museum catalogers, but also the algorithms that dictate searches throughout users' experiences online. This chapter will illustrate the need to reframe crowdsourcing projects (and metadata tagging projects in particular) within museums from the traditional ideals of outsourcing labor into participatory experiences. In this chapter, the language and standards used in cataloging will be called into

¹ Ciecko, Brendan, Hilary-Morgan Watt, and Emily Haight. "How Museums Can Experiment with Social Media to Boost Audience Engagement During Coronavirus." Webinar from Cuseum, April 1, 2020. <https://cuseum.com/webinars/how-museums-can-experiment-with-social-media-to-boost-audience-engagement-during-coronavirus-overview>

² Jones, Mike. *Artefacts, Archives, and Documentation in the Relational Museum*. Routledge, 2022. Pg. 41

³ Trant, Jennifer. "Tagging, Folksonomy and Art Museums: Early Experiments and Ongoing Research." *J. Digit. Inf.* 10 (2009). <http://hdl.handle.net/10150/105627>

⁴ Flanagan, Mary, Sukdith Punjasthitkul, Max Seidman, Geoff Kaufman, and Peter Carini. "Citizen Archivists at Play: Game Design for Gathering Metadata for Cultural Heritage Institutions," 2014, 13.

question, diving into the central issues around the professionalization of language production. This chapter will also examine the ways in which failed searches online affect public trust and how many of these failed searches could be remedied by shifting the mindset of the museum's interactions with the public to a new focus on expanding search capabilities and representation by working in tandem with the public to capture the public's language and voice.

I will begin the contextual review looking at how the history of access to collections from onsite/in-person card catalogs has shifted to online collections search portals and digital content centered in social media. I will then examine how the language used by museum professionals has affected discoverability at every level of this history of access, focusing on the bias and problems inherent in cataloging. This leads to a review of a different way of thinking about description, a focus on *aboutness* vs. *is-ness*, looking at a better alignment to the public's use of collections and the internet. From here, I will discuss discoverability and public trust, focusing on the central mission and promise of cultural heritage institutions and the wider distrust percolating in today's internet age. Next, crowdsourcing and citizen science will be introduced as a way to expand trust, access points, and engagement with audiences. This will lead to my own assertion that using crowdsourcing as an extension of the mission-driven work of the museum to engage with the public towards specific learning objectives is a new way of looking at an old process (cataloging), and a new way to look at crowdsourcing, focusing not just on increasing access points but on the experience itself.

A History of Access - From Card Catalogs to Online Public Search Portals and Beyond:

In the 2020 publication *Cataloguing Culture: Legacies of Colonialism in Museum Documentation*, Hannah Turner tracks the history of cataloging and of access to museum collections from the 1800s to today, with a specific focus on the Smithsonian Institution.⁵ Early in the publication, Turner states that within museums in particular, institutional knowledge exists in the work of record keeping, data collection, and digitization. This work asserts that the decisions grounded in best practices of the past still affect tasks like naming, standardizing, classifying, and excluding today.⁶ In this sense, it is possible to demonstrate that as long as museums have had collections and have endeavored to describe them, these records have been contextual and historical, and lacking in any perceived neutrality.⁷ As Mike Jones notes, these catalogs were created using a single hierarchical classification structure and shaped into public displays

⁵ Turner, Hannah. *Cataloguing Culture: Legacies of Colonialism in Museum Documentation*. Vancouver: UBC Press, 2020.

⁶ Turner, *Cataloguing Culture*, pg.4

⁷ Turner, *Cataloguing Culture*, pg.4

and exhibitions that asserted to be neutral and natural whilst suppressing the multiplicitous complexity of cultural, social, and scientific systems.⁸

Turner documents the earliest forms of cataloging, referencing the lists and guides created by curators for use in the field during acquisitions, and later used by cataloging teams divorced from the curatorial process. These guides emphasized attention to detail in the cataloging and labeling of objects because they were often the only written record for an object.⁹ In creating these lists, there was an attempt to structure and standardize the field of collections cataloging, but Turner notes that this establishment of fields of information also worked to value some information over others.¹⁰

“The early field guides pay particular attention to developing a standard and classified system of documentation with respect to knowledge and material heritage through the development of a recording system for field observations and catalogues. These guides were for the collection not only of objects, but also a range of information relating to the local populations.”¹¹ Here, Turner demonstrates the ways cataloging privileged and prioritized the description of physicality over visuality and context, and as I will introduce later, this is a focus on *is-ness* of objects.

Museums in the early 1900s continued this primacy of physicality. The Field Museum of Natural History in Chicago had the following fields in their catalog as of 1904: “when received; catalog number; original or accession number; object; locality; number of specimens; received from; by gift, loan, or purchase; collected by; when collected; dimensions or weight; and remarks.”¹² One hundred fifteen years later, this is still what the majority of museums focus their cataloging efforts on, and as card catalogs became digitized and shared online, this was also the majority of the information shared with the public.

As collections increased in size, the card catalogs became more valuable for research.¹³ And as the second half of the twentieth century dawned, computerization in museums brought an increased awareness of the organization of information and its importance in facilitating research and access to collections.¹⁴ Staff in institutions investing in computerization and digitization of card catalogs understood that too much information would lead to excessive

⁸ Jones, Mike. *Artefacts, Archives, and Documentation in the Relational Museum*. Routledge, 2022. Pg. 4

⁹ Turner, *Cataloguing Culture*, pg.55

¹⁰ Turner, *Cataloguing Culture*, pg. 57

¹¹ Turner, *Cataloguing Culture*, pg. 58

¹² Turner, *Cataloguing Culture*, pg. 68

¹³ Turner, *Cataloguing Culture*, pg. 89

¹⁴ Turner, *Cataloguing Culture*, pg. 141

record sizes which would be insufficient for researcher needs and technological functionality, and thus decisions on what to include and what to exclude were made.

Owing to these technical difficulties and other constraints including cost of computerization, data storage, and staff time, determinations needed to be made on what constituted the indispensable minimum of information that the catalogs had to include. This decision was complicated because different users, like collections managers and curatorial research staff, had different needs with respect to the early computer tools, and different research questions and institutional uses required different kinds of information about objects to be recorded in the catalog.¹⁵ As computerization led to databases, and specifically out-of-the-box databases like TMS (The Museum System), Emu, etc., it became acutely clear that the “boxes” and categories provided in the database were ineffective in holding the complex and robust information about collections, but as they were necessary components of the systems, most staff have learned to work within the constraints by making difficult decisions on what is and is not included in the record keeping.¹⁶ As Kevin Donovan stated when he addressed the first “Museums and the Web” conference in 1997, “two decades of investment in automation had produced ‘better looking documents and spreadsheets and more accurate lists’ without actually improving access to knowledge: ‘In and of itself access to much of our on-line sources is of little value because museums add so little value to the data they provide’.”¹⁷

In the early 2000s, these databases became online public access portals, in effect sharing access to collections with the public via the internet, though with little to no change in how this knowledge was documented from the days of the initial index card and descriptive catalog.¹⁸ This made it possible to search large amounts of data on a collection from anywhere in the world, but for the most part, these portals adopted the same strategies implemented in the earliest card catalogs, bringing with them the same choices, decisions, and biases of over 200 years of description and cataloging.¹⁹ Some of the bad data presented included incoherent pluralizations, whereby some terms are pluralized and some are not, making them difficult to navigate, but bad data can also refer to foreign or offensive terms, or out-of-date descriptive terms.²⁰

¹⁵ Turner, *Cataloguing Culture*, pg. 147

¹⁶ Turner, *Cataloguing Culture*, pg. 159

¹⁷ Jones, *Artefacts, Archives, and Documentation in the Relational Museum*, pg. 5

¹⁸ Jones, *Artefacts, Archives, and Documentation in the Relational Museum*, pg. 55

¹⁹ Turner, *Cataloguing Culture*, pg. 166

²⁰ Turner, *Cataloguing Culture*, pg. 166

As online platforms allow a larger number of diverse visitors to engage with museum collections,²¹ these platforms conversely allow museums to engage with audiences with whom they may not have prior relationships.²² As new audiences, with little attachment to the institution, access these online platforms and run into discoverability problems due to lack of knowledge of the collection, difference in language, or any other number of issues, their reactions may not be as forgiving as those of a museum guest, and as they come in to contact with “bad data” or limited descriptions, the difficulties may grow. By accessing collections online, audiences have different perceptions to onsite guests, and the lack of accessibility and discoverability of collections may widen the distrust of institutions. As the dominant narrative makes its way into the virtual space of the cultural heritage institution, it is important for those making the decisions about what data is shared to understand there are consequences for deciding to tell only a single story about collections items, and these consequences include reinforcing dominant narratives that can diminish the relevancy of museums and their objects while alienating members of the public.²³

An article published in the *Digital Humanities Quarterly* titled “Generous Interfaces for Digital Cultural Collections”²⁴ set up a powerful example of the issues cultural heritage institutions face as they transition to online media. Whereas in an institution, specifically a museum, the mode of discovery is browsing, strolling through galleries and serendipitously discovering a piece, online using a database-driven museum portal, you most often need to *know* what you are looking for in order to access any pieces. The anecdote printed in *DHQ* demonstrates what the onsite, physical experience at a museum would be like if it mirrored that of the online experience:

“Imagine yourself outside an art gallery in a far-off city, with a collection you don’t know well. You enter the building to find a small, drab lobby with an attendant at a desk. The attendant asks you to enter your query on a small slip of paper. Not knowing the collection, and not seeking anything in particular, you write down something arbitrary, and pass it over. The attendant disappears for a moment before returning with a line of

²¹ Linnett, Slover. “Rethinking Relevance, Rebuilding Engagement: Findings from the Second Wave of a National Survey about Culture, Creativity, Community and the Arts.” Slover Linett, January 31, 2022. <https://sloverlinett.com/insights/rethinking-relevance-rebuilding-engagement-findings-from-the-second-wave-of-a-national-survey-about-culture-creativity-community-and-the-arts/>.

²² Wood, Elizabeth, Rainey Tisdale, and Trevor Jones. *Active Collections*. New York, NY: Routledge, 2018.

²³ Wood et. al, *Active Collections*, p. 44

²⁴ Whitelaw, Mitchell. “DHQ: Digital Humanities Quarterly: Generous Interfaces for Digital Cultural Collections.” Accessed February 10, 2020. <http://www.digitalhumanities.org/dhq/vol/9/1/000205/000205.html>.

artworks sitting on trolleys. These are paraded, ten at a time, through the lobby. You can submit another query at any time, calling forth more trolleys, but there seems to be no way to explore the gallery beyond this small lobby. As absurd as it seems, this scenario is played out daily on the web sites of libraries, archives, galleries and museums around the world, where keyword search is the central — often the only — way to access the collection. The dichotomy embodied here can be framed through the notion of generosity. Decades of digitisation have made a wealth of digital cultural material available online.”²⁵

Even as institutions cling to the last line of that quote, “decades of digitisation have made a wealth of digital cultural material available online,” the availability means little to nothing without the ability of the public to actually access and find these materials. There is a disconnect between the experience of a user consulting a catalog in a reading room where help is at hand by an expert if discovery issues arise and that of a person consulting the same catalog remotely or even stumbling upon a reference to it in a Google search with no affiliated museum staff immediately available to provide context and content.²⁶ The loss of a helpful voice has left the user with only what is shared in the online catalog. There is no one there now to explain why this content is important, where it sits contextually, and how it may only tell one part of a narrative. If these facts, anecdotes, and stories are not added to the catalog, it not only impedes access to the materials but also use of the materials.²⁷ “As Yeo notes, this mattered less when finding aids were normally consulted in reading rooms with archivists on hand to offer assistance to researchers, but becomes critical when descriptions are only available digitally.”²⁸

In this sense, it is clear the issues with cataloging data extend beyond offensive terminology and potentially racist language choices. As Saffo, Bearman, Donovan, and others recognized, turning accumulations of discrete object records into virtually accessible museum stories and experiences requires more than expanded metadata and high-quality digitization...“objects need to be linked to their context, to knowledge about people, communities, expeditions, and events; they need to be connected through the knowledge of curators and the voices of communities.”²⁹

²⁵Generous Interfaces, <http://www.digitalhumanities.org/dhq/vol/9/1/000205/000205.html>.

²⁶ Thomas et al, ‘Silence in the Archive’, p. 71

²⁷ Thomas et al, ‘Silence in the Archive’, p. 59

²⁸ Thomas et al, ‘Silence in the Archive’, p. 59

²⁹ Jones, *Artefacts, Archives, and Documentation in the Relational Museum*, pg. 5

Without this focus on access through descriptions, keywords, and language that matches the user, not only can online access issues affect the value and relevance of museums, libraries, and archives within an already saturated knowledge space - the internet - but they also continue to lower the public's trust in these institutions as the keepers of history and culture for all. The internet has done away with the single narrative. It is possible now to do a quick Google search and come up with alternatives from every angle. The museums' insistence on continuing to show just the professionally curated/created narrative online neglects to recognize what cultural heritage institutions have accepted onsite. Onsite museum experiences understand and acknowledge that objects are understood differently depending on the individual's experience, and thus not all visitors engage with a single interpretation or curation of an object.³⁰ This focus on decentralizing the narrative should not be news to museums, archives, or libraries, and, indeed, should not even be a surprise on the internet. As Nancy Fraser states, "virtually from the beginning, counterpublics contested the exclusionary norms of the bourgeois public, elaborating alternative styles of political behavior and alternative norms of public speech."³¹

As one considers the ways in which to operate online to serve the public's expectations, not only does the previously listed need for multiple narratives become imperative, but so too does the need to serve a wider-ranging public. As the use of the internet has spread, how has the content added on cultural heritage sites changed to fit this? Has the content or audience changed?

Wood et al. encourage staff to think of the following questions: "Who is using your institution's database system and why? Is the database used by researchers or is it the basis of public access online? Who is able to input information? We have traditionally used systems designed by museum professionals for their own use."³² How has this design alienated and limited the access of the public to collections? A member of the public who looks to use a museum, library, or archive site does not come to the site with the same foreknowledge as a staff member or even a devoted researcher. This in particular is an issue as cultural heritage public access portals are often built with search in mind. Much like one would use Google, these sites rely on the user to know what they want to find and provide a search term from which results are returned based on whether the staff added similar language to particular items. Even though portals have added browsability functionality through clickable keywords or thematic

³⁰ Wood et. al, *Active Collections*, p. 48

³¹ Fraser, Nancy. "Rethinking the Public Sphere: A Contribution to the Critique of Actually Existing Democracy." *Social Text*, no. 25/26 (1990): 56–80. <https://doi.org/10.2307/466240>.

³² Wood et. al, *Active Collections*, p. 119

carousels of objects, these are dependent on the use of catalog terms to facilitate this experience. Here again, language can be an issue, as can the expectations and responsibility being cast on the user.

The changes in accessing content for cultural heritage institutions extend beyond the simple onsite-to-online paradigm. They also are affected by the change in how users access online environments. Searching and reading online materials now takes place in a social space, and “often on the hoof, in Starbucks or in the pub, rather than the university library.”³³ The importance of this change is that, even as we accept the world is more likely to search than to browse, we are now dealing with power searchers. “Nobody appears to do much deep reading, certainly not what is traditionally thought to be reading. A read online can mean that just 10-15% of a document is read,” according to David Nicholas.³⁴ The power searchers operating in social spaces signal a need to expand access points in cultural heritage data. There is no longer patience to scroll endlessly through sources to parse through for the right data. There is an insistence to find materials that are “good enough” to do the job quickly.

“Somewhere between 2020 and 2025, if David Nichols and Ian Chowcat are to be believed, archives will be servicing a generation of users who will want to access resources instantly from anywhere using mobile devices. According to Nicholas for the digital native the mobile phone is the library, while researchers' information horizons which were once bound by libraries and archives are now borderless. Archives need to find ways to meet the needs of the coming generation or their future users will shift their focus to resources which are available in the way they wish to access them. The archive will have silenced itself.”³⁵

Taking the expectations the public has for their experiences online, it becomes clear that museums, archives, and libraries need to begin changing how they present their materials to the public online. No longer are digital surrogates enough – the public expects to be able to *find* these materials. Not only that, they expect to find them through simple searches, much as they do with Google searches, or through browsable functionalities that mirror the ease of social media hashtags. There is an expectation to hear multiple narratives, to access virtually, and to find what they are looking for quickly and succinctly.

In 2021, in response to the digital pivot many institutions were forced to make due to COVID closures, the “Rolling Stone” magazine even took jabs at the inability of cultural heritage

³³ Thomas et al, ‘Silence in the Archive’, p. 71

³⁴ Nicholas, “The Google Generation”, p. 3

³⁵ Thomas et al, ‘Silence in the Archive’, p. 165

institutions (and museums in particular) to provide meaningful experiences online for their guests.³⁶ I share this example in particular to show how these conversations are moving outside the field and in to the public purview, and it is no longer just an inability to meet guests' expectations online, but a realization by the public and the media that missing these expectations is akin to missing out on the mission-critical purpose of cultural heritage. With these expectations in mind, it becomes clearer that, in much the same ways language and control are imperative to equity, trust, and accountability for museums, archives, and libraries, the methods of their production are similarly imperative.

The Professionalization of Cataloging Language - Privileging Who Can Access:

Before moving forward with a discussion of crowdsourcing and citizen science-based initiatives, it is integral to first set up in what ways a disconnect between the curatorial authority and the public exists, particularly in regards to language usage. It is important to note who is considered the "public" at this juncture by the museum sector at large. "Public" is used within the museum field as an almost monolithic term; however, the public of museums is not singular – it is in fact multiplicitous. As early as 1997, the use of the term "public" by museums was being questioned by scholars like Stephen Weil,³⁷ and it is important to note that as I use the term throughout this thesis, I do so with a recognition that members of the public at large will vary in what they want, who they are, what they expect, and in almost every way they interact with the museum. However, for the purposes of this thesis, the "public" refers to people outside the museum itself and outside the cultural heritage field who willingly engage with the museum, whether as tourist, fan, or casual observer.

Following the previous section's discussion on cataloging processes throughout the history of museums, it's important now to give a short background on the foundations of museums themselves, as this affects how the public interacts with and views these institutions. As explained by Hedstrom and King in "On the LAM: Library, Archive, and Museum Collections in the Creation and Maintenance of Knowledge Communities,"³⁸ museums in particular were born out of the exploration and colonialism of the seventeenth century. As explorations "uncovered" oddities and rarities around the world, these cultural objects were selectively

³⁶ "A Race to the Bottom: Why Museums Need a Digital Strategy - Rolling Stone." Accessed January 25, 2021.

https://www.rollingstone.com/culture-council/articles/race-to-the-bottom-museums-digital-strategy-1111400/?fbclid=IwAR0cleAh_UKSfbipvLyz4L_aGBIOXjCwF96qgpyj3EPS_fXfoZI9TU9kWtU.

³⁷ Stephen E. Weil (1997) The Museum and the Public, *Museum Management and Curatorship*, 16:3, 257-271, DOI: 10.1080/09647779708565852

³⁸ Hedstrom, Margaret, and John Leslie King. "On the LAM: Library, Archive, and Museum Collections in the Creation and Maintenance of Knowledge Communities," 2003, 33

plucked from their homelands and brought back to the cultural centers of Europe to be displayed. In this way, the very earliest collections at Wunderkammern and institutions like the Ashmolean were founded on the principles of colonialism, of creating an “other” to be shown within the context of a “known” culture.

This practice continued long after the seventeenth century and permeates the foundations of museums in the United States as well. As shared by Laura Raicovich of the Walker Art Museum, this “practice began at the founding of museums, which, in the US, largely grew out of the academy, where collections were typically gifted by wealthy, usually white, usually male, philanthropists. Of course, these were naturally very personal collections, tied to taste, race, and class. And yet, these became the foundation of what 'good art' looks like, and they evolved systems of connoisseurship and valuation that reinforced what was included as exceptional. And by omission, what was not included was deemed of lesser quality or value.”³⁹ By their very nature of being founded by a select few who deemed what was worthy of not only collecting and preserving, but also displaying, museums at their core have an inherent bias that excludes many and sets into stark comparison what is considered culture, art, science, etc. and by exclusion, what is not.

As museums took it as their “most basic task” to gather and preserve human and natural history without consulting the cultures they were “preserving”, they showed a bias towards a certain way of thinking and a certain way of presenting cultures.⁴⁰ Though these quotes specifically reference American museums, the same pattern of excluding cultures from how their history and stories are interpreted and preserved by museums can be seen throughout the colonized world: in New Zealand, the Caribbean, Africa, and more.⁴¹ Also shown by Stephen Weil, the act of collecting and preserving itself was often prioritized over the act of sharing. This can still be seen in modern museums, where often only 1-2% of a collection is on display to the public at any given time.⁴² Guests may rightly ask, why these instead of those? The answer: because the *museum* selected these, not those.

Museums as perpetrators of colonialism are apparent again within the descriptions of collections. In 2013, Nina Simon wrote “On White Privilege and Museums” to address many of the disconcerting ways the cultural heritage sector has created a narrative of whiteness, and of

³⁹ “Museum Resolution: Dismantle the Myth of Neutrality.” Accessed January 30, 2020. <https://walkerart.org/magazine/soundboard-museum-resolutions-laura-raicovich>.

⁴⁰ Weil, Stephen E. “From Being about Something to Being for Somebody: The Ongoing Transformation of the American Museum.” *Daedalus* 128, no. 3 (1999): 229–58.

⁴¹ Cameron, Fiona, and Sarah Kenderdine. *Theorizing Digital Cultural Heritage*. Media in Transition 6. The MIT Press, 2007.

⁴² Geraldine Fabrikant (2009) “The Good Stuff is in the Back,” *The New York Times: Arts*. Available at: <https://www.nytimes.com/2009/03/19/arts/artsspecial/19TROVE.html>

the “other.”⁴³ Simon writes: “When non-white stories are told, they are always flagged as such - an exhibition of Islamist scientific inventions or women pioneers or African-American artists. I will never forget walking through a major art institution in San Francisco and being shocked by the fact that artwork in the African and Oceanic sections was often labeled with modifiers like 'beautiful' - words intended to legitimize that only exacerbated with a sense that these objects were not legitimate artworks in their own right. I never saw comparable adjectives used in the European art labels at the museum.”⁴⁴ The use of clarifiers and modifiers not only identifies an artist, an object, or a person as specifically non-white, but those used (such as “beautiful”) to defend the inclusion of a non-white piece as being of equal standing with its white-produced counterparts, are problematic at best, but privileged and prejudiced at worst. There is an acknowledgement to the public that if you do not identify as the default (white, male, European) that you are acknowledged as “others in our midst.”⁴⁵

As Simon continues, “The white privilege frame distorts the extent to which museums can represent and reflect the diversity of humanity.”⁴⁶ The language used in descriptions, whether in databases or in museum displays, has resonance with the public, and it matters. Objects in museum collections are in fact collected because they are cultural resources that serve both a variety of purposes and a variety of audiences, and our cataloging should acknowledge this fact.⁴⁷ Yet despite knowing that cultural resources serve a variety of audiences, curatorial control is still enacted over these object descriptions and often in ways that serve one specific subsection of the public: researchers. As Wood notes, the majority of indexing, categorizing, and description is done in a way to serve researchers, despite the majority of museums’ mission statements claiming to serve “the public.”⁴⁸ It is important to note there is a disconnect between serving a researcher-centric audience and a public audience. A researcher is often privy to the academy and trained in research that privileges their ability to navigate online catalogs and searches, which, as described above, often reflects how museum staff utilize these materials. A non-researcher member of the general public does not have this same training or knowledge.⁴⁹

⁴³ Simon, Nina. “On White Privilege and Museums.” Museum 2.0 (blog), March 6, 2013. <http://museumtwo.blogspot.com/2013/03/on-white-privilege-and-museums.html>.

⁴⁴ Simon, “On White Privilege and Museums”

⁴⁵ Simon, “On White Privilege and Museums”

⁴⁶ Simon, “On White Privilege and Museums”

⁴⁷ Wood, Elizabeth, Rainey Tisdale, and Trevor Jones. *Active Collections*. New York, NY: Routledge, 2018.

⁴⁸ Wood et. al, *Active Collections*, p. 110

⁴⁹ Mathes, Adam. “Folksonomies - Cooperative Classification and Communication Through Shared Metadata.” Accessed October 27, 2019.

<https://adammathes.com/academic/computer-mediated-communication/folksonomies.html>.

Thus one of the reasons the curatorial control of descriptions is so concerning is that most institutions are presenting collections to the public in terms and with descriptions that the public may not understand, and thus it keeps the public from using collections in meaningful ways. It breaks the trust that collections are in fact for the public. To end this discussion on description, this quotation from Mark A. Greene has particular resonance:

“Everything an institution does should be supporting the end goal of increasing the use of its holdings - use, by the way that includes not solely researchers in the reading room or viewing digitized collection material on our websites, but also viewing our in-house and traveling exhibits, employing facsimile packets in the classroom, listening to or reading scholars who have used our holdings, watching documentaries that highlight some of our photographs and objects and the like. Use should be the end of all our efforts.”⁵⁰

It is important to note that there are already discussions amongst museum staff and visitors about the need for a more representational narrative and broader inclusion of the narratives. As issues of white supremacy, police brutality, racial inequality, and more have gripped the news cycles, from the Ferguson unrest in 2014 to the George Floyd protests of 2020, the community of museum professionals has called for museums to become places of social change and mass action.⁵¹ *Museums Are Not Neutral*⁵² is a global advocacy initiative co-produced by La Tanya S. Autry and Mike Murawski that was founded in 2017, and along with the *Museums as Sites of Social Actions* (MASS Action) project launched in 2016, movements that began in the United States have picked up members and attention across the world.⁵³ This will be discussed further in the *Public Trust and Cultural Heritage* section below, but is important to introduce here in terms of questioning how institutions catalog.

As the expectations in the previous section illustrate, the public is coming to cultural heritage websites expecting to discover materials in much the way they navigate the rest of the internet, using thematic and contextual language. Where this comes into play for museums, libraries, and archives is with the language created and shared as metadata. As defined,

⁵⁰ Wood et. al, *Active Collections*, p. 80

⁵¹ Artstuffmatters. “Changing the Things I Cannot Accept: Museums Are Not Neutral,” October 15, 2017. <https://artstuffmatters.wordpress.com/2017/10/15/changing-the-things-i-cannot-accept-museums-are-not-neutral/>.

⁵² Murawski, Mike. “MUSEUMS ARE NOT NEUTRAL.” *Art Museum Teaching* (blog), August 31, 2017. <https://artmuseumteaching.com/2017/08/31/museums-are-not-neutral/>.

⁵³ “La Tanya Autry and Mike Murawski – Panorama: Journal of the Association of Historians of American Art.” Accessed January 30, 2020. <https://editions.lib.umn.edu/panorama/article/public-scholarship/museums-are-not-neutral/>.

metadata is a set of data that provides information about other data.⁵⁴ Metadata consists of a set of properties (elements or fields) and a set of values for each property (for example, Title Field - “The Mona Lisa”, Accession Number - “2010.030.0001”, etc.). Metadata allows people to perform various functions including searching, browsing, managing, structuring, preserving, and authenticating resources.⁵⁵

Alemu and Stevens state that although metadata is developed explicitly in the emerging web context, “critics contend that contemporary metadata approaches have retained some of the constraints inherent in the physical library and card catalogue systems and, hence, fail to rise to the challenge of the present day digital information landscape. As a consequence current metadata principles are criticised for failing to take into account the diversity of cultural, linguistic and local perspectives that abound in the global community of library users.”⁵⁶ Here we see the continuing issue of bias in language within the cultural heritage sector (laid out previously) permeating into the online landscape through metadata.

A key issue with metadata is further raised by Steven Miller early in his work *Metadata for Digital Collections*. “The properties have been invented or selected by human beings because they have been judged to be useful for people to perform some kind of function in relation to the resource. Functions might include finding resources in a database or catalog.”⁵⁷ As shown in previous sections, it is the invention and selection of items by human beings that perpetuates biases in cultural heritage. Alemu and Stevens confirm that the bias is often revealed when the language (terminology) used in these schemes significantly diverges from the one employed by its public users.⁵⁸ The ability to discover collections materials is dependent on the ability of the cultural heritage professional to add language that the user will query the database with. Even if the materials are digitized and available online, if the language is not matching, you will not be able to find it. Digitization has been proven to be no panacea – as previously stated, availability of materials does not equate to findability of materials.⁵⁹ The best way to improve the discoverability of and access to cultural heritage institutions online is through providing the public with more information about the materials – metadata, but in terms they will use.

⁵⁴ Miller, Steven. *Metadata for Digital Collections*. 179. New York, NY: Neal-Schuman Publishers, Inc., 2011.

⁵⁵ Miller, *Metadata for Digital Collections*, p. 5

⁵⁶ Alemu, Getaneh, and Brett Stevens. *An Emergent Theory of Digital Library Metadata: Enrich Then Filter*. 1st ed. Chandos Publishing, 2015.

⁵⁷ Miller, *Metadata for Digital Collections*, p. 4

⁵⁸ Alemu and Stevens, *An Emergent Theory*, p. 19

⁵⁹ Thomas et al, ‘Silence in the Archive’, p. 83

What Is in a Description? - “Aboutness” vs. “Is-ness”

Further obscuring the breadth of access to collections is the way in which collections are described, not just in what objects and narratives are selected to be described, but also in *how* they are actually described. Cultural heritage professionals often focus on describing what an object *is*, not what an object is *about*. This may seem like a matter of semantics, but it is not. Unlike text-based forms of information, cultural heritage objects and their images featured online have not traditionally been described according to subject matter or visuality, the *aboutness*.⁶⁰ Descriptions often focus on physicality, things like: who made the piece, where was it made, what size is it, when was it made, and what materials is it. Though helpful, this information does not help when a person is querying a database looking for images that feature specific visual traits or even thematic elements – for example, someone searching for *snow* or for *Black History*. Further, literature shows that the public is searching for subject *aboutness* over object *is-ness*.

Kris Wetterlund further provides an example of how the difference in professionally added descriptive metadata can actually obscure materials from public searching on subjects – how the *is-ness* can prevent discovery of the *aboutness*. As Wetterlund states: “Curators in art museums describe the medium of works of art very specifically. An oil painting in an art museum is often catalogued as *oil on canvas* and a black and white photograph is called a *silver gelatin print*. Thus, when teachers search museum sites for paintings or photographs, no items are returned even though art museums obviously are filled with paintings or fine art photographs.”⁶¹ This further demonstrates how this way of cataloging privileges researchers in the know over the general public. As Colleen Dilenschneider has argued, cultural heritage professionals and cataloguers are not great at thinking like regular visitors.⁶² Working for a cultural organization means you already know more than the average person about the institution’s content area, which may lead a professional to create metadata language that negates the novice user, creating the institution’s biggest blindspots.

⁶⁰ Rossetti, Alyx. “Subject Access and ARTstor: Preliminary Research and Recommendations for the Development of an Expert Tagging Program.” *Art Documentation: Journal of the Art Libraries Society of North America* 32, no. 2 (September 2013): 284–300.

⁶¹ Wetterlund, Kris. “Flipping the Field Trip: Bringing the Art Museum to the Classroom.” *Theory Into Practice* 47, no. 2 (Spring 2008): 110–17.

⁶² Colleen Dilenschneider. “Why Forgetting That Industry Experts Have Biased Perspectives Hurts Cultural Organizations,” July 5, 2017. <https://www.colleendilen.com/2017/07/05/forgetting-industry-experts-biased-perspectives-hurts-cultural-organizations/>.

An example of how this could be mitigated by bringing in various perspectives was shared in an opinion piece published on OZY.com in 2014 by Mary Flanagan.⁶³ As Flanagan writes:

“Say a digitized image is from an Arctic exploration. The words that come to mind when a member of the public sees the image might be: “Bear, Polar Bear, Animal, Snow.” Another person who happens to know Latin comes along — Wikipedia style — and types “Ursus,” the species name for bear. A geography buff might notice distinct markings of the “Beaufort Sea” in Northern Alaska. A photography lover might be able to date the photo by the color or type of technique used.”⁶⁴

As demonstrated by Flanagan, the language that is added to this image of the Arctic will affect who can find the image. If the institution that cataloged the image only included “Arctic Exploration” and the year of capture, let’s say 2007, then the geography buff trying to find this specific image by searching for “Beaufort Sea” will not receive the image in the search, as that metadata has not been added. Similarly, the query for “Ursus” will not find this image. This is where language in metadata is crucial for discovery: it can help expand entry points.

As set up in the previous section, the majority of the public are accessing cultural heritage materials from their phone or personal devices far from the actual collections and the experts who created the metadata through which the searches are made possible. As the public cannot rely on the experts to explain their reasoning anymore, the experts must find ways to better serve the public. Cameron and Kenderdine continue that “Information needs to be preserved in such a way that a future society can use it with confidence. In other words, the information objects or records must be readily comprehensible by a future audience, not just people inside a given community, but all others with some sort of interest or concern.”⁶⁵

Here is where one of the biggest issues with metadata creation can be observed. As experts look at how to best serve future audiences, there is difficulty in anticipating what all the entry points to specific material might be for all people. Human beings are highly unlikely to agree on a singular, authoritative, and hierarchical classification of objects as experiences and interpretations vary. Controlling vocabularies and organizing information for users when creating metadata presumes some knowledge of the public’s terminologies and search strategies.

⁶³ Flanagan, Mary. “How You Can Save Libraries With Just a Few Clicks | OZY,” May 27, 2014. <https://www.ozy.com/opinion/how-you-can-save-libraries-with-just-a-few-clicks/31551/>.

⁶⁴ Flanagan, Mary. “How You Can Save Libraries With Just a Few Clicks | OZY,” May 27, 2014. <https://www.ozy.com/opinion/how-you-can-save-libraries-with-just-a-few-clicks/31551/>.

⁶⁵ Cameron and Kenderdine, *Theorizing Digital Cultural Heritage*, p. 245

However, Weinberger notes that these presumptions are likely to be incongruent with the actual search behaviors of users.⁶⁶ One of the key issues here is in the time and effort it takes to generate metadata. As one can recognize that metadata plays an imperative role within cultural heritage institutions to support the findability and discoverability of materials and information objects by not only users in the public but also staff, it must also become noted that assigning metadata to the tens, if not hundreds, of millions of digital information objects has become a progressively more expensive and nearly impossible endeavor.⁶⁷

The combination of high cost of adding semantic meaning within cultural heritage image databases,⁶⁸ reliant on human indexing, and the increasing amounts of digital content created that need these levels of metadata added, has resulted in a very minimal amount of description added to online published images.⁶⁹ Further, “these formulaic descriptions are rooted in the long-established practices of curatorial disciplines such as art history, decorative arts, history, science, and technology. Such practices have been perceived as separate from more 'subjective' forms of documentation such as interpretive exhibition text. However, far from being self-evident and unbiased, item level collection records represent the primary means by which museums interpret, define, and communicate the significance and heritage value of their objects.”⁷⁰ This reliance on professionally controlled, minimally descriptive metadata was often done to get masses of materials available to the public. However, the heterogeneity of materials held by institutions has made it impossible for minimally descriptive metadata to cover all the possible entry points to the data the public require, actually limiting the discoverability of these collections.⁷¹

Mistrust and regard for institutions may continue to be affected if this contextual and subject matter metadata is not present in the online public access portals, even if the language provided matches that of the user. Already, there is literature to show the users are struggling to find materials using the current minimally descriptive metadata. As Jennifer Schaffner of OCLC, Programs and Research Division, stated in 2009, structured metadata best serves internal audiences for the purposes of collections management, but it is often not what the users need to discover collections and primary sources. Schaffner asserts that the minimally described collections privilege the internal user over the external user, as staff is trained on archival

⁶⁶ Alemu and Stevens, *An Emergent Theory*, p. 11

⁶⁷ Alemu and Stevens, *An Emergent Theory*, p. 11

⁶⁸ Hooland, Seth van. “From Spectator to Annotator: Possibilities Offered by User-Generated Metadata for Digital Cultural Heritage Collections,” September 2006.

⁶⁹ Hooland, “From Spectator to Annotator”, p. 2

⁷⁰ Cameron and Kenderdine, *Theorizing Digital Cultural Heritage*, p. 166

⁷¹ Hooland, “From Spectator to Annotator”, p. 2

standards for description and cataloging but users are not. Furthermore, studies have shown the majority of external users are not searching collections by provenance, which is a key aspect of archival cataloging. Within a cultural heritage perspective, and for the purposes of this thesis, provenance can be understood as the ownership history of an object, from when it was first created to its arrival at the institution.⁷² Though librarians and archivists need to manage these collections by provenance, they also need to describe what is in these collections to better suit the search needs of their users.⁷³

Schaffner argues that thirty years of user studies show that *aboutness* and relevance matter most for discovery, especially as discovery happens off site and online.⁷⁴ But the language used to describe this *aboutness* still matters. Subject analysis and representation cannot be described without an inherent bias of the describer infusing the metadata. As Miller states, representations are, “inherently mired in the subjectivity and ambiguity of human thought processes; personal, cultural, social, linguistic, and subject knowledge limitations and potential biases, whether conscious or unconscious, and the ambiguity of human language itself.”⁷⁵ Even if museums acknowledge a need for enhanced metadata to include *aboutness*, working within the vacuum of the museum staff mindset is inevitable to continue to perpetuate the subjectivity, limitations, and biases raised by Miller.

As searching by subject (and *aboutness*) is shown to be the most frequent and important way that users seek information, it is imperative to again note that the use of language will affect this searchability. As Brook, Ellenwood, and Lazzaro show, “taking into account the ways in which spaces can empower or disempower specific groups of users would require an examination of how navigation may be 'intuitive' to one group of students, depending upon the language that they commonly use, and indecipherable to another group for the same reason.”⁷⁶ In the case of professionally created metadata, the empowered group is the metadata creator, the museum staff, and the researcher, while the public is disempowered due to lack of knowledge and transparency of the metadata language and structure. The understanding of the

⁷² “What Is Provenance? | Getty News.” Accessed December 6, 2022.

<https://www.getty.edu/news/provenance-explained-why-it-matters-who-owns-art/>.

⁷³ Schaffner, Jennifer, OCLC, Programs and Research Division. *The Metadata Is the Interface: Better Description for Better Discovery of Archives and Special Collections : Synthesized from User Studies*. Dublin, Ohio: OCLC Programs and Research, 2009.

<http://www.oclc.org/programs/publications/reports/2009-06.pdf>.

⁷⁴ Schaffner, *The Metadata is the Interface*, page 13

⁷⁵ Miller, *Metadata for Digital Collections*, p. 99

⁷⁶ Brook et al, ‘Denaturalizing Whiteness,’ p. 260

narrative hinges on the use of normative codes for meaning-making that both the *creator* and the *user* can understand.⁷⁷

It becomes clear that not only is the language used within the metadata important to appeal to the public's wide-ranging needs and wants, but the metadata itself must also be focused on what the object is physically, and also what it is about visually. But further than this, metadata must also evolve and change. As Olivia Vane states,⁷⁸ cataloging data is subject to change: "What is recorded about items intends to meet the requirements of those accessing the collection. But those requirements can change, and cataloguers have to try to keep up."⁷⁹

What the public is looking for and the language they may be using will inevitably change as public interests and language are constantly doing. Within Vane's thesis, she lays out an anecdotal conversation with a curator who signaled a need to refocus metadata for thematic searches: "20 years ago they'd come in and say 'I want to see works by this artist', 'I want to see works by Constable'...Now, they're more likely to come in and say, 'I'm researching early feminism' or 'I'm researching black British history'. It's much more thematic and much more social history based perhaps. So they're looking for specific imagery that we didn't necessarily think to record at the time. We were more focused on who painted it or who took the photo."⁸⁰

As this anecdote lays out, in a very real way, as the interests and expectations of the public have shifted, their queries are shifting. Without staff onsite in reading rooms or on the museum floor to help bridge this gap, the collections become irrelevant unless metadata and description keep pace with the societal changes. As stated previously in this section, metadata creation is expensive and time consuming, and as I have flagged issues concerning expanding minimally descriptive metadata, evaluating and diversifying narratives and language in metadata, adding subject descriptive metadata, and evolving and editing metadata over time, it becomes clear there are many issues to address and still a limit to resources. Through curatorial authority and minimally descriptive metadata, entire narratives have been excluded, limiting access by large swathes of the public. But as shown above, it is not just what stories are being told, but the way objects are actually described and the language used within this description that further limits discoverability. This limitation in discoverability breeds mistrust in museums, especially in the Internet Age.

⁷⁷ Robinson, "Remembering Things Differently", p. 424

⁷⁸ Vane, Olivia. "Timeline Design for Visualising Cultural Heritage Data." Royal College of Art Postgraduate Art and Design, September 5, 2019

⁷⁹ Vane, "Timeline Design", p. 18

⁸⁰ Vane, "Timeline Design", p. 18

Thinking Critically About the Rules of Cultural Heritage - Critical Heritage Studies and Issues of Trust

In many ways the societal change in discovery and searching behaviors brought forward in the Internet Age is reflected in the emergence of the field of Critical Heritage Studies. Beginning in the 2000s, Critical Heritage Studies attempted to consolidate the disparate interests in heritage studies across libraries, archives, museums, archeology, and more. It describes a body of scholarship that moves beyond heritage studies as a field traditionally focused on technical issues and practice, and into one that emphasizes the political, cultural and social phenomenon of cultural heritage itself.⁸¹ Critical Heritage Studies encompasses research on the choices made about what to conserve and why, the politics of heritage management, the relationships between commemorative acts and public memory, and the process of heritage management articulating across unequal relations of expertise and power.⁸² Critical Heritage Studies changed the emphasis of Heritage Studies from one of conservation and preservation of heritage, to complex questions of the power that heritage entails and produces.⁸³

As a field, Critical Heritage Studies attempts to shift the emphasis in cultural heritage away from simply how, where and which heritage is conserved, towards an emphasis on why these decisions are made and the effects these decisions have.⁸⁴ By focusing on the role of heritage in assembling and making futures based on the choices made about what to preserve from the past, the field focuses attention on the power and knowledge created by these choices.⁸⁵ Prominent critical heritage scholars including Rodney Harrison stated in 2016 that a central notion for Critical Heritage Studies was the plurality of cultural heritage activities, and in particular the ways in which heritage practices of different kinds could lead to radically different futures depending on how decisions were made in the field.⁸⁶ Christoph Brumann continued this line of thought, noting that the field of study is not about moral claims of whether heritage is

⁸¹ Gentry, Kynan, and Laurajane Smith. "Critical Heritage Studies and the Legacies of the Late-Twentieth Century Heritage Canon." *International Journal of Heritage Studies* 25, no. 11 (2019): 1148.

⁸² Harrison, Rodney. "CONCLUSION: On Heritage Ontologies: Rethinking the Material Worlds of Heritage." *Anthropological Quarterly* 91, no. 4 (2018): 1365–83. p. 1367.

⁸³ *Politics of Scale: New Directions in Critical Heritage Studies*. 1st ed. Vol. 1. Berghahn Books, 2019. <https://doi.org/10.2307/j.ctv12pnscx>.

⁸⁴ Harrison, "CONCLUSION: On Heritage Ontologies," p. 1365.

⁸⁵ Harrison, Rodney. "Heritage Practices as Future Making Practices." In *Cultural Heritage and the Future*, 29–45. Routledge, 2020. <https://rps.ucl.ac.uk>. p. 29-31

⁸⁶ Harrison, Rodney, Nadia Bartolini, Caitlin DeSilvey, Cornelius Holtorf, Antony Lyons, Sharon Macdonald, Sarah F. May, Jennie Morgan, and Sefryn Penrose. "Heritage Futures." *Archaeology International* 19 (December 12, 2016): 68–72. <https://doi.org/10.5334/ai.1912>. Pg. 70

“good” or “bad” but instead thinking about how the decisions made across distinct yet related fields of practice impact one another.⁸⁷

Scholar Laurajane Smith has been at the forefront of Critical Heritage Studies since 2006, where she looked to examine the connections between power and language in heritage studies, reflecting and creating a set of social and political practices within the cultural heritage field.⁸⁸ As one of the founders of the Association of Critical Heritage Studies,⁸⁹ Smith was instrumental in the creation of the Manifesto for Critical Heritage Studies. This Manifesto included the proposition that “heritage studies needs to be rebuilt from the ground up, which requires the ‘ruthless criticism of everything existing’. Heritage is, as much as anything, a political act and we need to ask serious questions about the power relations that ‘heritage’ has all too often been invoked to sustain.”⁹⁰

Smith went on to publish an editorial in the *International Journal of Heritage Studies* in 2012⁹¹ to explain and defend not only the creation of the Association of Critical Heritage Studies, but also the Manifesto it proposed. Here Smith grounded the Critical Heritage Studies field in the work of 1980s and 1990s cultural heritage scholars including Peter Vergo and his own manifesto *New Museology*.⁹² Scholars such as Witcomb and Buckley⁹³ point to the importance of grounding Critical Heritage Studies within this earlier research, as both Vergo and Smith argued for a move away from emphasis on techniques and more towards an analysis of ideological functions.⁹⁴ Additionally scholars such as Lowenthal⁹⁵ in the 1980s, as well as

⁸⁷ Harrison, Rodney. “CONCLUSION: On Heritage Ontologies: Rethinking the Material Worlds of Heritage.” *Anthropological Quarterly* 91, no. 4 (2018): 1365–83. Pg. 1368

⁸⁸ Smith, Laurajane. “Uses of Heritage.” Routledge & CRC Press. Accessed August 31, 2023.

<https://www.routledge.com/Uses-of-Heritage/Smith/p/book/9780415318310>.

⁸⁹ Association of Critical Heritage Studies. “History.” Accessed November 3, 2023.

<https://www.criticalheritagestudies.org/history>.

⁹⁰ Association of Critical Heritage Studies. “History.” Accessed November 3, 2023.

<https://www.criticalheritagestudies.org/history>.

⁹¹ Smith, Laurajane. “IJHS Editorial: A ‘critical’ Heritage Studies?” *International Journal of Heritage Studies* 18(6):533–40, November 1, 2012.

https://www.academia.edu/2106554/IJHS_Editorial_A_critical_heritage_studies.

⁹² Vergo, Peter. *New Museology*. Reaktion Books, 1997.

⁹³ Witcomb, Andrea, and Kristal Buckley. “Engaging with the Future of ‘Critical Heritage Studies’: Looking Back in Order to Look Forward.” *International Journal of Heritage Studies* 19, no. 6 (2013): 562.

⁹⁴ Witcomb, Andrea, and Kristal Buckley. “Engaging with the Future of ‘Critical Heritage Studies’: Looking Back in Order to Look Forward.” *International Journal of Heritage Studies* 19, no. 6 (2013): 562. P. 564

⁹⁵ Lowenthal, David. *The Past Is a Foreign Country*. Cambridge University Press, 1985.

Tunbridge,⁹⁶ Byrne,⁹⁷ Macdonald,⁹⁸ and more in the 1990s, were all committed to establishing heritage as a separate field of study, and had begun discussions on politics and social power dynamics within this field.⁹⁹

Smith's work is especially important for the context of this thesis, as it examines and draws attention to the concrete ways in which power can be exercised through language choice and exhibition in cultural heritage sites.¹⁰⁰ Smith also lays out five themes that emerged at the first conference on Critical Heritage Studies: the recognition of plurality and diversity of values; the diversity of ways in which heritage is brought to bear on a wide range of issues in society; the ways in which heritage itself becomes a resource of power with monolithic control; how different disciplines consider heritage and the importance of this disciplinary framing being influenced by practice; and finally the engagement of non-Anglophone and non-Western understandings of heritage.¹⁰¹ Additionally, Witcomb and Buckley point to the importance of including practitioners in the field of Critical Heritage Studies to avoid losing sight of the importance of not just critique but also implementation. As a practicing scholar this will play into my own research.¹⁰²

Smith & Harrison, Graham and Howard,¹⁰³ Dicks,¹⁰⁴ Kirshenblatt-Gimblett,¹⁰⁵ Munjeri,¹⁰⁶ and Akagawa¹⁰⁷ all published in the first decade of the twenty-first century on the tangible and intangible dimensions of heritage, including perceiving the ideas, practices, and processes of

⁹⁶ Graham, Brian, Gregory John Ashworth, and J. E. Tunbridge. *A Geography of Heritage: Power, Culture and Economy*. Arnold, 2000.

⁹⁷ Byrne, Denis. "Deep Nation: Australia's Acquisition of an Indigenous Past." *Aboriginal History Journal* 20 (2011).

https://www.academia.edu/7305015/Deep_nation_Australias_acquisition_of_an_indigenous_past.

⁹⁸ Macdonald, Sharon. *The Politics of Display: Museums, Science, Culture*. Psychology Press, 1998.

⁹⁹ Gentry, Kynan, and Laurajane Smith. "Critical Heritage Studies and the Legacies of the Late-Twentieth Century Heritage Canon." *International Journal of Heritage Studies* 25, no. 11 (2019): 1148. P. 8.

¹⁰⁰ Smith, Laurajane. "Uses of Heritage." Routledge & CRC Press. Accessed August 31, 2023.

<https://www.routledge.com/Uses-of-Heritage/Smith/p/book/9780415318310>.

¹⁰¹ Smith, Laurajane. "IJHS Editorial: A 'critical' Heritage Studies?" *International Journal of Heritage Studies* 18(6):533-40, November 1, 2012.

https://www.academia.edu/2106554/IJHS_Editorial_A_critical_heritage_studies. Pgs 538-539.

¹⁰² Witcomb, Andrea, and Kristal Buckley. "Engaging with the Future of 'Critical Heritage Studies': Looking Back in Order to Look Forward." *International Journal of Heritage Studies* 19, no. 6 (2013): 562. P. 568

¹⁰³ Graham, B. and P. Howard (eds). 2008. *The Ashgate Research Companion to Heritage and Identity*. London: Ashgate.

¹⁰⁴ Dicks, B. 2000. *Heritage, Place and Community*. Cardiff : University of Wales Press.

¹⁰⁵ Kirshenblatt-Gimblett, B. 2004. 'Intangible Heritage as Metacultural Production', *Museum International* 56(1-2): 52-65.

¹⁰⁶ Munjeri, D. 2004. 'Tangible and Intangible Heritage: From Difference to Convergence', *Museum International* 56(1-2): 12-20.

¹⁰⁷ Smith, L. and N. Akagawa. 2009. 'Introduction', in L. Smith and N. Akagawa (eds), *Intangible Heritage*. London: Routledge, pp. 1-10.

heritage as inherently political.¹⁰⁸ Scholarly research concerned with cultural heritage changed during the late twentieth to early twenty-first century, as humanities and social science scholars like Labadi,¹⁰⁹ Turnbridge and Graham,¹¹⁰ and Ashworth¹¹¹ “took increasing interest in uneven power relations, hierarchical power structures, explicit and implicit politics of dominance and oppression, silenced narratives and alternative, emancipatory and empowering identity projects.”¹¹²

As Critical Heritage Studies looks to explore the power relations tied up in the meaning making and practices of heritage professionals and institutions, the fetishization of expert knowledge and the privileging of “old, grand, prestigious, expert-approved sites, buildings, and artefacts” have been called into question, much in the ways my own research looks to continue.¹¹³

Additionally, a focus in cultural heritage studies that is of importance to this thesis is the foregrounding of transparency. Harrison stated:

“what is most important is exposing all of the processes by which heritage is made—both expert and popular—and thus allowing publics to understand them in their own social, historical, political and economic context. Publics are then able to make an informed decision, taking into account the implications of the arguments mobilised in the name of heritage”¹¹⁴

During a period of time when there is unrest and introspection not only in academic communities, but also coming from the public, the adoption of Critical Heritage Studies has a clear moral impetus.¹¹⁵ Following the rapid expansion of cultural heritage institutions that came after the 1972 World Heritage Convention, new industries and professions were spun up including the professionalization of museum, library, and archival practices mentioned previously

¹⁰⁸ Politics of Scale: New Directions in Critical Heritage Studies. 1st ed. Vol. 1. Berghahn Books, 2019. <https://doi.org/10.2307/j.ctv12pnscx>. P. 2

¹⁰⁹ Labadi, S. 2007. ‘Representations of the Nation and Cultural Diversity in Discourses on World Heritage’, *Journal of Social Archaeology* 7(2): 147–70.

¹¹⁰ Graham, B., G. Ashworth and J. Tunbridge. 2000. *A Geography of Heritage: Power, Culture and Economy*. London: Hodder Arnold Publication.

¹¹¹ Ashworth, G., B. Graham and J. Tunbridge. 2007. *Pluralising Pasts: Heritage, Identity and Place in Multicultural Societies*. London: Pluto Press.

¹¹² Politics of Scale: New Directions in Critical Heritage Studies. 1st ed. Vol. 1. Berghahn Books, 2019. <https://doi.org/10.2307/j.ctv12pnscx>.

¹¹³ Politics of Scale: New Directions in Critical Heritage Studies. 1st ed. Vol. 1. Berghahn Books, 2019. <https://doi.org/10.2307/j.ctv12pnscx>. P. 2

¹¹⁴ Harrison, Rodney. “Critical Heritage Studies beyond Epistemic Populism.” *Antiquity* 92, no. 365 (2018): e9. doi:10.15184/aqy.2018.223.

¹¹⁵ Winter, Tim. “Clarifying the Critical in Critical Heritage Studies.” *International Journal of Heritage Studies* 19, no. 6 (September 1, 2013): 532–45. <https://doi.org/10.1080/13527258.2012.720997>. P. 532

in this thesis.¹¹⁶ Many of the processes enforced by this professionalization focused on the top-down decision making traditionally used in institutions that fuels inequalities and injustices by consuming and using cultural resources of communities while also excluding these communities from their own heritage making.¹¹⁷

Importantly to this thesis, the Critical Heritage Studies field does not apply only to the physical aspects and actions of institutions, but also to the actions taken online. With the advent of digitization and social media it has been noted by scholars like Joel Taylor and Laura Kate Gibson that these virtual tasks and spaces for facilitating greater access and providing spaces for new voices are not inherently unbiased or democratic.¹¹⁸ In fact by adopting the Critical Heritage Studies lens to these spaces it is possible to see how the societal inequalities surrounding Internet access (which will be discussed further in **Chapter 3: Literature Review**) affect heritage access based on a multitude of issues including: who has the ability to write code, who can afford server space, who has access to stable and faster connections, who receives training, and what language the user speaks in an English dominated web environment?¹¹⁹ These issues all point to the truth that “ simply expanding participation is not enough; we need to think more about the kinds of participation.”¹²⁰

The focus on critically thinking about these practices within the scope of the larger issues that affect heritage today is important to the discussion of these institutions serving in the public trust that will be discussed in following sections. Better positioning the various ways in which cultural heritage institutions have a stake in, and can act as moderators for, multitudinal challenges such as sustainability, economic inequality, colonialism, and more, helps assert the importance of the cultural heritage sector during times of mistrust.¹²¹

As Rodney Harrison and Colin Sterling stated in 2021, cultural heritage institutions have been isolated from the world in many ways due to their nature as public servants, however their actions and entanglement with colonialism, imperialism, capitalism and nationalism make them complicit in a range of oppressive structures that are now being thrown into focus on multiple

¹¹⁶ Harrison, Rodney. “CONCLUSION: On Heritage Ontologies: Rethinking the Material Worlds of Heritage.” *Anthropological Quarterly* 91, no. 4 (2018): 1365–83. P. 1366

¹¹⁷ Apaydin, Veysel. “Heritage, Education and Social Justice.” *Elements in Critical Heritage Studies*, November 2022. <https://doi.org/10.1017/9781009052351>. P. 2-3

¹¹⁸ Taylor, Joel, and Laura Kate Gibson. “Digitisation, Digital Interaction and Social Media: Embedded Barriers to Democratic Heritage.” *International Journal of Heritage Studies*, 2016. <https://doi.org/10.1080/13527258.2016.1171245>. P. 2

¹¹⁹ Taylor and Gibson, “Digitisation, Digital Interaction and Social Media,” p. 3-4.

¹²⁰ Taylor and Gibson, “Digitisation, Digital Interaction and Social Media,” p. 10.

¹²¹ Winter, Tim. “Clarifying the Critical in Critical Heritage Studies.” *International Journal of Heritage Studies* 19, no. 6 (September 1, 2013): 532–45. <https://doi.org/10.1080/13527258.2012.720997>.

fronts.¹²² By thinking of cultural heritage institutional mandates not just as preserving material culture or learning about the past, but instead as a tool to challenge contemporary issues,¹²³ it is possible to see how Critical Heritage Studies can be used by institutions to directly tackle issues of transparency and trust by creating a critical consciousness and counter-narratives that the public can engage with.¹²⁴

Public Trust and Cultural Heritage Institutions - A Challenge of the 2020s:

Something I have touched upon in the previous sections, but that requires a more detailed analysis before I begin to suggest solutions to the previously mentioned issues, is the idea of public trust. The American Alliance of Museums (AAM) Code of Ethics for Museums states that “Museums in the United States are grounded in the tradition of public service. They are organized as public trusts, holding their collections and information as a benefit for those they were established to serve.”¹²⁵ Though this specifically references museums in the United States, universally museums rely on the public and are one of the most trusted institutions in society, therefore they need to maintain the highest level of accountability and transparency.¹²⁶

In this way, there are two definitions to trust that are important: the first being that cultural heritage sectors hold objects/collections in the public trust, for the benefit of the user/guest; the second being the traditional definition of trust as a belief in the reliability, truth, ability, or strength of someone or something – in this case, the public’s trust in cultural heritage institutions to serve and benefit their needs. “Fukuyama defined trust as ‘the expectation that arises within a community of regular, honest, and cooperative behaviour, based on commonly shared norms, on the part of other members of that community’. Similarly Shaw defined trust as ‘a belief that those on whom we depend will meet our expectation of them’.”¹²⁷ Consulting AAM’s Core

¹²² Harrison, Rodney, and Colin Sterling, eds. *Reimagining Museums for Climate Action*. London, 2021. www.museumsforclimateaction.org. P. 12

¹²³ Apaydin, Veysel. “Heritage, Education and Social Justice.” *Elements in Critical Heritage Studies*, November 2022. <https://doi.org/10.1017/9781009052351>. Pg. 16

¹²⁴ Apaydin, Veysel. “Heritage, Education and Social Justice.” *Elements in Critical Heritage Studies*, November 2022. <https://doi.org/10.1017/9781009052351>. Pg. 36

¹²⁵ American Alliance of Museums. “Public Trust and Accountability Standards,” January 4, 2018. <https://www.aam-us.org/programs/ethics-standards-and-professional-practices/public-trust-and-accountability-standards/>.

¹²⁶ American Alliance of Museums. “Museum and Trust 2021,” September 30, 2021. <https://www.aam-us.org/2021/09/30/museums-and-trust-2021/#:~:text=Museums%20consistently%20rank%20among%20the,a%20similar%20level%20of%20trust>.

¹²⁷ Huotari, Maija-Leena, and Mirja Iivonen. “Managing Knowledge- Based Organizations Through Trust,” 2004, 29.

Standards for Public Trust and Accountability demonstrates the importance of all of these definitions of trust within the museum sector in particular.¹²⁸

Of the nine core standards identified in the AAM list, the ones that I believe are most evidently breached in how cultural institutions in general have continued to perpetuate a language of bias and prejudice are the commitment to be a good neighbor in an institution's geographic area; striving to be inclusive and offer opportunities for diverse participation; a commitment to provide the public with physical and intellectual access; and a commitment to accountability and transparency. These are also the four core standards that can be most affected by the inherent bias of GLAM institutions, and in particular, the ones that can affect the public's trust in the institution.

If one recognizes that inherent biases can affect the public's trust in the GLAM sector, it is important to then note why this is important. What is the need to maintain and foster the public's trust in cultural heritage? The argument I will make for the importance of the public's trust is that, for institutions tasked with maintaining social memory, it is imperative the public trusts the memories created, otherwise, there is no reason for these institutions, or this work, to continue.

As Hedstrom and King stated, "Libraries, archives, and museums maintain collections over the course of centuries. The LAM are the most important form of long term social memory."¹²⁹ The previous sections demonstrated that the mission of cultural heritage institutions is to preserve and share knowledge as a form of social memory or history. One of the issues with these institutions being recognized as unfairly favoring a whiteness narrative is that the public did lose trust in the ability of cultural heritage to function as a trusted form of social memory for all.

Over 50 years ago, this was already impacting institutions. As the public began to view exhibitions as elitist for narratives that reinforced conservative, nationalistic, colonialist, and bourgeois master narratives, many established institutions began to see audiences dwindle.¹³⁰ In response to this, many museums in the late 1960s to the 1990s redefined their role and image from a temple for passively viewing already interpreted objects to a forum for interaction, learning and open-ended interpretation.¹³¹ This switch from expecting guests to be passive receptacles for knowledge, to a place where knowledge was built in tandem was one of the earliest attempts to mitigate the loss of trust in the curatorially controlled narrative.

¹²⁸ American Alliance of Museums, "Public Trust and Accountability Standards."

¹²⁹ Hedstrom and King, "On the LAM."

¹³⁰ Hedstrom and King, "On the LAM."

¹³¹ Hedstrom and King, "On the LAM."

With the loss of trust in large institutions to create inclusive narratives, many minority groups broke out to create their own culturally specific centers.¹³² What should resonate here is that cultural groups felt so neglected, so erased from the curatorial narrative at the traditional GLAM institutions, that they felt they needed to found their own institutions to preserve their social memory. These smaller, culturally specific institutions are not in themselves a problem. The issue is that these stories are so undeveloped and excluded from the current accepted narrative in larger institutions that now someone must know they are looking for this culturally aware narrative in order to find it. Instead of attending a museum and seeing a complicated but more fully fleshed out narrative of history, one will continue to see a Westernized, white, male narrative with the added option to pop down the street to see the other side of the story. By not having these narratives in tandem, institutions are not upholding their missions to serve as the social memory of their communities, nor can they maintain the public's trust.

The inclusion of the narratives is key to the maintenance of public trust, and one can see this in the sister community of science. In evaluating science institutions, Honma showed that:

“if social groups who are likely to have the most critical perspectives on the dominant belief systems are systematically excluded from and devalued in research communities through formal and/or informal processes, the alternative problematics, hypotheses, concepts, and evidence that will be the most critical of the beliefs represented in the scientific community will not be voiced at all...the incorporation of previously marginalized voices has transformed science and scientific inquiry to include the concerns of oppressed groups, such as people of color, women, and gays and lesbians. These groups have been instrumental in redirecting scientific inquiry and opening up new spaces of epistemological possibility.”¹³³

Cultural heritage institutions need to learn from the science communities, and similarly begin inviting previously marginalized voices into cultural heritage interpretations if they want to rebuild and maintain the public's trust.

This loss of trust is having a real impact on the attendance of museums already. As Nina Simon wrote in 2013, the vast majority of American museums are institutions of white privilege, telling histories of the white male, colonialist conquest. Already in 2013, the National Endowment for the Arts was reporting twenty years of declining participation and visitorship to traditional art institutions, and as Simon pointed out, it was not solely a mass exodus of

¹³² Hedstrom and King, “On the LAM.”

¹³³ Honma, “Trippin’ Over the Color Line”, p. 17-18

African-American and Latino audiences – this decline included white people. Simon stated, “One of the odd artifacts of white privilege is to ignore the fact that an increasing percentage of white people don’t find museums relevant.”¹³⁴

When GLAM institutions tried to diversify using tokenization the public often recoiled. As shown in the study by Ali Meghji, “Diversity is a Myth in Middle-Class Cultural Spaces”, the population he surveyed in London identified as having lost trust in cultural spaces.¹³⁵ “Around 41% of London’s population are from Black or Minority Ethnic backgrounds. However, middle-class cultural spaces across this city – including art galleries, the theater, classical music concert halls, opera houses, and literary, history, and film festivals – are dominated by white consumers and producers.”¹³⁶ This is a statistic that most urban areas would reflect. Meghji argued that “cultural spaces in London are dominated by white audiences. This is not coincidental, and neither is it the fault of the excluded. Rather, this demonstrates the wider point that middle-class identity and culture are often articulated around the norms and identities of whiteness.”¹³⁷ This argument fits well within the review I have previously shown of bias and prejudice towards whiteness in cultural heritage institutions. The additional pieces from Meghji’s research that are key to my discussions on trust are the conversations he had with the survey participants.

“Many of my participants thus criticised the way that black people and histories are treated in this middle-class cultural sphere, with cultural institutions increasingly adopting ‘tokenistic’ inclusion policies...institutions will only do one annual ‘black exhibit’ to avoid charges of racism. As one participant, who previously worked at the Arts Council, stated, ‘It would tick a box to say it’s done it. And that’s it, that’s their black project done for the year’.”¹³⁸ Though Meghji’s research was conducted in the UK, in the United States institutions are similarly guilty of, and criticized for, tokenism. In particular, each February, which is Black History Month in the United States, cultural heritage institutions will highlight stories and content created by or around black audiences, but when March rolls around, this content often disappears until the following February.

This tokenization affects how institutions are viewed by the public, driving away not only audiences of color, but also those that feel the language is alienating. The cultural heritage

¹³⁴ Simon, “On White Privilege and Museums.”

¹³⁵ Meghji, Ali. “Diversity Is A Myth In Middle-Class Cultural Spaces | HuffPost UK.” Accessed November 11, 2019.

https://www.huffingtonpost.co.uk/amp/entry/diversity-is-a-myth-in-middle-class-cultural-spaces_uk_5ace33c0e4b064876775f404/.

¹³⁶ Meghji, “Diversity is a Myth in Middle-Class Cultural Spaces.”

¹³⁷ Meghji, “Diversity is a Myth in Middle-Class Cultural Spaces.”

¹³⁸ Meghji, “Diversity is a Myth in Middle-Class Cultural Spaces.”

sector loses trust again not only by who is included and erased from the narratives, but the ways in which language choices come across as elitist.¹³⁹ If museums aren't seen as being responsive, actively working to adapt to a world that continually works towards throwing off the biases and holdovers from colonialism, then museums (and cultural heritage institutions in general) will lose not only trust, but also relevance.¹⁴⁰

There are arguments by many in the GLAM sector, however, that it is actually the curatorial control of description and narrative that instills a sense of trust in the public. Sharon MacDonald argued that in spite of these attempts to represent multiple perspectives in exhibitions displays, people are attracted by the authority of museums, and audiences could lose interest if that authority is called into question.¹⁴¹ Though there is validity to the argument made by MacDonald and others for a need to maintain the authority within the GLAM sector that the public has been raised to trust, and in fact a need to assert truth in a society that is often confronted online with post-truth,¹⁴² this does not negate the issues of discoverability and representation of narratives within our institutions and the specific breed of mistrust this also lends to institutions.

Archives, museums, and libraries are increasingly perceived as incomplete sources of information with the public favoring the internet, Google and huge third-party sites for their search needs.¹⁴³ As shown in *Silence in the Archive*, the public has been led to believe by Hollywood, big data, and popular media that anything you might want to find is available on the internet.¹⁴⁴ Due to these public expectations of the internet's inability to fail in a search or discovery, when searches are found to be undiscoverable within the cultural heritage online public access portals, it is often assumed that the records are "being concealed in an act of subterfuge" instead of the idea that the cataloging and subsequent metadata have left the particular piece unfindable (if, in fact, it is even in the institution).¹⁴⁵

Cultural heritage institutions need to be aware of how their digital offerings and footprints continue to cause issues of distrust. In a digital space, cut off from the authority and reputation of the onsite institution, what is presented can garner as much distrust and present the same

¹³⁹ Laar, Paul van der. "The Contemporary City as Backbone: Museum Rotterdam Meets the Challenge." *Journal of Museum Education* 38, no. 1 (Season 2013): 1–11.

¹⁴⁰ van der Laar, 'The Contemporary City as Backbone', p.1

¹⁴¹ Longair, "Culture of Curating", p. 2

¹⁴² Lewandowsky, Stephan, Ullrich K. H. Ecker, and John Cook. "Beyond Misinformation: Understanding and Coping with the 'Post-Truth' Era." *Journal of Applied Research in Memory and Cognition* 6, no. 4 (December 2017): 353–69. <https://doi.org/10.1016/j.jarmac.2017.07.008>.

¹⁴³ Nicholas, David. "The Google Generation, the Mobile Phone and the 'library' of the Future: Implications for Society, Governments and Libraries." *DLIS, FCSIT*, 2014, 1–8.

¹⁴⁴ Thomas et al, 'Silence in the Archive', p. xv

¹⁴⁵ Thomas et al, 'Silence in the Archive', p. x

biases but with the disadvantage of being removed from a real person to defend the issues, biases, or inconsistencies. On site, a docent could explain a specific curatorial decision, or even steer a guest towards additional exhibitions when context is needed. Online, there is no one to facilitate this explanation if that information is not included. As online spaces are designed for users, the ideas of trust must also be incorporated, perhaps the most important being, “trustworthiness of the [information] depends firstly on the inclusion of all relevant information...disclosure of the underlying data and the designers' decisions about data, representation, and interaction can increase trustworthiness.”¹⁴⁶ In this way, transparency is key, especially for institutions already losing trust due to singular authoritative narratives and perceived biases.

As the AAM Core Standards set up, trust is also impacted by the ability to be transparent about decisions made. Right now, the public is not privy to these internal discussions, so they only see a biased end product – in the case of my research, the act of metadata creation, of cataloging choices is invisible labor, leading only to databases that can be difficult to navigate with objects and narratives obfuscated by these choices. This means that “today the authority of the museum is being questioned not only in terms of what is collected and how, and what is exhibited and how it is shown, but also how decisions are made and who has the power to make them.”¹⁴⁷ One way trust is being lost among the public is by lack of transparency about how institutions work, why they work in these ways, and what the goals for this work are.¹⁴⁸

Not only does the language of museums, the erasure of certain narratives, and other previously mentioned issues with biases impact searchability, but this difficulty in finding what the public believes GLAM institutions hold has further affected their trust in these institutions. David Nicholas has analyzed the ways in which the new generation determine the trustworthiness of information on the internet: “They appear to rely on cross-comparison, asking friends on Facebook or Twitter, reading reviews, relying on Google. For some, the traditional view that organizations which have been established for a large number of years are inherently more reliable seems to work in the opposite way now. Moreover, younger people are inherently less likely to recognize traditional brands.”¹⁴⁹ Nicholas’s analysis is not surprising in a post-Web 2.0 world, but it is a concern for the cultural heritage sector that has often relied on name

¹⁴⁶ Mayr, Eva, Nicole Hynek, Saminu Salisu, and Florian Windhager. “Trust in Information Visualization,” 2019. <https://doi.org/10.2312/trvis.20191187>.

¹⁴⁷ Raicovich, “Museum Resolution”

¹⁴⁸ Cook, ‘Remembering the Future’, p. 179

¹⁴⁹ Thomas et al, ‘Silence in the Archive’, p. 89

recognition and historical standing to elicit the public's trust: with the emerging generations, this will not be enough.

One of the best ways cultural heritage institutions have to remain relevant and to appeal to the public for continued support is to begin to once again prove that the objects held in public trust are in fact the social memory of *all*. To do this convincingly and genuinely will require earning back the public's trust. As AAM suggests, one of the best ways to do this is through accountability and transparency. "Accountability will eventually boil down to a single hard-nosed question: is this institution demonstrably using the resources entrusted to it to achieve what it said it intended to achieve when it requested and was given those resources?"¹⁵⁰ For GLAM institutions, this will be answered by how much institutions can prove to the public that they are, in fact, representative of the entire public, and, eventually, how they see these institutions buoyed by their trust.

Now that I have laid out how the daily work in cultural heritage continues to perpetuate these biases towards minoritized groups, how these biases are affecting the public's trust in GLAM, and how the loss of trust further impacts the sector, I will lay out the importance of increasing access points while also reflecting transparency. This will help to demonstrate what a digital-age audience expects and how institutions can better align their content not only for accessibility but also expectations, leading to a more transparent process of digital engagement whereby the discoverability of collections is aided by representative language added through transparent tagging systems – crowdsourcing.

Crowdsourcing - From Outsourcing to Engaging:

The importance of setting up the previous sections to demonstrate the ways in which the foundations of cultural heritage institutions and their professionalization of tasks has perpetuated white supremacy and colonialism and furthered biases that have weakened the public's trust was to begin to demonstrate why inviting the public into metadata creation not only helps to enhance searchability, but may also help to combat these biases and repair mistrust through radical transparency.¹⁵¹

Thomas et al. stated, "one of the most important manifestations of this need for awareness of impartiality is in the process of cataloguing. For some time, there has been a

¹⁵⁰ Weil, 'About Something to Being for Somebody, p. 252

¹⁵¹ Lynch, Bernadette. "Reflective Debate, Radical Transparency and Trust in the Museum." *Museum Management and Curatorship* 28, no. 1 (February 1, 2013): 1–13. <https://doi.org/10.1080/09647775.2012.754631>.

growing awareness and willingness to tackle perceived bias in past descriptions of records.”¹⁵² As a new acceptance of history and culture as ambiguous, contested, nuanced, and open to change and contribution continues to spread in cultural heritage, the establishment of users adding language and ownership to materials will follow.¹⁵³ As Cameron and Kenderdine state, “museums have been given a greater social mandate and responsibility to combat social exclusion, disadvantage, and discrimination, and to promote social inclusionist practices in all areas of museum work,”¹⁵⁴ and I propose this has been key to the use of user-generated metadata in the past and is the key to its future uses.

As I move forward with my own efforts to connect the social mandate of museums to work towards inclusion and representation with the engagement of digital crowdsourcing projects, it is important to note that this research and this thesis are anchored within a two-decade discussion of crowdsourcing within museums and an even longer discussion of authority within cultural heritage institutions. Though I will highlight more within the Literature Review chapter to follow, it is important to still introduce crowdsourcing here as it relates to the context discussed in this chapter.

In 2011, Johan Oomen and Lora Aroyo wrote,

“one of the distinguishing qualities of heritage organizations is their authority: providing context and trusted information. Nowadays, online search engines and ‘the people formally known as the audience’ can easily perform the same activities. This could be seen as a threat to the position of heritage institutions. Allowing the end users to actively participate, for instance by adding descriptive metadata to catalogues, could corrode this (perceived) qualitative distinction between users and organization staff. Thus a fundamental change is required of the old in-situ culture based on controlled authority and the new in-vivo reality based on the wisdom of the crowds and crossing various geographical, age and competency boundaries.”¹⁵⁵

In line with this discussion on the “new” reality, being discussed by Oomen and Aroyo in 2011, Tim Berners-Lee made earlier notes that the social web was creating silos of information that are only accessible under the conditions set by the entity that manages the site, and that this locking up of information hinders innovation.¹⁵⁶ The inaccessibility of information due to

¹⁵² Thomas et al, ‘Silence in the Archive, p. 147

¹⁵³ Thomas et al, ‘Silence in the Archive, p. 151

¹⁵⁴ Cameron and Kenderdine, *Theorizing Digital Cultural Heritage*, p. 166

¹⁵⁵ Oomen, Johan, and Lora Aroyo. “Crowdsourcing in the Cultural Heritage Domain: Opportunities and Challenges,” 138:138–49, 2011. <https://doi.org/10.1145/2103354.2103373>.

¹⁵⁶ Oomen and Aroyo, “Crowdsourcing in the Cultural Heritage Domain”, p. 138

discoverability issues is thus not only dangerous for its hindrance to innovation but also its perpetuation of prejudices. Allen believed the entrenched categorization scheme reinforced prejudices and made it difficult to find or track items that fall into gaps within the categorization scheme.¹⁵⁷ These discoverability issues continue to undermine the public trust discussed earlier, and as such, the mission of the institutions to serve the public, in particular as museums operate in the virtual web space.

As shown previously, metadata used online reflects the cataloging style of cultural heritage institutions, bringing the issues described above by Turner, Schaffner, and others to the web. Studies report consistently that many users want to find information about the context of collections.¹⁵⁸ Here is a key discrepancy in online public access portals being searchable and usable by the public: the metadata they are looking for to search a collection by its thematic and contextual aspects are likely not there. When it comes to using descriptive metadata to discover cultural heritage materials, users want it all. Users want to search names by keyword, search for subjects by browsing, and browse by keyword or name, too. Again, the major takeaway here is that by transitioning the back end catalogs of cultural heritage institutions that were meant to serve curators and staff in cataloging, conserving, and researching collections directly to the web without thought of users search needs and habits there has been a semantic gap between what is provided to the public and what they are looking for. This semantic gap is directly caused by a difference in priority and language between staff and users.

As Schaffner concludes, “Unfortunately, there is a gap between the expectations of users and historical descriptive practices in archives and special collections. Changes must be made to description because researchers rarely look in library catalogs or archival portals for primary resources...ensuring that 'hidden collections' can be discovered requires appropriate description, not just expert processing, cataloging and cross-searching networks. It would be heartbreaking if special collections and archives remained invisible because they might not have kinds of metadata that can easily be discovered by users on the open Web.”¹⁵⁹

Following Schaffner and the OCLC’s guidelines shared above, it becomes clear that a reworking of metadata presented to the public vs. that used by staff internally is not only needed to increase searchability but also to keep cultural heritage institutions relevant and necessary. Part of the solution proposed specifically by Schaffner to bridge the gap includes the use of

¹⁵⁷ Allen, Colin, and the InPhO Group. “Cross-Cutting Categorization Schemes in the Digital Humanities.” *Isis* 104, no. 3 (2013): 573–83. <https://doi.org/10.1086/673276>.

¹⁵⁸ Schaffner, “The Metadata is the Interface,” p. 4

¹⁵⁹ Schaffner, “The Metadata is the Interface,” p.13

“long-tail keywords, repeat names and keywords...Let's put the right descriptive metadata in the right places.”¹⁶⁰ This introduces the ideas of Wisdom of the Crowd and the Long Tail.

In 2005, James Surowiecki published *The Wisdom of the Crowds*.¹⁶¹ Within the introduction of the book, two points are made that are directly relevant to this research. First, that relying solely on experts is a costly mistake, as often a crowd will include experts as well as other novel approaches, and second, that diversity and independence are important and integral to collective decisions as disagreement and contest fuel the best decisions, not consensus and compromise.¹⁶²

In much the same way that a museum's authority is based on the trust of the public, so too is the “Wisdom of the Crowds” model. If the public does not trust that there was a diversity of thought, an independence in working and thinking, and a decentralized system, then it makes no sense to work in this manner. Looking to science as one of the best examples of the “Wisdom of the Crowds” model of collaboration, it is important to note that this collaboration is imperative because of the specialized nature of scientists now, who often know one thing extremely well but find it difficult to know everything they may need for a specific project. In much the same way, specialization in cultural heritage means that a curator may not know the needs of the public in the ways an educator might, or know the terms being searched online like a website manager may track. Collaboration, for both the scientist and the cultural heritage institution, allows an incorporation of many different kinds of knowledge, and an ability to do so in an active and engaging way.¹⁶³

As I will continue looking at the “Wisdom of the Crowds” effect on crowdsourcing, and in turn crowdsourcing's effects on and promises for cultural heritage, it is imperative to highlight early criticisms of this way of working, though further criticisms and limitations will be discussed throughout this thesis. In particular, criticism for this decentralized and diversified way of thinking and working was raised by Andrew Keen in his work *The Cult of the Amateur*,¹⁶⁴ published in 2007, shortly after the *Wisdom of the Crowds* was published. In many ways, Keen was an early critic of the social web, particularly personified by Wikipedia. Keen argued that democratization of knowledge and authorities, “despite its lofty idealization, is undermining truth, souring civic discourse, and belittling expertise, experience, and talent”¹⁶⁵ Keen criticized the Web 2.0 revolution and democratized media stating that the “truth, to paraphrase Tom Friedman, is being

¹⁶⁰ Schaffner, “The Metadata is the Interface,” p.12

¹⁶¹ Surowiecki, James. *The Wisdom of the Crowds*. First Anchor Books Edition, 2005.

¹⁶² Surowiecki, *The Wisdom of the Crowds*, p.xix

¹⁶³ Surowiecki, *The Wisdom of the Crowds*, p.161

¹⁶⁴ Keen, Andrew. *The Cult of the Amateur*. Random House, 2007.

¹⁶⁵ Keen, *The Cult of the Amateur*, p. 15

'flattened', as we create an on-demand, personalized version that reflects our own individual myopia."¹⁶⁶

Using Wikipedia as his major point of contention within the book, Keen asserted that relying on democratized and decentralized media meant that “we get, of course, what we pay for. We get what the great thinker and writer Lewis Mumford called 'a state of intellectual enervation and depletion hardly to be distinguished from massive ignorance' ...¹⁶⁷ as a result, our knowledge - about everything from politics, to current affairs, to literature, to science - is being shaped by nothing but the aggregation of responses. The search engine is a quantitative historical record of previous requests. So all the search engine offers is a ranking system that feeds back to us the wisdom of the crowd.”¹⁶⁸

This criticism of the internet, search engines, democratization, and “wisdom of the crowd” thinking has not disappeared, though the concerns have shifted. In the current landscape of “fake news” and distrust of the media, there is still a discussion on how to make a news source trustworthy and how to find the “truth” when anyone can publish.¹⁶⁹ This thesis will not solve this issue, but it is important to note that as Keen wrote these critiques in 2007, there are still concerns in modern times surrounding crowdsourcing in cultural heritage. Today, critiques are more varied but include possible issues of labor exploitation and ethics,¹⁷⁰ the field’s focus on specific project results instead of replicable context for the field at large,¹⁷¹ heritage institutions deprioritizing collections that could benefit from crowdsourcing (such as Afghan collections) due to their risk of loss or destruction before they can be crowdsourced,¹⁷² the resources and staff time required to run these projects,¹⁷³ and the difficulty in managing increasing database sizes and possibly overwhelming search results.

Acknowledging these critiques by Keen and others helps to frame how institutions need to structure projects and expertise for the public. If institutions are trying to decentralize their

¹⁶⁶ Keen, *The Cult of the Amateur*, p. 17

¹⁶⁷ Keen, *The Cult of the Amateur*, p. 45

¹⁶⁸ Keen, *The Cult of the Amateur*, p. 93

¹⁶⁹ Lewandowsky, Stephan, Ullrich K. H. Ecker, and John Cook. “Beyond Misinformation: Understanding and Coping with the ‘Post-Truth’ Era.” *Journal of Applied Research in Memory and Cognition* 6, no. 4 (December 2017): 353–69. <https://doi.org/10.1016/j.jarmac.2017.07.008>.

¹⁷⁰ Agostino, Cristiano. “Museum Crowdsourcing as Playful Labour.” *ICOFOM Study Series*, no. 43a (June 1, 2015): 23–37. <https://doi.org/10.4000/iss.545>.

¹⁷¹ Severson, Sarah. “Crowding the Library: How and Why Libraries Are Using Crowdsourcing to Engage the Public.” *Partnership: The Canadian Journal of Library and Information Practice and Research, Innovations in Practice*, 14, no. 1 (2019). <https://doi.org/10.21083/partnership.v14i1.4632>. (pg. 5)

¹⁷² Constantinidis, Dora. “Crowdsourcing Culture: Challenges to Change.” In *Cultural Heritage in a Changing World*, edited by Karol Jan Borowiecki, Neil Forbes, and Antonella Fresa, 215–34. Cham: Springer International Publishing, 2016. https://doi.org/10.1007/978-3-319-29544-2_13.

¹⁷³ Severson, “Crowding the Library,” pg. 14

description and their metadata to further the public's trust, which has been affected negatively by single authoritative narratives, how do they also keep an eye on critiques raised by Keen to ensure the public will also trust decentralized and diverse user generated, crowdsourced tags? How should project designs be optimized to prioritize collections most at risk, to prevent ethical gray areas around labor practices, to best utilize staff time, to optimize searchability, and to report in ways to be more applicable to the field at large?

I will note the importance to considering these critiques in project creations as there will be members of the public who similarly react with mistrust at diversifying and decentralizing initiatives within museums (as was raised in the previous section by MacDonald), and having an eye to how to address these issues will help build more trustworthy and useful projects and solutions, even if it is not as simple as relying on Alemu and Steven's suggestion of *post hoc* and *a priori* metadata incorporating the "Long Tail."

Before I discuss the "Long Tail", it is important to define the *a priori* and *post hoc* metadata categories identified by Alemu and Stevens. *A priori* metadata is defined as standards-based metadata that is predominantly generated before users get to access a particular information object: for example, a book that has had its metadata created by a publisher and/or a librarian, or a museum object as described in a catalog.¹⁷⁴ *Post hoc* metadata is the metadata that is added through socially constructed interactions of the user with the material, whereby users are proactively engaged in co-creating metadata. This metadata is contextually and semantically linked to the *a priori* metadata to become more accessible to the public.¹⁷⁵ Alemu and Stevens acknowledge similar critiques raised by Keen, stating that "the call for openness does raise the issue of quality" for the metadata produced.¹⁷⁶ However Alemu and Stevens support the earlier works of Thomas Gruber (2007) stating:

"a balance should be struck between standards-based and socially-constructed metadata approaches. As Gruber argues, socially-constructed metadata approaches are one-dimensional; plagued with inconsistency and lack of organisation, whilst standards-based metadata approaches are forced upon users and fail to represent the users' worldviews. Gruber suggests that ontologies should be developed to capitalise on the best of both worlds. At a conceptual level, Morville and Wright contend that the two metadata approaches can productively coexist."¹⁷⁷

¹⁷⁴ Alemu and Stevens, *Enrich then Filter*, p. 21

¹⁷⁵ Alemu and Stevens, *Enrich then Filter*, p. 31

¹⁷⁶ Alemu and Stevens, *Enrich then Filter*, p. 33

¹⁷⁷ Alemu and Stevens, *Enrich then Filter*, p. 44

In agreement with Alemu and Stevens, and in response to Keen, my argument will situate around the need for both authoritative/expert created *a priori* metadata and the socially constructed crowdsourced metadata terms of *post hoc* metadata. As Alemu and Stevens wrote, “The latter provides the diversity and breadth of interpretations of information objects, whilst a *priori* metadata serves as a focus for presenting basic structured, standards-based, metadata to users.”¹⁷⁸ Together they better serve both the public and the expert, but this enriching of data with *post hoc* metadata needs to be done with an eye towards issues arising from the “Long Tail” demonstrated and markedly shown throughout crowdsourced metadata projects.

The Long Tail: Why the Future of Business is Selling Less of More was published in 2006 by Chris Anderson.¹⁷⁹ In this work, Anderson set out to address the distribution, inequity, and power law he saw playing out on the web.¹⁸⁰ Though it is a business book, much in the same way *Wisdom of the Crowds* is, because of how crowdsourcing itself comes from the business world, it still has applications that can be taken into the cultural heritage sector and, in particular, into digital collections searchability and discoverability. The idea of the long tail power law, at its simplest, is that if you chart the sales of a store, say Apple iTunes or Amazon, you will see that the most sales are for the fewest items (think the top 20 albums selling at an exponential rate above the next 10,000 albums) and the majority of items sell much lower amounts. When graphed, this is a large peak tapering down into a long tail. The strategy suggested by Anderson was by selling a large number of different items which each sell relatively small quantities on their own as well as the few popular items, you diversify the business and strengthen profits.

As mentioned above, crowdsourcing itself is a term that derives from the business world. Originally meaning to outsource part of an activity to an external provider, it is currently used to identify an array of initiatives, both commercially and non-commercially, and has become an accepted term within citizen science and citizen history projects (to be discussed in greater detail in the following section).¹⁸¹ But of note before proceeding is a quote from Carletti et al. which states, “crowdsourcing projects in the digital humanities can be seen as novel paths of collaboration between institutions and their audiences. In fact, institutions are not merely “taking a function once performed by employees and outsourcing it to an undefined (and generally

¹⁷⁸ Alemu and Stevens, *Enrich then Filter*, p. 97

¹⁷⁹ Anderson, Chris. *The Long Tail: Why the Future of Business is Selling Less of More*. Hyperion, 2006.

¹⁸⁰ Anderson, Paul. “What Is Web 2.0? Ideas, Technologies and Implications for Education,” 2007, 64.

¹⁸¹ Carletti, Laura, Derek McAuley, Dominic Price, Gabriella Giannachi, and Steve Benford. “Digital Humanities and Crowdsourcing: An Exploration | MW2013: Museums and the Web 2013.” Museums and the Web, 2013.

<https://mw2013.museumsandtheweb.com/paper/digital-humanities-and-crowdsourcing-an-exploration-4/>.

large) network of people'...they are collaborating with their public to augment or build digital assets through the aggregation of dispersed resources."¹⁸² Moving forward, it is this definition of crowdsourcing I will be using.

Jennifer Trant, an early adopter of metadata crowdsourcing in museums, stated in 2009 that the interest in tagging and folksonomy derives in part from the information discovery needs of the 'long tail.'¹⁸³ Note that tagging is the process of adding metadata terms to an object, and a folksonomy is the taxonomy of user-generated terms (both will be discussed in greater detail below). In the concept discussed by Trant, and most relevant to my own research, one can see the "Long Tail" charted for metadata terms. If you were to give a group of people an image of Leonardo DaVinci's "Last Supper" painting and asked them to write down every term they would use to describe the image to find it again, there would inevitably be overlap in responses. Perhaps terms like "DaVinci", "man", "Jesus", and "blue" would percolate up to the top of the response list forming what is known as the short head, while terms identified by only one person (perhaps "Santa Maria delle Grazie", or "Da Vinci Code") would make up the long tail.

In Trant's early discussions of the "Long Tail" within metadata collection, she discusses a proposition by Halpin et al. from 2007¹⁸⁴ that focusing on this short head rather than the long tail is a way to look at commonalities in the most-used metadata tags to create an ontology measured by stability and information value.¹⁸⁵ Though there is more authority and consensus in the "short head" than the "long tail", there is also a limit to diversity of thought and, in turn, the diversity of entry points to content as shown by Surowiecki's criticism of consensus. Regardless, Trant states that in "broad folksonomies" where many people tag the same item, analysis of the tags will reveal a power law distribution, tapering into a long tail of items in which only a few people expressed interest.¹⁸⁶ With a goal towards diversifying and maximizing points of entry to objects, this long tail can still be extremely useful and may even assist cultural heritage staff in recognizing what further interests their users have. In this way, I believe that both the "Wisdom of the Crowds" and the "Long Tail" are not only necessary for understanding the use of crowdsourcing, but also positive indicators for the increased access points and value of *post hoc* metadata.

¹⁸²Carletti et al., "Digital Humanities and Crowdsourcing."

¹⁸³ Trant, J. "Studying Social Tagging and Folksonomy: A Review and Framework," 2009, 43. Pg. 4.

¹⁸⁴ Halpin, H., Robu, V., & Shepherd, H. (2007). The Complex Dynamics of Collaborative Tagging. WWW2007, Banff, Alberta, Canada. Retrieved January 31, 2008 from <http://www2007.org/papers/paper635.pdf>.

¹⁸⁵ Trant, J. "Studying Social Tagging and Folksonomy", p. 13

¹⁸⁶ Trant, J. "Studying Social Tagging and Folksonomy", p. 15

As I close this section, I want to more clearly define what a folksonomy is. The concept was mentioned above, and introduced as a term coined by Thomas Vander Wal, but should be fully defined before moving on. Folksonomy is a folk classification, created as the result of users indexing digital collections using their own vocabulary and terms, as opposed to a traditional system of classification using ontologies, or authoritative language and dictionaries. Most often, folksonomies “encourage their visitors to help with the indexing of collections by associating their own keywords with the online museum content or by choosing to validate tags assigned by other users. This form of social tagging by the public appears to be a new way to describe, encounter, and understand cultural projects, providing a counterweight to the often complex scientific thesaurus drawn up by curators.”¹⁸⁷

It is important to also note the differences within the terms “tagging,” “folksonomy,” and “social tagging” as they are often associated but mean separate things. As described above, folksonomy is the resulting collective vocabulary (focusing on knowledge organization) that is created by the process of tagging (with a focus on user selected language). Social tagging is a socio-technical context whereby tagging takes place within social computing and networks.¹⁸⁸

As early as 2015, Puhl and Mencarelli contended that the new aim of the folksonomy was to move past just supplementing staff work (the outsourcing of the business world’s “crowdsourcing”), and to overturn passive viewing and browsing and instead offer participatory experiences that were built with the goal to help visitors better relate to the content they were exposed to. Puhl and Mencarelli saw social tagging as particularly emblematic of this participatory experience, as while guests categorize objects they encounter with their own language, they appreciate the value of what is on offer as things that they more personally relate to.¹⁸⁹ A study of tagging behavior in US museums found that 86% of visitor tags were seen as useful for research by museum staff, showing these projects benefit both museums and visitors.¹⁹⁰ Now, it is important to note that even Puhl and Mencarelli were raising possible critiques of folksonomies and user-generated metadata in 2015. Their argument was that “historically, the museum has been the sole authoritative voice because of its scientific and/or artistic expertise. This voice is now being lowered and even drowned out by the voices of visitors.”¹⁹¹ This is a concern that is very real for museum staff, but as shown in the section on trust, this is not a concern the museum public is raising. In fact, “shared authority is more

¹⁸⁷ Puhl, Mathilde, and Rémi Mencarelli. “Web 2.0: Is the Museum–Visitor Relationship Being Redefined?” *International Journal of Arts Management* 18, no. 1 (2015): 43–51.

¹⁸⁸ Trant, J. “Studying Social Tagging and Folksonomy”, p. 4

¹⁸⁹ Puhl and Mencarelli, “Web 2.0: Is the Museum-Visitor Relationship Being Redefined?”, p. 47

¹⁹⁰ Puhl and Mencarelli, “Web 2.0: Is the Museum-Visitor Relationship Being Redefined?”, p. 47

¹⁹¹ Puhl and Mencarelli, “Web 2.0: Is the Museum-Visitor Relationship Being Redefined?”, p. 48

effective at creating and guiding culture than institutional control,” according to Lynch and Alberti.¹⁹²

Tackling the single authoritative narrative is something institutions must do to gain back the public’s trust, and my contention is that by creating the more democratic participatory experience of crowdsourcing, guests not only gain trust in the institution but also a valuable engagement experience. Though this will be a major part of my thesis moving forward, it should be made clear that there are critics to this thought who follow Puhl and Mencarelli’s assertions that, “the decline of the sacralized character of the museum offer is, admittedly, nothing new but, by promoting visitor involvement within the cultural offer, participatory devices are hastening the decline....the museum will end up offering something quite ordinary.”¹⁹³ However, I would argue for the approach put forward by Benkler that demonstrates “that peer-production does work, at least as it applies to information and culture. The key to understanding why it works is to realize that information is a nonrival commodity, that is, its consumption by one person does not diminish its availability to use by any other person...rather, each product unit is designed to be utilized by many, thus becoming more valuable with use.”¹⁹⁴ Increased access points and information will not cheapen or decline the value of institutions, they will only increase the value and use of these institutions.

Citizen Science – A Lens for Crowdsourcing Projects:

Citizen science as an expression dates to the mid-2000s, around the same time as terms like folksonomy were taking hold in an internet age when collaborative design and production supported processes across the globe.¹⁹⁵ Similar to the discussion of crowdsourcing above, citizen science looked to engage with members of the public. Though these terms took off in the mid-2000s, the roots of engaging with the public to enable research or production can be seen as early as the 1880s when the *Oxford English Dictionary* invited educated members of the public to supply Oxford’s lexicographers with variations in spellings, etymologies, and definitions, purely on a voluntary basis.¹⁹⁶ In fact, Hedges and Dunn state that:

"long before crowdsourcing was ever known by that name, researchers in especially the natural sciences were engaging in 'citizen science,' a set of practices in which unpaid

¹⁹² Wood, Elizabeth, Rainey Tisdale, and Trevor Jones. *Active Collections*. New York, NY: Routledge, 2018. p.17

¹⁹³ Puhl and Mencarelli, “Web 2.0: Is the Museum-Visitor Relationship Being Redefined?”, p. 48

¹⁹⁴ Evans, Max. “Archives of the People, by the People, for the People.” *The American Archivist* 70, no. 2 (Fall-Winter 2007): 387–400.

¹⁹⁵ Hedges, Mark, and Stuart Dunn. *Academic Crowdsourcing in the Humanities: Crowds, Communities, and Co-Production*. Chandos Information Professional Series. Chandos Publishing, 2018.

¹⁹⁶ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. xi

volunteers provided input to professionally coordinated research projects. This has been going on in domains such as field ecology, conservation, and habitat studies since at least the 17th century, when in any case the role of professional scientist did not exist, at least in its 21st century form."¹⁹⁷

For cultural heritage institutions, similar use of volunteers has been seen as integral to the work and continual growth of the institution for centuries.¹⁹⁸ Hannah Turner traced similar proto-citizen science projects to the Smithsonian's strategy to enlist the public in the collection of "Indian relics" in the 1800s,¹⁹⁹ and in many ways the earliest professionalization of cataloging as an act outside that of the curator could be seen within the early veins of citizen science projects as cataloging has often been completely free-form and practiced by people without training.²⁰⁰ In the current day, this definition of cataloging as proto-citizen science is not accurate, but in the earliest days of the 19th and 20th centuries it could be seen similarly.

In the early 2000s, projects like the Galaxy Zoo, hosted by Zooniverse, "demonstrated the power of devolved and distributed participation by untrained amateurs in bringing forward scientific discoveries that would not otherwise have been possible."²⁰¹ Citizen science as a field exposed volunteers to real scientific data sets and relied on these volunteers to process and classify data in ways a computer could not.²⁰² As noted by Hedges and Dunn, there have thus far been three waves of academic crowdsourcing in the humanities.

The first emerged in the mid-2000s. This "functional crowdsourcing" mirrored the practices of citizen science, looking to create or enhance information resources and data sets of researchers, institutions, and academics.²⁰³ In 2006, Jeffrey Howe, coined the term "crowdsourcing" in an article published in *Wired* in which he stated:

"All these companies grew up in the internet age and were designed to take advantage of the networked world. It doesn't matter where the laborers are - they might be down the block, they might be in Indonesia - as long as they are connected to the network...technological advances in everything from product design software to digital video cameras are breaking down the cost barriers that once separated amateurs from

¹⁹⁷ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 2

¹⁹⁸ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 24

¹⁹⁹ Turner, *Cataloguing Culture*, pg. 45

²⁰⁰ Turner, *Cataloguing Culture*, pg. 133

²⁰¹ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. xi

²⁰² Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. xi

²⁰³ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. xii

professionals...the labor isn't always free, but it costs less than paying traditional employees. It's not outsourcing, it's crowdsourcing."²⁰⁴

Within this ideal of crowdsourcing, many of the earliest crowdsourcing projects in the humanities looked to engage with this concept of crowdsourcing not as outsourcing, but as a way to operationalize tasks of a larger size and scale than was previously possible using unpaid labor. Projects such as the *steve.museum*, which looked to enhance museum catalogs, can be seen within this phase, as well as the earliest projects on the Zooniverse and Smithsonian Transcription Center sites. In this initial phase, and for phases to come, a key focus of crowdsourcing within the humanities has been “on the improvement and transformation of content from one type to another.”²⁰⁵

The second phase can be seen from the late 2000s to the early 2010s, and it mirrored the “conversational paradigms of Web 2.0...contributors begin to communicate about their participation on web platforms, whether project-specific or using social media, leading to the development of various forms of community.”²⁰⁶ In many ways, the Zooniverse platform and Smithsonian Transcription Center embodied this phase best, with focuses on creating platforms that allowed, and in fact encouraged, volunteers to feel a part of a larger community of volunteers and to engage with each other and with project leaders via chat boards and messaging features built right in.

Within this second phase of crowdsourcing, the idea of engagement really comes to the forefront. “An immediate assumption underlying the word 'engagement' itself is an ontological separation of one entity into two or more further entities: for there to be engagement, one entity must engage with another.”²⁰⁷ As the second phase incorporated functionality for community building and conversations, the engagement within the projects between researchers/institutions and volunteers (and between volunteer and volunteer)²⁰⁸ became a reality, bringing the possibility of engaging with the public into the possible reasons to create a crowdsourcing project. In fact, it has been a noted necessity in crowdsourcing projects to engage.²⁰⁹ Trevor Owens of the Library of Congress states, “most successful crowdsourcing projects are not about large anonymous masses of people. They are not about crowds. They are about inviting participation from interested and engaged members of the public. These projects can continue a

²⁰⁴ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 3

²⁰⁵ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 5

²⁰⁶ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. xii

²⁰⁷ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 4

²⁰⁸ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 23

²⁰⁹ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 7

long standing tradition of volunteerism and involvement of citizens in the creation and continued development of public good.”²¹⁰

The third, and final to this point, phase is termed “co-production” by Hedges and Dunn, where “contributors begin to take a more proactive role in the design and construction of research outputs.”²¹¹ In many ways, this current phase is what sets apart current crowdsourcing from that of the business model of the early 2000s. Whereas, “government, industry, and commercial enterprises are developing crowdsourcing practices as a means to engage their audiences and readerships, to improve and enrich their own data assets and services, and to address supposed disconnects between the public and professional sectors”,²¹² they do so in a way that still positions the power and authority within the institution.

This can begin to be seen in the categories of crowdsourcing task types that are introduced by Ridge, and by Oomen and Aroyo. “Ridge, proposes the categories tagging, debunking (i.e. correcting/reviewing content), recording a personal story, linking, stating preferences, categorizing, and creative responses. Again, these categories imply a processual approach, and are, at least potentially, extensible across different types of online and physical-world content and collections.”²¹³ An alternative typology for crowdsourcing projects in the GLAM sector as developed by Oomen and Aroyo share the categories, “correction, transcription, defined as inviting users to correct and/or transcribe outputs of digitization processes (a category that Ridge's 'debunking' partially, but not entirely, covers); contextualization, or adding contextual knowledge to objects, by constructing narratives or creating UGC (user generated content) with contextual data; complementing collections, which is the active pursuit of additional objects to be included in a collection; classification defined as the gathering of descriptive metadata related to objects in a collection (Ridge's 'tagging' would be a subset of this); co-curation, which is using inspiration/expertise of non-professional curators to create exhibits; and crowdfunding.”²¹⁴

As can be seen in both the typologies created by Ridge, and by Oomen and Aroyo, the majority of the tasks are still processual, focusing on a one-sided relationship where the institution creates the ask, and the volunteer does the task.²¹⁵ Tasks like tagging, debunking, categorizing, transcribing, and correcting all fall in this processual approach; however, the beginnings of co-production can be seen in tasks such as creative responses, recording a

²¹⁰ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 20

²¹¹ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. xii

²¹² Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 1

²¹³ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 25

²¹⁴ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 25

²¹⁵ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 25

personal story, creating UGC, and co-curation. In many ways, it extends beyond the task type itself and more into how a project is designed. “Howe's original definition in Wired adopted a functional and business oriented view of crowdsourcing by focusing on it as a means of getting labor-intensive tasks done cheaply” and projects that still center the outputs over the experience will likely fail to live up to the third phase of crowdsourcing: co-production. To understand crowdsourcing as a means of generating cultural value or academic knowledge, there needs to be “an ontological shift, which is linked to the way the WWW has changed how individuals participate in institutional top-down activities.”²¹⁶

It is my belief that projects today and in the future will need to incorporate the co-production coined by Hedges and Dunn, focusing on engagement as a two-way, equitable street, and for cultural heritage institutions, this can be done by creating projects that not only serve to close a semantic gap but also to bring the mission driven learning objectives of the institutions' onsite programming to the project's design and goals. By focusing on crowdsourcing as a “set of processes, not just a set of outcomes, or new resources”,²¹⁷ it is possible to bring the same focus on engagement with volunteers online that museums create for in-gallery experiences. As Hedges and Dunn state, “the successful implementation of a methodological commons for scholarly humanities crowdsourcing must not reject the history of crowdsourcing as a functional process, but rather should examine how that process has evolved and consider what kinds of levels of intellectual complexity the humanities bring to the process.”²¹⁸

In fact, in 2019, the International Council of Museums proposed a new definition for museums which echoed many of these ideas, referring to “democratising, inclusive and polyphonic spaces” responsible for safeguarding “diverse memories” through “participatory and transparent” practice.²¹⁹ It is time to begin changing the way these institutions work to deliver on this promise, creating transparent processes to expand and enrich metadata through crowdsourcing projects that particularly address the bias of cataloging and how language affects search across the publics' daily use of the internet.

Conclusion:

Through this contextual review of the cultural heritage sector, I have looked to demonstrate that the standards for description and cataloging of collections have been notably problematic, leading to issues in discoverability, representation, and inevitably, trust. Further, I

²¹⁶ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 28

²¹⁷ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 28

²¹⁸ Hedges and Dunn, *Academic Crowdsourcing in Humanities*, pg. 28

²¹⁹ Jones, *Artefacts, Archives, and Documentation in the Relational Museum*, pg. 8

have demonstrated that initial fears and critiques of tagging and folksonomies as disruptors of cultural heritage institutions' validity and quality have been assuaged through case studies and literature, and that many of the remaining concerns for crowdsourcing projects can be addressed within ethical considerations of project designs. It is evident that the idea of community tagging did not disappear, instead changing as the zeitgeist around the web transferred from sites like Flickr and del.icio.us to sites like Instagram and TikTok. However, as culture has changed, the use of metadata tagging has as well, begging the questions of how to incentivize and motivate experiences to become more engaging while enriching not just searchability, but also discoverability and building transparent experiences that engage with the public while rebuilding trust.

Chapter 3: Literature Review:

Introduction:

This chapter will focus on previous folksonomy projects and literature, and this review will work to address the promises and challenges of these projects as demonstrated by Puhl and Mencarelli stating: “it is important to show that this collaborative trend can have beneficial effects by developing visitors’ skills and facilitating access to museums, but it can also have adverse effects, by questioning the museum’s authority and identity and by disenchanting the museum experience.”¹ Though I have questioned and sought to assuage the fears and critiques surrounding folksonomy and the crowd in the previous contextual review chapter, I will further demonstrate the early promises of positive results of folksonomic projects, as well as questions that persist from these early projects, while still balancing the critiques and possible adverse effects of these projects as vital to future project planning.

As introduced above, the terms “tagging” and “folksonomy” are different, though will often be presented within this thesis, and within the literature, together, as “we can think of tagging as a process (with a focus on user choice of terminology); and of folksonomy as the resulting collective vocabulary (with a focus on knowledge organization).”² Within this review of the literature, I will endeavor to highlight the history and practice of both tagging and folksonomy within the cultural heritage sector, as, though they are often presented hand in hand, the critiques and the results of each vary.

The beginnings of tagging can be seen in the research and publications of Mathes (2004), Golder & Huberman (2005) and many more. In her “Studying Social Tagging and Folksonomy: A Review and Framework,”³ Jennifer Trant identified 180 sources related to tagging and folksonomy that were published prior to December 2007. For brevity and clarity within this review, I will not cover all these sources, but it is a useful overview that strongly supports the history and general acceptances of tagging, and social tagging, as early as the 2000s. As highlighted earlier, user tagging was born out of the “Web 2.0” focus on user-driven design and social participation, and it was this enabling and empowering of the user to contribute keywords and tags that first attracted the cultural heritage communities as early as 2005-2006.⁴

¹ Puhl, Mathilde, and Rémi Mencarelli. “Web 2.0: Is the Museum–Visitor Relationship Being Redefined?” *International Journal of Arts Management* 18, no. 1 (2015): 43–51.

² Trant, J. “Studying Social Tagging and Folksonomy: A Review and Framework,” 2009, 43. Pg. 4

³ Trant, J. “Studying Social Tagging and Folksonomy,” pg. 43.

⁴ Trant, J. “Studying Social Tagging and Folksonomy,” p. 2

Tim Berners-Lee made early notes that the social web was creating silos of information that were only accessible under the conditions set by the entity that manages the site, and that this locking up of information hindered innovation.⁵ The inaccessibility of information due to discoverability issues is not only dangerous for its hindrance to innovation but also its perpetuation of prejudices. As stated by Allen, “an entrenched categorization scheme can reinforce prejudices. And it can be difficult to find or track items that fall into gaps in the categorization scheme.”⁶ These discoverability issues continue to undermine the public trust discussed in **Chapter 2: Contextual Review**, and as such, they undermine the mission of the institutions to serve the public, in particular as museums operate in the virtual web space.

Increasing Access Through Tagging:

Early advocates for user-generated metadata projects, crowdsourcing projects, or folksonomies often saw the expansion of language in catalog records as the key to increasing discoverability. Proponents of these projects, specifically in the mid-to-late 2000s and early 2010s, advocated that each additional entry to the catalog, each new term, would bring in new and novel viewpoints. It was contended that there could be no superfluous or irrelevant metadata when serving a public audience – it was, in fact, a matter of context.⁷ Alemu and Stevens⁸ advocated that the quality of metadata should not be weighted only on its mere accuracy of persistence to rules and standards, but on its effectiveness in making resources findable, accessible, and usable, aligning with the early goal of many tagging projects: increasing access points to data through involving users as proactive metadata co-creators.⁹

Cho, Yeh, Cheng, and Chang noted in 2012, connecting to Berners-Lee earlier note on Web 2.0, that museum professionals were designing websites that used controlled vocabularies unfamiliar to non-museum professionals, and that as discovery and retrieval were both the goals of museum operating their websites and a demand of the wider internet audience, retrieval issues were a major problem of this semantic gap.¹⁰ Cameron and Kenderdine supported this,

⁵ Oomen, Johan, and Lora Aroyo. “Crowdsourcing in the Cultural Heritage Domain: Opportunities and Challenges,” 138:138–49, 2011. <https://doi.org/10.1145/2103354.2103373>. p. 138

⁶ Allen, Colin, and the InPhO Group. “Cross-Cutting Categorization Schemes in the Digital Humanities.” *Isis* 104, no. 3 (2013): 573–83. <https://doi.org/10.1086/673276>.

⁷ Alemu, Getaneh, and Brett Stevens. *An Emergent Theory of Digital Library Metadata: Enrich Then Filter*. 1st ed. Chandos Publishing, 2015.

⁸ Alemu and Stevens, “An Emergent Theory of Digital Library Metadata,” pg. 61

⁹ Alemu and Stevens, “An Emergent Theory of Digital Library Metadata,” pg. 62

¹⁰ Cho, Chung-Wen, Ting-Kuang Yeh, Shu-Wen Cheng, and Chun-Yen Chang. “The Searching Effectiveness of Social Tagging in Museum Websites.” *Journal of Educational Technology & Society* 15, no. 4 (October 2012): 126–36.

demonstrating how the shift of the backend catalog to the online public search catalog was problematic for public use, saying:

“In the past, collections databases functioned as internal museum tools for the almost exclusive use of collection managers and curators. Consequently, there was little motivation to alter the standard formats, classifications, and terminologies that characterized collections documentation in paper and, more recently, database forms. By contrast, the presence of collection records on museum Internet sites has opened up database access for a wide range of potential users. Although this move has been touted as the linchpin solution to facilitating expanded public access to museum resources, the exact process for rendering collection databases truly useful and engaging to public users has remained undefined.”¹¹

Adam Mathes similarly stated that the tools built around professional cataloging systems were too complicated for anyone without the specialized training or knowledge to navigate.¹² Describing the functionality of tagging systems and tagging behavior using Flickr and del.icio.us as case studies, Mathes identified the strengths of tagging as the low barrier to entry, ability to share tags, low cognitive costs, and the ability for serendipitous discovery through increasing browsability.¹³ However, he was one of the first to touch on what is likely still the major criticism of tagging and folksonomies: “there is no synonym control in the system,” nor a way to combat ambiguity or inconsistent spellings.¹⁴ Despite these concerns, Mathes seemed buoyed by the promise of the language (tagging vocabulary - i.e. folksonomy) within the role of information retrieval and findability.

David Bearmand and Jennifer Trant expanded on this, stating that museum collections remained inaccessible despite being made available through online search databases because the museum documentation shared on these portals seldom satisfied the online access needs of the broad public due to its use of professional terminology and its inability to address what

¹¹ Cameron, Fiona, and Sarah Kenderdine. *Theorizing Digital Cultural Heritage*. Media in Transition 6. The MIT Press, 2007.

¹² Mathes, Adam. “Folksonomies - Cooperative Classification and Communication Through Shared Metadata.” Accessed October 27, 2019. <https://adammathes.com/academic/computer-mediated-communication/folksonomies.html>.

¹³ Trant, J. “Studying Social Tagging and Folksonomy”, p. 4

¹⁴ Mathes, Adam. “Folksonomies - Cooperative Classification and Communication Through Shared Metadata.” Accessed October 27, 2019. <https://adammathes.com/academic/computer-mediated-communication/folksonomies.html>.

was important to the museum visitor.¹⁵ This again connects to the previous Contextual Review discussion of *is-ness* vs. *aboutness* in museum professional cataloging.

In 2005, this line of inquiry was continued by Scott Golder and Bernardo Huberman, who focused on the actual use of these systems for tagging.¹⁶ Golder and Huberman described collaborative tagging as “the practice of allowing anyone to freely attach keywords or tags to content.”¹⁷ Though most cultural heritage institutions have a “librarian” or an authority who is designated with the role of classification (catalogers, curators, archivists), in many ways it is the idea that there is simply too much content for a single authority to classify, as previously highlighted in the **Chapter 2: Contextual Review** by Alemu and Stevens,¹⁸ that continues to make tagging of interest to the field.¹⁹

Golder and Huberman found that within their own tests of social tagging, it took only a small number of tags (fewer than 100) before an initial consensus seemed to form, which initially hinted that there may be a limit to the diversity of thought.²⁰ However, upon further investigation, Golder and Huberman believed this convergence did not negate minority views, the majority simply added to the weight of existing tags which may have been a consequence of the del.icio.us interface that suggested commonly used tags to users, further facilitating their re-use. This raised questions on how to build better tagging platforms to encourage a diversity of thought over a predilection to reuse tags already added. As a follow up to this question, Marlow et al. presented a case study using Flickr (as opposed to Golder & Huberman’s focus on del.icio.us) to focus on the socio-technical aspects of tagging systems, or social tagging.²¹

As Golder & Huberman focused on collaborative tagging as a way to be inclusive and non-hierarchical, and Marlow et al. focused on social tagging as a system, David Weinberger²² was also looking at the use of technology to solve retrieval and information discovery issues on the ever growing internet. Weinberger was not looking at cultural heritage institutions in particular but was examining the ever-expanding issue of digital photographs permeating the

¹⁵ Bearman, David, and Jennifer Trant. “Social Terminology Enhancement through Vernacular Engagement: Exploring Collaborative Annotation to Encourage Interaction with Museum Collections.” *D-Lib Magazine* 11, no. 09 (September 2005). <https://doi.org/10.1045/september2005-bearman>.

¹⁶ Golder, Scott A, and Bernardo A Huberman. “The Structure of Collaborative Tagging Systems,” 2006, 8.

¹⁷ Golder & Huberman, “The Structure of Collaborative Tagging Systems.”

¹⁸ Alemu, Getaneh, and Brett Stevens. *An Emergent Theory of Digital Library Metadata: Enrich Then Filter*. 1st ed. Chandos Publishing, 2015.

¹⁹ Golder & Huberman, “The Structure of Collaborative Tagging Systems.”

²⁰ Golder & Huberman, “The Structure of Collaborative Tagging Systems.”

²¹ Marlow, C., Naaman, M., Boyd, D., & Davis, M. (2006b). Position Paper, Tagging, Taxonomy, Flickr, Article, ToRead World Wide Web 2006 (WWW2006): Collaborative Web Tagging Workshop, Edinburgh, Scotland, 2007 from http://www.ibiblio.org/www_tagging/2006/29.pdf.

²² Weinberger, David. *Everything Is Miscellaneous: The Power of the New Digital Disorder*. New York, NY: Henry Holt and Company, 2007.

web. Weinberger saw tagging sites such as Flickr as a place where people could tag not only their own photographs but those of others to facilitate indexing and retrieval. Weinberger states, “the more ways our digital photos can be sorted, ordered, clustered, and made sense of the better. We lose the requirement that a family get on the same page (literally) about its memories. And if albums are the archetypes of memory, memory becomes less what we have assembled and locked away and more what we can assemble and share.”²³ I find this particular quotation to be the most important for cultural heritage institutions, as it is the contextualization and openness to more than one narrative that crowdsourcing could enrich collections with.

Similar to Weinberger’s inquiry, Joshua Porter contrasts “discovery” with “finding”, hinting at the importance of language for browsability and noting the key difference is that users who discover information didn’t need to know it was there to begin with. In a word, this is serendipity.²⁴ Scott Bateman et al. similarly focused on the tagger, though instead of serendipitous discovery (browsability) vs. finding (searchability), Bateman et al. saw tagging as an act of reflection where the participant condenses and summarizes a series of words into one or more summary tags, each of which stands on its own to describe some aspect of the resource based on the individual’s experiences and beliefs.²⁵ This focus on tagging and subsequent folksonomies as an educational and learning experience helps to reinforce its use within museums and cultural heritage institutions as mission-critical engagement, which will be further discussed in this thesis. However, it is important to note that Bateman et al. did see concerns that tagging systems, like most forms of social networking software, require a critical mass of submissions and engagements before they become truly useful to a community.²⁶

Cho, Yeh, Cheng, and Chang advocated the use of socially created metadata tags by the users of museum collections and sites themselves as a more natural and familiar language to search than that of the controlled ontological terms of the museum staff.²⁷ Though they advocated for social tagging as a way to increase discoverability and access to collections on museum websites, Cho, Yeh, Cheng, and Chang, as well as Ingrid Hsieh-Yee,²⁸ were not blind to the issues already recognized in metadata crowdsourcing projects. They stated, “while the

²³ Weinberger, *Everything is Miscellaneous*, pg. 15

²⁴ Porter, J. (2005a). “Controlled Vocabularies Cut Off the Long Tail”.
http://bokardo.com/archives/controlled_vocabularies_long_tail/

²⁵ Bateman, Scott, Christopher Brooks, Gordon McCalla, and Peter Brusilovsky. “Applying Collaborative Tagging to E-Learning,” January 2007, 7.
https://www.researchgate.net/publication/228614917_Applying_collaborative_tagging_to_e-learning

²⁶ Bateman et al., “Applying Collaborative Tagging”

²⁷ Cho, Yeh, Cheng, and Chang, “The Searching Effectiveness of Social Tagging in Museum Websites,” pg. 127

²⁸ Hsieh-Yee, Ingrid. “Educating Cataloging Professionals in a Changing Information Environment.” *Journal of Education for Library and Information Science* 49, no. 2 (Spring 2008): 93–106.

benefits of social tagging are appreciated, social tagging is not without problems. These problems include: polysemy (a term has two or more similar meanings), synonymy (different terms have similar or identical meanings), and lack of hierarchy ambiguity (how specific should resources be described), which are mainly recognized as the absence of characteristics of professional classification schemes.”²⁹ When looking at crowdsourcing as a tool for increasing discovery, it is important to note these problems, as they can obscure and complicate discovery by adding extraneous results to searches.

Whether viewing cataloging data, and metadata in particular, as a tool for internal discovery and organization for staff or for external discovery and access for users, it's clear that the main purpose of metadata is to enable discoverability, and as shown by Alemu and Stevens, this prioritization of discovery then means that metadata must be reflective and iterative in its service to discovery. Terminologies, language choices, and even context change over time, and therefore the metadata should be able to reflect these changes.³⁰ Crowdsourcing of metadata tags was initially identified as a relatively cheap means of obtaining descriptive data and conducting the labor-intensive tasks of creating metadata; however, it was this enhancing of findability that became a major impetus for many of the crowdsourcing projects conducted in the 2000s and 2010s.³¹ As Clay Shirky stated, “great minds don’t think alike”³² and “the only group that can categorize everything is everybody.”³³

During this time, scholars and practitioners like Alemu and Stevens, Gruber,³⁴ and Morville³⁵ and Wright³⁶ all advocated for hybrid approaches to metadata cataloging – not forgoing traditional ontological approaches of professional cataloging altogether, but recognizing a need to balance this approach with the inclusion of socially constructed, or crowdsourced, metadata as well.³⁷ This hybrid approach addressed many of the concerns permeating the early to mid-2000s surrounding the ever increasing access points to information and the idea that

²⁹ Cho, Yeh, Cheng, and Chang, “The Searching Effectiveness of Social Tagging in Museum Websites,” pg. 127.

³⁰ Alemu and Stevens, “An Emergent Theory of Digital Library Metadata,” pg. 73

³¹ Alemu and Stevens, “An Emergent Theory of Digital Library Metadata,” pg. 35

³² Shirky, Clay. “Shirky: Ontology Is Overrated -- Categories, Links, and Tags.” Accessed October 22, 2019. http://shirky.com/writings/herecomeseverybody/ontology_ouerrated.html.

³³ Shirky, Clay. “Shirky: Ontology Is Overrated -- Categories, Links, and Tags.” Accessed October 22, 2019. http://shirky.com/writings/herecomeseverybody/ontology_ouerrated.html.

³⁴ Gruber, Thomas. “Ontology of Folksonomy: A Mash-up of Apples and Oranges.” *International Journal of Semantic Web and Information Systems* 3, no. 2 (2007). <https://tomgruber.org/writing/ontology-of-folksonomy.htm>.

³⁵ Morville, Peter. *Ambient Findability*. O’Reilly Media, Inc., 2005.

³⁶ Wright, Alex. *Glut: Mastering Information Through the Ages*. Joseph Henry Press, 2007.

³⁷ Alemu and Stevens, “An Emergent Theory of Digital Library Metadata,” pg. 44

folksonomy and crowdsourcing of metadata could create a watering down of access by creating too many access points.³⁸

Wright believed that it was possible, and in fact necessary, to envision a middle ground between pure democracy of bottom-up metadata creation via tagging, and the “empirical determinism of top-down controlled vocabularies.”³⁹ Gruber specifically looked to address this same criticism of crowdsourcing metadata and the resulting folksonomies, refocusing the impetus of folksonomy as a questioning of top down categorization instead of as a way of finding and organizing information.⁴⁰ Gruber, similarly to Wright, believed that for the task of discovery and finding collections information, the professionally created taxonomies were too rigid and too text-based in their creation, and that tagging projects helped to introduce distributed human intelligence into the catalogs and systems, aiding in discovery.⁴¹ Weinberger and Trant went even further, believing that crowdsourcing of metadata and folksonomies were an anti-authoritarian symbol that embraced a multiplicity of world views, as controlled vocabularies marginalized those who did not use the same words.⁴²

Framing crowdsourcing of metadata tags within this idea of balance between the curatorially created top-down metadata of a taxonomy is important, as it addresses early concerns and is more realistic in enhancing discovery than the idea of abandoning ontology altogether in favor of folksonomy alone.⁴³ It focuses on the benefit of the public volunteer enhancing metadata created by the cataloger, who may not be able to find or identify every aspect important to discovery.⁴⁴ Thus, this thesis will center around this idea of enrichment not replacement, falling in line with the previous discussions. From this point, it is possible to address how a major impetus for tagging and crowdsourcing metadata revolved around this early promise of enhancing discoverability.

Furner et al. saw the major advantages to collaborative indexing (or user tagging) being based around the fact it is distributed (no one single person is required to index all resources, and no single resource needs to be indexed by all people), it is cheap (especially when done by volunteers), it is democratic (volunteers are invited to participate instead of having experts selected), it is empowering to the volunteers who may be providing their own language to these

³⁸ Wright, Alex. *Glut: Mastering Information Through the Ages*. Joseph Henry Press, 2007.

³⁹ “Folksonomy - Alex Wright.” Accessed February 8, 2022.
<https://alexwright.com/blog/archives/000900.html>.

⁴⁰ Gruber, “Ontology of Folksonomy.”

⁴¹ Gruber, “Ontology of Folksonomy.”

⁴² Trant, J. “Studying Social Tagging and Folksonomy: A Review and Framework,” 2009, 43.

⁴³ Alemu and Stevens, “An Emergent Theory of Digital Library Metadata,” pg. 44

⁴⁴ Miller, Steven. *Metadata for Digital Collections*. 179. New York, NY: Neal-Schuman Publishers, Inc., 2011.

projects for the first time, it is collaborative, and it is dynamic.⁴⁵ Perhaps in greatest support of these projects within the cultural heritage sector, Furner et al. stated that this form of engagement is not so different from what cultural institutions already seek to encourage from their patrons but that it “could be envisaged as a vital service that would help patrons interact with and interpret those resources, largely outside the authority and control of curators and other specialists.”⁴⁶

In a project comparing popular tags created as part of the del.icio.us project with those of the Library of Congress Subject Headings (LCSH), Yi and Chang found that about two-thirds of social tags created appeared in the LCSH indicating a demonstrated accuracy to social tags and usefulness in what the public could produce.⁴⁷ One of the earliest examples of a cultural heritage institution attempting to decentralize its classifications using tagging in this way, was the Steve.Museum.

The steve.museum, also known as the steve tagger, was a collaborative project started in 2005, eventually being awarded a \$1 million grant from the United States Institute of Museum and Library Services. It saw staff from the Indianapolis Museum of Art, Guggenheim Museum of Art, Cleveland Museum of Art, Metropolitan Museum of Art, and San Francisco Museum of Modern Art working to explore the possibilities of user-generated descriptions of art. Early analysis of the project in 2006 went beyond the study of Yi and Chang, showing that, “analysis of terms collected in the prototype steve tagger suggests that social tagging of art museum objects can in fact augment museum documentation with unique access points not found in traditional cataloguing.”⁴⁸ As shown in **Chapter 2: Contextual Review**, museums have often emphasized the physical nature of art as an artifact and the scholarly significance of the work over time, with staff recording conservation, exhibition, loan, and publication history, but the systems of documentation and classification that support the professional discovery of art history, history, culture, and more within museum collections have failed to represent the interests, perspectives, or passions of those who visit (and use) museum collections, both on-site and online.⁴⁹ One of the main goals of the steve.museum project was to investigate the role of social tagging of art museum objects in augmenting museum documentation with unique

⁴⁵ Furner et al., “Collaborative Indexing of Cultural Resources

⁴⁶ Furner et al., “Collaborative Indexing of Cultural Resources

⁴⁷ Cho, Yeh, Cheng, and Chang, “The Searching Effectiveness of Social Tagging in Museum Websites,” pg. 129

⁴⁸ Trant, Jennifer. “Social Classification and Folksonomy in Art Museums: Early Data From the Steve.Museum Tagger Prototype.” 17th Annual ASIS&T SIG/CR Classification Research Workshop, November 4, 2006.

⁴⁹ Trant, “Early Data from the Steve.Museum Tagger Prototype,” p.1

access points not found in traditional cataloging, looking to bridge the semantic gap introduced previously.⁵⁰

Inspired by social tagging environments like Flickr and del.icio.us, and encouraged by the success of the ESP Game (further discussed in the *Increasing Tagging through Gamification, Machine Learning and AI* section to come), this group built an environment within which to research the contribution of publicly assigned terms to the online accessibility of art collections (available at <http://www.steve.museum>).⁵¹ Proof of concept tests held at the Metropolitan Museum of Art showed striking differences between the terms assigned to works of art by professional art historians and librarians, and those assigned by non-professionals, laying the groundwork for a semantic gap between professional and public discourse that may be bridged by incorporating user-generated tags into the museum documentation.⁵²

Jennifer Trant, in her work with the *steve.museum*, studied the relationship of social tags created for an online art collection and found that 86% of tags generated by participants did not exist in the documentation before, indicating a semantic gap between the public and the professionals, and demonstrating a possible increase in discoverability that incorporating crowdsourced tags could have.⁵³ As the *steve.museum* team stated, “simply put, the access offered by the Web hasn’t translated into accessibility...the folksonomy that results from social tagging appears likely to fill gaps in museum documentation practices.”⁵⁴ These tests helped to demonstrate early on that there was a difference in the language of the “professional” and the “public” and that, in many cases, the “public” was adding the most unique new terms to the works. As Hedges and Dunn state, “analyses of collaborative tagging in museum environments have highlighted the fact that the terminology used by crowd taggers can differ from the controlled vocabulary terms used by professional curators...and for the creation of effective discovery metadata, as perspectives overlooked by curators may be captured, without compromising the curatorial integrity of the collection itself.”⁵⁵

Results of the *steve.museum* project signaled that social tagging of art museum objects could augment museum documentation with unique access points not found within the

⁵⁰ Trant, “Early Data from the Steve.Museum Tagger Prototype,” p.1

⁵¹ Trant, “Early Data from the Steve.Museum Tagger Prototype,” p.11

⁵² Trant, “Early Data from the Steve.Museum Tagger Prototype,” p.11

⁵³ Cho, Yeh, Cheng, and Chang, “The Searching Effectiveness of Social Tagging in Museum Websites,” pg. 127

⁵⁴ “Archives & Museum Informatics: Museums and the Web 2006: Wyman, B., et al., *Steve.Museum: An Ongoing Experiment in Social Tagging, Folksonomy, and Museums.*” Accessed November 1, 2019. <https://www.museumsandtheweb.com/mw2006/papers/wyman/wyman.html>.

⁵⁵ Hedges, Mark, and Stuart Dunn. *Academic Crowdsourcing in the Humanities: Crowds, Communities, and Co-Production.* Chandos Information Professional Series. Chandos Publishing, 2018. Pg 55.

traditional cataloging structures, initially supporting a bridge for the semantic gap between cataloguers and the public.⁵⁶ This semantic gap as identified by the *steve.museum* team went beyond language choices and highlighted the disconnect between *is-ness* and *aboutness* highlighted previously in the contextual review. As Rossetti stated, unlike text-based forms of information, cultural objects have not traditionally been described according to subject matter or context.⁵⁷ Trant stated that the language used by cataloguers was structured according to museum goals and objectives, not that of the user, and that the interpretive context was often not shared with the user.⁵⁸ Rossetti stated further that though social tagging may solve the problem of the semantic gap, there was no evidence that the value of the tagging outweighed the value of the authority control.⁵⁹

In addition to evidence shown above by Trant, and Yi and Chang, a 2009 analysis of folksonomic projects by Jan-Erik Bråthen demonstrated a fundamental semantic gap between traditional classification and folksonomies and the ability of tags to bridge this gap when it was shown that 50% of tags entered in the metadata tagging project were deemed valid classification that had previously not been included in traditional metadata.⁶⁰ Susan Cairns believed that social tagging projects were a tactic to broach the divide between experts and non-experts in the online museum space, increasing access to online collections and providing museum staff with insights into their users.⁶¹ Max Evans believed that crowdsourcing of metadata was so effective in expanding access and discovery because it went beyond a semantic gap and addressed an aspect of description that cultural heritage staff could not do alone, that of granular item level. While archivists and catalogers are bound to classification styles and rules that look at minimal processing data of collections, volunteers and crowdsourcing participants had the ability to describe at an item-level, expanding and enhancing how collections were described and thus increasing their discoverability.⁶²

⁵⁶ Trant, Jennifer. "Social Classification and Folksonomy in Art Museums: Early Data From the Steve.Museum Tagger Prototype." 17th Annual ASIS&T SIG/CR Classification Research Workshop, November 4, 2006.

⁵⁷ Rossetti, Alyx. "Subject Access and ARTstor: Preliminary Research and Recommendations for the Development of an Expert Tagging Program." *Art Documentation: Journal of the Art Libraries Society of North America* 32, no. 2 (September 2013): 284–300.

⁵⁸ Trant, "Social Classification and Folksonomy in Art Museums," pg. 3

⁵⁹ Rossetti, "Subject Access and ARTstor," pg. 287

⁶⁰ Bråthen, Jan-Erik. "An Analysis of Image Folksonomy Generation," 2009, 180.

⁶¹ Cairns, Susan. "Mutualizing Museum Knowledge: Folksonomies and the Changing Shape of Expertise." *Curator: The Museum Journal* 56, no. 1 (January 2013).

⁶² Evans, Max. "Archives of the People, by the People, for the People." *The American Archivist* 70, no. 2 (Fall-Winter 2007): 387–400.

Mathilde Pulh and Rémi Mencarelli looked at folksonomy projects hosted in the 2010s at the Philadelphia Museum of Art and the Brooklyn Museum.⁶³ They believed the tagging projects were a new way to describe, encounter, and understand objects, “providing a counterweight to the often complex scientific thesaurus drawn up by curators.”⁶⁴ Though they acknowledged the risk of these projects to question the museum’s authority and possibly disenchant the museum experience,⁶⁵ they overall saw the increase in access points and perspectives as an intuitive form of navigation, helping to support serendipitous discovery previously limited by curatorial voice.⁶⁶

Practitioners like Elaine Peterson,⁶⁷ Mirko Tobias Schaefer,⁶⁸ and Olivia Vane⁶⁹ also helped expand the understanding of folksonomies and tagging projects' promise of increasing access points by focusing on the non-exclusive and iterative nature of these metadata tags. Vane stated that cataloging data is subject to change, that what is recorded about objects intends to meet the requirements of those accessing the collection, and that as these requirements change, catalogers have to try to keep up and iterate their approach.⁷⁰ Schaefer argued for the importance that human-centered tagging brought to description, particularly in the case of semantic value and content, the ability to describe the *aboutness* as well as the *is-ness* of an object.⁷¹ Going further, Schaefer also advocated for the flexibility of tagging structures, allowing for information that is not exclusive or static, allowing for more nuanced descriptions of objects than ontologies that want to catalog objects as one thing, or one narrative.⁷² Seth van Hooland similarly saw the need to incorporate tagging due to the high diversity of content housed by collections and the inability of an institution alone to ensure sufficient in-house knowledge for the description of such heterogenous and nuanced collections.⁷³ Cairns connected this to a point by Gruber that, “never before have so many creative and knowledgeable people been connected by such an efficient, universal network...the result today

⁶³ Pulh, Mathilde, and Rémi Mencarelli. “Web 2.0: Is the Museum–Visitor Relationship Being Redefined?” *International Journal of Arts Management* 18, no. 1 (2015): 43–51.

⁶⁴ Pulh and Mencarelli, “Web 2.0 Is the Museum-Visitor Relationship Being Redefined?,” pg. 45

⁶⁵ Pulh and Mencarelli, “Web 2.0 Is the Museum-Visitor Relationship Being Redefined?,” pg. 47

⁶⁶ Pulh and Mencarelli, “Web 2.0 Is the Museum-Visitor Relationship Being Redefined?,” pg. 56)

⁶⁷ Peterson, Elaine. “Beneath the Metadata: Some Philosophical Problems with Folksonomy.” *D-Lib Magazine* 12, no. 11 (November 2006). <https://doi.org/10.1045/november2006-peterson>.

⁶⁸ Schaefer, Mirko Tobias. “Bastard Culture.” In *Bastard Culture!* Amsterdam University Press, 2011. <https://www.jstor.org/stable/j.ctt46n23s.8>.

⁶⁹ Vane, Olivia. “Timeline Design for Visualising Cultural Heritage Data.” *Royal College of Art Postgraduate Art and Design*, September 5, 2019.

⁷⁰ Vane, “Timeline Design for Visualising Cultural Heritage Data,” pg. 18

⁷¹ Schaefer, “Bastard Culture,” pg. 109

⁷² Schaefer, “Bastard Culture,” pg. 109

⁷³ Hooland, Seth van. “From Spectator to Annotator: Possibilities Offered by User-Generated Metadata for Digital Cultural Heritage Collections,” September 2006.

is incredible breadth of information and diversity of perspective, and a culture of mass participation that sustains a fountain of publicly available content.”⁷⁴

Peterson recognized the promise of folksonomies for this nuanced and iterative approach; however, she also advocated for a need to refine the process of using these tags so as not to undermine the systems’ own usefulness. This falls in line with earlier criticisms and concerns raised by Wright, Morville, and Alemu and Stevens, and the checks and balances introduced above go toward addressing this prevalent concern of the mid to late 2000s. As stated by Darlene Fichter in 2006, folksonomies lacked precision; however, they certainly demonstrated an increase in discoverability.⁷⁵ Many of the earliest adopters of these tagging and metadata crowdsourcing projects in the museum world did so with the aim of increasing access to online collections and improving it for non-expert users. There was an acknowledgement that simply making collections available online was not necessarily access, and that the expansion of language and access points, and, in fact, those access points being created by these non-expert users, was a better way to create accessible and engaging spaces online.⁷⁶

Continually in the 2000s to 2010s, this balance between recognizing the concerns and limitations of metadata tagging and its promises for increasing access points is noted. In fact, much of the emphasis in studying folksonomy in a museum context focused on questions of access and whether it improved public access to online collections, and as stated by Cairns, “such studies have indicated that folksonomies do hold benefit and potential.”⁷⁷ However, during this time it was unclear if folksonomy would become a replacement for professional cataloging, or just an enhancement, creating many concerns for the user-centered approach. Overall, this fear about crowdsourcing has largely disappeared in the 2020s from conversations within institutions as the idea that professional staff could be replaced by a crowd has disappeared.⁷⁸ In fact, today there is an understanding that there is a marked value in the participation of the public in expanding access points, but, in many ways, the value is dependent on devoting proper staff and resources to guide and support the project participants.⁷⁹

⁷⁴ Cairns, Susan. “Mutualizing Museum Knowledge: Folksonomies and the Changing Shape of Expertise.” Curator: The Museum Journal 56, no. 1 (January 2013).

⁷⁵ “Intranet Applications for Tagging and Folksonomies’ by Fichter, Darlene - Online, Vol. 30, Issue 3, May-June 2006 | Online Research Library: Questia.” Accessed November 18, 2019. <https://www.questia.com/magazine/1G1-148931596/intranet-applications-for-tagging-and-folksonomies>.

⁷⁶ Cairns, “Mutualizing Museum Knowledge.”

⁷⁷ Cairns, “Mutualizing Museum Knowledge.”

⁷⁸ “The Decade in Crowdsourcing Transcription | FromThePage Blog.” Accessed February 24, 2020. <https://content.fromthepage.com/decade-in-crowdsourcing/>.

⁷⁹ “The Decade in Crowdsourcing Transcription | FromThePage Blog.” Accessed February 24, 2020. <https://content.fromthepage.com/decade-in-crowdsourcing/>.

As I have endeavored to show in this section, seeing metadata tagging as a replacement for professional cataloging should not be the goal. There are very real advantages to professional cataloging, including specialist knowledge and perspective necessary for tracking provenance and description, but the increase in discoverability and access afforded by metadata tagging can also not be belittled. As Trant stated:

“While museum online databases provide many details important to the scholar, things that might seem exceptional to the general viewer - that a painting is of dogs playing poker - might not be mentioned at all. Neither the authored nor the database model of collections information fully supports museums' goals to enable use and understanding of the objects in their care. Collections are available, but not necessarily accessible.”⁸⁰

The scholars and practitioners who focused on folksonomy and tagging in the 2000s and 2010s demonstrated the marked ability of these platforms and projects to expand access points, and, in particular, to tackle the semantic gap between professional language of the curator and the popular language of the visitor, helping to not only increase discoverability but also perspectives within the collections.⁸¹

As shown above, the question of whether crowdsourcing of metadata could increase access to collections was solidly answered by projects, researchers, and practitioners of the 2000s and 2010s. However, beyond increased access, Trant believed the cooperation between museums and visitors could bridge the gap between the professional language of the curator and the popular language of the visitor.⁸² Cairns supported this, expanding on the ideas of Schaefer and van Hooland that tagging enhanced nuanced understanding of collections and descriptions, advocating for museums to include multiple knowledges and perceptions about their collections within their catalogs to more deeply impact representation.⁸³

The diversity of tags created in crowdsourcing projects proved adept at expanding access to collections, but their integration into cataloging also showed early support for presenting multiple points of view represented by various users.⁸⁴ This is an important early

⁸⁰ Trant, Jennifer. “Investigating Social Tagging and Folksonomy in Art Museums with Steve.Museum,” 2006.

⁸¹ Trant, Jennifer. “Investigating Social Tagging and Folksonomy in Art Museums with Steve.Museum,” 2006.

⁸² Trant, Jennifer. “Investigating Social Tagging and Folksonomy in Art Museums with Steve.Museum,” 2006.

⁸³ Cairns, “Mutualizing Museum Knowledge.”

⁸⁴ Trant, Jennifer. “Social Classification and Folksonomy in Art Museums: Early Data From the Steve.Museum Tagger Prototype.” 17th Annual ASIS&T SIG/CR Classification Research Workshop, November 4, 2006.

thread beyond simple discovery and into representation that will be picked up in the next section regarding the importance of tagging projects for increasing representation, for as Cairns stated, “After all, it really cannot be true that there are only a handful of people worth listening to in the world.”⁸⁵

Representation - From Language Used to Who Creates It:

The shift in seeing the impact of crowdsourcing not just as a way to increase access points but to diversify the access points and create a more representational narrative online began to take form out of the Web 2.0 ethos of the producer/consumer.⁸⁶ As shown in the previous section, even for the practitioners and scholars who viewed crowdsourcing initiatives as a way to increase access points to data, such as Trant, Cairns, and Weinberger, there was an understanding throughout the process that expanding access also included expanding narratives and voices. Weinberger believed this was a natural progression of the Web 2.0 world, in which the control had already shifted hands, with the “new rules of the information jungle” already changing with the rise of consumers as producers.⁸⁷ In regards to how this impacted the way crowdsourcing was envisioned, Weinberger highlights an important aspect, stating, “social knowing changes who does the knowing and how, more than it changes the what of knowledge.”⁸⁸

As shown in the previous section, and **Chapter 2: Contextual Review**, one of the key critiques of crowdsourcing metadata has been the loss of institutional authority, with the perception being that by incorporating the voices of the crowd, it loses the trusted voice and expertise of the museum. As I demonstrated in **Chapter 2: Contextual Review**, this critique does not account for the actual loss of trust that single narratives create with the community at large, and the ways the public has called for more diversification of the narrative in recent years, not a stronger grasp on authority. Puhl and Mencarelli had early critiques of the visitors drowning out or lowering the voice of the museum, whose authority they believed was grounded in scientific or artistic expertise.⁸⁹ But even they had stated in 2015 that digital programming and platforms in museums were transitioning in much the same way the physical museum space

⁸⁵ Cairns, “Mutualizing Museum Knowledge.”

⁸⁶ Estellés-Arolas, Enrique, and Fernando González-Ladrón-de-Guevara. “Towards an Integrated Crowdsourcing Definition.” *Journal of Information Science* 38, no. 2 (April 1, 2012): 189–200. <https://doi.org/10.1177/0165551512437638>.

⁸⁷ Weinberger, David. *Everything Is Miscellaneous: The Power of the New Digital Disorder*. New York, NY: Henry Holt and Company, 2007.

⁸⁸ Weinberger, “Everything is Miscellaneous,” pg. 144

⁸⁹ Puhl, Mathilde, and Rémi Mencarelli. “Web 2.0: Is the Museum–Visitor Relationship Being Redefined?” *International Journal of Arts Management* 18, no. 1 (2015): 43–51.

had, to no longer represent the museum as an “inescapable authority but increasingly serve as platforms for exchange among their different communities.”⁹⁰ It is this change that leads most strongly to the view that crowdsourcing can diversify data entry points and actually be a tool to create more representational access points as part of its expansion of access points.

If the last section demonstrated the semantic gap between museum staff and museum public in the language used and created in these projects, this section expands upon that to discuss the need for crowdsourcing projects as a way to include a representational public in the process of tagging metadata to ensure biases, colonialism, and whiteness in cataloging, as discussed in **Chapter 2: Contextual Review**, are countered by the voices of the public. One way crowdsourcing projects began to tackle this portion of the semantic gap in the 2010s was by looking at participatory experience design as a template for crowdsourcing projects.

In 2010, Nina Simon published the work “The Participatory Museum.”⁹¹ Three of the fundamental theories underpinning this work were the ideas of the audience-centered institution being relevant, useful, and accessible; that visitors construct their own meaning from their cultural experiences; and that users’ voices can both inform and invigorate project designs and public-facing programs.⁹² I would argue that the previous section demonstrated the usefulness of crowdsourcing projects to create audience-centered experiences that made museum collections relevant, useful, and accessible, and it is now important to see diversity-focused crowdsourcing projects centered on the construction of individual meaning and the users’ voice informing project design and programs.

By changing the goal of crowdsourcing projects from solely outsourcing cataloging work to increasing access points, it’s possible to understand that the initial criticisms noted above and in the previous sections around authoritative voice actually are of little consequence within this new goal of crowdsourcing. By focusing on representation and participation, one of the goals is to in fact disrupt the single narrative of the institution, tying to Simon’s second point above. As Simon examined five commonly expressed forms of public dissatisfaction with participatory experiences, the third most common was that the authoritative voice of the institution did not include the view of the participant or give enough context for understanding what was presented.⁹³ As presented in **Chapter 2: Contextual Review**, this is a true concern for retaining trust in institutions in a digital space, where there is no museum staff present and available to add context or share diverse perspectives not included in the text shared. By presenting multiple

⁹⁰ Pulh and Mencarelli, “Web 2.0”, pg. 49

⁹¹ Simon, Nina. *The Participatory Museum*. Santa Cruz, California: Museum 2.0, 2010.

⁹² Simon, “The Participatory Museum,” pg. ii

⁹³ Simon, “The Participatory Museum,” pg. iv

stories and voices in these online spaces, cultural institutions can actually help the public understand where their own views fit in the wider context of diverse perspectives, but first these institutions need to cultivate the diverse perspectives in the data.⁹⁴ This is where crowdsourcing connects.

Bias does not only exist within the work of museum professionals, in fact every single person approaches description from a specific positionality, a bias.⁹⁵ The term bias should not be seen as synonymous with prejudice, racism, sexism, or in fact any derogatory term. Bias is best defined as a distorting lens that is a byproduct of how the human brain functions and the disparities within our society.⁹⁶ As Jennifer Eberhardt states, what is important to note about each person having an implicit bias is that despite our conscious awareness or deliberate intentions, these implicit biases have the power to bias our perceptions, our attention, our memories, and our actions.⁹⁷ In many ways this is the importance of recognizing positionality, and also the importance of incorporating many voices into a process in an attempt to counteract exclusionary norms.⁹⁸ Public participation, including crowdsourcing, will never be a salve for bias, as every single participant comes to these interactions and projects with their own biases; however, by incorporating the public into the process it is possible to reflect the diverse perspectives of the community at large and not a single institutional bias.

As Carletti, McAuley, Price, Giannachi, and Benford stated, Simon's framework for public participation does not refer explicitly to crowdsourcing; however, the notions of public participation and crowdsourcing in cultural heritage certainly overlap.⁹⁹ This way of beginning to see crowdsourcing as a tool for opening up collections and welcoming in larger populations of volunteers to add their own contexts is also solidly in line with the evolution of citizen science projects in the 2010s. As Wiggins and Crowston stated, citizen science was rapidly expanding at this time with the availability of technologies to demonstrate the efficacy of this open

⁹⁴ Simon, "The Participatory Museum," pg. iv

⁹⁵ Fraser, Nancy. "Rethinking the Public Sphere: A Contribution to the Critique of Actually Existing Democracy." *Social Text*, no. 25/26 (1990): 56–80. <https://doi.org/10.2307/466240>.

⁹⁶ Eberhardt, Jennifer. *Biased: Uncovering the Hidden Prejudice That Shapes What We See, Think, and Do*. Penguin Books, 2020.

⁹⁷ Eberhardt, Jennifer. *Biased: Uncovering the Hidden Prejudice That Shapes What We See, Think, and Do*. Penguin Books, 2020.

⁹⁸ Fraser, Nancy. "Rethinking the Public Sphere: A Contribution to the Critique of Actually Existing Democracy." *Social Text*, no. 25/26 (1990): 56–80. <https://doi.org/10.2307/466240>.

⁹⁹ Carletti, Laura, Derek McAuley, Dominic Price, Gabriella Giannachi, and Steve Benford. "Digital Humanities and Crowdsourcing: An Exploration | MW2013: Museums and the Web 2013." *Museums and the Web*, 2013. <https://mw2013.museumsandtheweb.com/paper/digital-humanities-and-crowdsourcing-an-exploration-4/>.

movement, including diverse volunteers as a research strategy.¹⁰⁰ In fact, it was this shift in viewing crowdsourcing as a means of public participation towards diversity that helped breathe life back into social tagging in museums.

By the mid-2010s, social tagging projects were seen by many as a “buzzword out of vogue,”¹⁰¹ and many projects that were still active struggled to attract participants. The initial context for crowdsourcing in museums, of tagging as a means to increase retrieval,¹⁰² as advocated by Vander Wal¹⁰³ and others shown above, had lost steam with museum professionals. In part, this can be seen in the 2019 publication by Severson in which she states, “one of the common myths we encountered when first talking about crowdsourcing was that it was a great way to complete large amounts of repetitive work like transcription or description. While it is true that these projects directly utilize volunteers instead of paid staff, they require just as much institutional resources to ensure they are successful and managed well.”¹⁰⁴ The resources (monetarily, technologically, and staff time wise) that it took to run these projects had many people in the field in the 2010s shifting away from running these projects in favor of experimenting with machine learning and AI models they believed held the promise of tagging visual elements like color¹⁰⁵ and subjects.¹⁰⁶

They have been used by various institutions already to expand and enrich existing metadata tags (and will be discussed in greater detail later in this chapter), including as part of the *Your Paintings Project*.¹⁰⁷ Andrew Greg noted in a 2014 presentation, “that it was taking volunteer taggers longer than had been anticipated to complete the *Your Paintings* Tagger project, and pointed to research undertaken by the Oxford Visual Geometry Group as promising to automate much of the process” pivoting the focus of the project.¹⁰⁸ However, by shifting the views of these projects away from just access point creation and towards expansion of access

¹⁰⁰ Wiggins, Andrea, and Kevin Crowston. “From Conservation to Crowdsourcing: A Typology of Citizen Science.” In 2011 44th Hawaii International Conference on System Sciences, 1–10. Kauai, HI: IEEE, 2011. <https://doi.org/10.1109/HICSS.2011.207>.

¹⁰¹ Hyperallergic. “Can Social Tagging Deepen the Museum Experience?,” November 3, 2017. <https://hyperallergic.com/409854/can-social-tagging-deepen-the-museum-experience/>.

¹⁰² Hyperallergic, “Can Social Tagging Deepen the Museum Experience?”

¹⁰³ “Folksonomy :: Vanderwal.Net.” Accessed February 9, 2022. <https://vanderwal.net/folksonomy.html>.

¹⁰⁴ Severson, Sarah. “Crowding the Library: How and Why Libraries Are Using Crowdsourcing to Engage the Public.” *Partnership: The Canadian Journal of Library and Information Practice and Research*, Innovations in Practice, 14, no. 1 (2019). <https://doi.org/10.21083/partnership.v14i1.4632>.

¹⁰⁵ Hyperallergic, “Can Social Tagging Deepen the Museum Experience?”

¹⁰⁶ Hancher, Michael. “Seeing and Tagging Things.” *Representations* 155 (Summer 2021): 82–109. <https://doi.org/10.1525/rep.2021.155.4.82>.

¹⁰⁷ Ciecko, “AI Sees What?”

¹⁰⁸ Hancher, Michael. “Seeing and Tagging Things.” *Representations* 155 (Summer 2021): 82–109. <https://doi.org/10.1525/rep.2021.155.4.82>.

points across diverse contexts, the need for human-centered participatory approaches again becomes clear.

As Allen Colin noted in 2013, “people continue to supply a depth of understanding that we don’t see machines achieving any time soon.”¹⁰⁹ It is this depth and diversity that are best addressed by the strengths of socially constructed, or crowdsourced, metadata.¹¹⁰ The more metadata systems reflect the diversity, variations, and coinages in the nomenclature of their objects, the better they support discoverability and relevancy of the objects.¹¹¹ Alemu and Stevens, Gosden and Marshall,¹¹² and Phillips¹¹³ all saw the value of adding these divergent cultural contexts and perspectives to objects as a key to the mission of the institutions. Phillips and Hooper-Greenhill advocated for cultural interpretation to be seen as multifaceted with increased needs for diversity and inclusiveness to enable new voices to be heard in order to tackle the inherent biases in cultural narratives.¹¹⁴

As Hooper-Greenhill stated:

“Museums have always had to modify how they worked, and what they did, according to the context, the plays of power, and the social, economic, and political imperatives that surrounded them. Museums, in common with all other social institutions, serve many masters, and must play many tunes accordingly. Perhaps success can be defined by the ability to balance all the tunes that must be played and still make a sound worth listening to.”¹¹⁵

By viewing crowdsourcing of metadata as a modification in the way museums catalog, it is possible to again address the need to diversify narratives and contexts to address inherent biases that threaten trust and relevancy in museums, while providing participatory and engaging experiences for the public that yield new metadata that can be used in tandem with the professionally curated metadata of the cataloger – the *post hoc* and *a priori* approach proposed

¹⁰⁹ Allen, Colin, and the InPhO Group. “Cross-Cutting Categorization Schemes in the Digital Humanities.” *Isis* 104, no. 3 (2013): 573–83. <https://doi.org/10.1086/673276>.

¹¹⁰ Alemu, Getaneh, and Brett Stevens. *An Emergent Theory of Digital Library Metadata: Enrich Then Filter*. 1st ed. Chandos Publishing, 2015.

¹¹¹ Alemu and Stevens, “An Emergent Theory of Digital Library Metadata,” pg. 73

¹¹² Gosden, Chris, and Yvonne Marshall. “The Cultural Biography of Objects.” *World Archeology* 31, no. 2 (1999): 169–78.

¹¹³ Phillips, Lori Byrd. “The Temple and the Bazaar: Wikipedia as a Platform for Open Authority in Museums.” *Curator: The Museum Journal* 56, no. 2 (April 2013).

¹¹⁴ Phillips, Lori Byrd. “The Temple and the Bazaar: Wikipedia as a Platform for Open Authority in Museums.” *Curator: The Museum Journal* 56, no. 2 (April 2013).

¹¹⁵ Hooper Greenhill, Eileen. *Museums and the Shaping of Knowledge*. 0 ed. Routledge, 1992. <https://doi.org/10.4324/9780203415825>.

by Alemu and Stevens.¹¹⁶ As Phillips points out, this reconceptualization of the museum's authority should be described as moving from a focus on "absolute authority" to a new form of "contextual authority".¹¹⁷

This reconceptualization of crowdsourcing as a participatory experience that expands diversity, representation, and context has also been advocated by Cameron and Kenderdine as a way for museums to fulfill their goal of enlarging audiences to include underserved populations and novice learners by providing experiences that actually accommodate them in ways visiting galleries alone cannot.¹¹⁸ This focus also demonstrates the reciprocal nature and benefits these projects should, and can, have. As Cameron and Kenderdine stated:

"When communities engage with cultural institutions to preserve cultural identity, each party can contribute to the sharing of cultural knowledge and distribution of this knowledge to a wider audience. Cultural institutions can extend the new literacy in this process by providing tools and methods for community cocreation, thus reshaping the process of learning and producing content."¹¹⁹

This is where the digital divide and semantic gap have a bearing, in terms of whose cultural information needs are being served by the cataloging standards and development of digital programs, as previously discussed in the *Thinking Critically About the Rules of Cultural Heritage - Critical Heritage Studies and Issues of Trust* section of **Chapter 2: Contextual Review**. In this case, the digital divide defined is not just the social/political issue referencing the socioeconomic gap between communities that have access to computers and the internet and those who do not, though these inequalities do exist throughout the world, including the 14% of Americans who still don't use the Internet according to the Pew Internet and American Life Report.¹²⁰ It is instead referencing a secondary definition in which a gap exists between groups regarding their ability to use information and communications technologies effectively, in this case, collections search functionality.¹²¹ If it is understood that virtual access to digital cultural heritage includes benefits like reinforcing the physical presence of museums, extending access

¹¹⁶ Alemu, Getaneh, and Brett Stevens. *An Emergent Theory of Digital Library Metadata: Enrich Then Filter*. 1st ed. Chandos Publishing, 2015.

¹¹⁷ Phillips, Lori Byrd. "The Temple and the Bazaar: Wikipedia as a Platform for Open Authority in Museums." *Curator: The Museum Journal* 56, no. 2 (April 2013).

¹¹⁸ Cameron, Fiona, and Sarah Kenderdine. *Theorizing Digital Cultural Heritage*. Media in Transition 6. The MIT Press, 2007. Pg. 140.

¹¹⁹ Cameron and Kenderdine, "Theorizing Digital Cultural Heritage," pg. 153

¹²⁰ Apaydin, Veysel. "Heritage, Education and Social Justice." *Elements in Critical Heritage Studies*, November 2022. <https://doi.org/10.1017/9781009052351>. P. 40

¹²¹ Cameron and Kenderdine, "Theorizing Digital Cultural Heritage," pg. 230

within and without the cultural organization, extending the opportunity for interorganizational collaboration, and the opportunity for reinterpreting and establishing relationships with cultural heritage,¹²² then the ability of crowdsourcing to bridge the semantic gap and digital divide whilst providing more representational context to objects should be viewed as a key mission-centric activity for the institutions. In line with critical heritage theory, this takes the cultural heritage space from one where knowledge is not just learned, but also where it is produced; a place where people can come together and reconstruct knowledge to overcome injustices and inequalities.¹²³

Diverse communities have in fact been forming and interacting online for over a decade, and museums have the opportunity to enhance user experiences by experimenting with new strategies for user engagement that build community and attract new audiences.¹²⁴ As **Chapter 2: Contextual Review** and this section have laid out, it is necessary for museums to engage audiences in the process of description in order to enhance narratives shared and the subsequent relevancy of collections. This work cannot be done by staff alone, in certain senses due to homophily within museum staff limiting the range of diversity staff can bring to collections due to the limited diversity amongst museum staff themselves.¹²⁵

The heterogeneity of the crowd brings variations in contexts and views, bringing personal knowledge from each participant to the collections.¹²⁶ As critical heritage theorist Veysel Apaydin stated, “Everyone has valuable knowledge that can contribute to this because they are part of the community as individuals, therefore, they are also part of the knowledge production that is socially constructed.”¹²⁷ This underpins the participatory action research methodology used throughout this thesis, to be discussed in the following **Chapter 4: Methodology & Project Design**.

An important limitation and criticism to modern crowdsourcing in cultural heritage, and, in particular, when doing these projects with diversification of narrative and context in mind, is that many platforms and audiences for crowdsourcing lack diversity in themselves. Though Gray,

¹²² Cameron and Kenderdine, “Theorizing Digital Cultural Heritage,” pg. 233

¹²³ Apaydin, Veysel. “Heritage, Education and Social Justice.” Elements in Critical Heritage Studies, November 2022. <https://doi.org/10.1017/9781009052351>. P. 41

¹²⁴ “Archives & Museum Informatics: Museums and the Web 2006: Wyman, B., et al., Steve.Museum: An Ongoing Experiment in Social Tagging, Folksonomy, and Museums.” Accessed November 1, 2019. <https://www.museumsandtheweb.com/mw2006/papers/wyman/wyman.html>.

¹²⁵ McPherson, Miller, Lynn Smith-Lovin, and James M. Cook. “Birds of a Feather: Homophily in Social Networks.” Annual Review of Sociology 27 (2001): 415–44.

¹²⁶ Estellés-Arolas, Enrique, and Fernando González-Ladrón-de-Guevara. “Towards an Integrated Crowdsourcing Definition.” Journal of Information Science 38, no. 2 (April 1, 2012): 189–200. <https://doi.org/10.1177/0165551512437638>.

¹²⁷ Apaydin, Veysel. “Heritage, Education and Social Justice.” Elements in Critical Heritage Studies, November 2022. <https://doi.org/10.1017/9781009052351>. P. 47

Parise, and Iyer stated that quantity can be a proxy for diversity in that the more information obtained and the larger the number of participants included, the higher the likelihood of adding more novel ideas,¹²⁸ this is still a limitation that needs to be addressed within my own research and the literature at large.

Demographics of users can be difficult to ascertain, as this is information not always readily available in statistics and often is collected by individual platforms voluntarily with participants; however, there are noted issues. For example, in 2019, user demographics for the citizen science platform Zooniverse depended on the subject type of the projects. For example, projects centered on astronomy saw a demographic split on average around 30% female to 70% male, whereas projects centered on ecology saw demographic splits on average around 60% female to 40% male.¹²⁹ In a survey of citizen science projects run by the National Academies of Sciences, Engineering, and Medicine; Division of Behavioral and Social Sciences and Education; Board on Science Education; Committee on Designing Citizen Science to Support Science Learning in 2018,¹³⁰ participants who reported their race showed a demographic breakdown of 88.6% white, 6.1% Hispanic, 4.6% Asian, with no projects reporting overwhelming participation by Blacks or African Americans, or Indigenous people.

Similarly, a publication in 2020 published by “Theory and Practice: Citizen Science” reflected that in a survey of the RiverWatch citizen science project, data indicated that participants were “disproportionately white, highly educated, and affluent compared with the Illinois [site of RiverWatch] general population.”¹³¹

Again, it is important to note that many of the criticisms and concerns mentioned in **Chapter 2: Contextual Review** for crowdsourcing metadata are referencing this expansion of narratives and contexts without referencing the demographics of who is involved. The inclusive and non-hierarchical structure of these tagging projects was seen as a possible dilution of query results, with the threat being that the noted polysemy and homonymy issues with crowdsourcing

¹²⁸ Gray, Peter, Salvatore Parise, and Bala Iyer. “Innovation Impacts of Using Social Bookmarking Systems.” *MIS Quarterly* 35, no. 3 (September 2011): 629–43.

¹²⁹ Spiers, Helen, Alexandra Swanson, Lucy Fortson, Brooke Simmons, Laura Trouille, Samantha Blickhan, and Chris Lintott. “Everyone Counts? Design Considerations in Online Citizen Science.” *Journal of Science Communication* 18, no. 1 (January 17, 2019). <https://doi.org/10.22323/2.18010204>.

¹³⁰ National Academies of Sciences, Engineering, and Medicine, Division of Behavioral and Social Sciences and Education, Board on Science Education, Committee on Designing Citizen Science to Support Science Learning, Kenne Ann Dibner, and Rajul Pandya. *Demographic Analyses of Citizen Science. Learning Through Citizen Science: Enhancing Opportunities by Design*. National Academies Press (US), 2018. <https://www.ncbi.nlm.nih.gov/books/NBK535967/>.

¹³¹ Blake, Charlie, Allison Rhanor, and Cody Pajic. “The Demographics of Citizen Science Participation and Its Implications for Data Quality and Environmental Justice.” *Citizen Science: Theory and Practice* 5, no. 1 (October 7, 2020): 21. <https://doi.org/10.5334/cstp.320>.

would return related but potentially inapplicable items in searches of the collections.¹³² Yet it is still important to introduce that an additional limitation such as diversity of audiences for crowdsourcing projects is noted and important, especially when trying to use these projects for the expressed purpose of expanding representational data access points. I will address these limitations more in **Chapter 4: Methodology & Project Design** as they relate to my own research project, but this limitation itself helps to highlight the importance of framing crowdsourcing projects in museums as a transparent process for diversification but also an expansion of the museum's mission-centric content.

As Cameron and Kenderdine critiqued, museums often promote their missions and purpose as being places for life-long learning, but when it is felt by populations that the museum is controlling knowledge and gatekeeping expertise, a patronizing attitude is felt and goes against the grain of the agenda.¹³³ With the public used to having individual agency literally at their fingertips during this internet age, it is important for the museum's self-directed learning to support this in ways that framing crowdsourcing as an engaging, self-driven experience can do.

Tagging as Engaging:

The last two sections have shown that over the last 15 years, notable practitioners and scholars have supported the use of crowdsourcing in museums, and, in particular, for metadata creation, as a way to expand access points for searchability and discoverability, but also to diversify these access points for better representation and varied contexts. In the later 2010s and early 2020s, this evolved again to begin thinking of crowdsourcing's value as its experience as well. This shift in building and planning crowdsourcing projects around engagement and experience falls in line with the questions on motivation for participants raised in the Contextual Review and previous sections, but also in the longer standing discussion of museum's as spaces for learning and action.

The largest museum associations throughout the world began shifting priorities for museums in the twenty-first century to better align with museums as spaces for engagement. Museum policy advocates from the Museum Association (MA) and the International Council of Museums (ICOM) prompted museums to step up their focus on audience engagement in the last decade, recognizing museums needed to be more than a collection to be viewed.¹³⁴ This

¹³² Golder, Scott A, and Bernardo A Huberman. "The Structure of Collaborative Tagging Systems," 2006, 8.

¹³³ Cameron and Kenderdine, "Theorizing Digital Cultural Heritage," pg. 141

¹³⁴ Barnes, Pamela, and Gayle Mcpherson. "Co-Creating, Co-producing and Connecting: Museum Practice Today." Curator: The Museum Journal 62 (April 1, 2019): 257–67. <https://doi.org/10.1111/cura.12309>.

push for engagement in museum spaces was in many ways fueled by the Web 2.0 shift of consumers to producers, with the public no longer visiting museum spaces as passive observers, vessels to be filled, but instead looking to engage directly with collections in experiences that are “digital, participatory and informed.”¹³⁵ Within this recognized need for museums to shift, to become more engaging and co-productive, crowdsourcing of metadata can be seen anew as an extension of the museum’s mission for interactive learning.

Cameron and Kenderdine, and Fahy all discussed the need for active visitors and hands-on interactivity as a part of the museum experience. In 2001, Fahy noted the importance for incorporating hands-on participant driven experiences in museums was in part due to these experiences increasing retention for learning objectives, stating, “whilst we only remember ten percent of what we read, we remember ninety percent of what we say and do.”¹³⁶ Ross Gibson¹³⁷ and Zahava Doering¹³⁸ conducted research in the early 2000s to 2010s looking into the experiences that visitors found satisfying in museums. Gibson saw the museum’s strongest mission-centric activity, and in fact power, to be that of alteration where an opportunity to experience what it is to be other alters the person’s perspective of this otherness.¹³⁹ And Doering et al. found that the most satisfying experiences for guests often revolved around “gaining new information or knowledge” and “seeing the real thing (as in an object).”¹⁴⁰ Crowdsourcing projects allow the public the opportunity to see real objects in the collections, often those that are not currently on physical display, and to help add new information to these objects’ metadata while themselves experiencing the new experience of participating in the cataloging process.

Michael Haley Goldman and Eric Schmalz suggested in 2020 that more institutions should prioritize the benefits that the crowdsourcing process itself has for volunteers as part of the fundamental purpose of these projects’ creation.¹⁴¹ By placing more of an emphasis on the

¹³⁵ Barnes and Mcpherson, “Co-creating, Co-producing and connecting.”

¹³⁶ Anne Fahy, “New Technologies for Museum Communication,” in *Museum: Media: Message*, ed. E. Hooper-Greenhill (Routledge: London, 2001).

¹³⁷ *Interaction: Systems, Practice and Theory*, edited by Ernest Edmonds and Ross Gibson, Sydney: Creativity & Cognition, 2004.

¹³⁸ Pekarik, Andrew, Zahava Doering, and David Karns. “Exploring Satisfying Experiences in Museums.” *Curator: The Museum Journal* 42 (May 24, 2010): 152–73. <https://doi.org/10.1111/j.2151-6952.1999.tb01137.x>.

¹³⁹ Cameron, Fiona, and Sarah Kenderdine. *Theorizing Digital Cultural Heritage. Media in Transition* 6. The MIT Press, 2007.

¹⁴⁰ Pekarik, Andrew, Zahava Doering, and David Karns. “Exploring Satisfying Experiences in Museums.” *Curator: The Museum Journal* 42 (May 24, 2010): 152–73. <https://doi.org/10.1111/j.2151-6952.1999.tb01137.x>.

¹⁴¹ Schmalz, Eric, and Michael Haley Goldman. “Citizen History - so Close or Too Far? Current Results from Citizen History and the Problems of Creating Participatory Projects.” *Museums and the Web 2020*, 2020.

crowdsourcing process itself as opposed to focusing primarily or exclusively on the end results such as data collection, access, or transformation, there could be a stronger defense of the resources and staff time these projects cost museum staff to run, as mentioned in the previous section by Severson.¹⁴²

There was actually early support for the process of metadata tagging in particular, but crowdsourcing in museums at large, being a key component and motivation for running such projects, as opposed to only focusing on the output goals. As early as 2009, the *steve.museum* team published reports looking to answer questions on participants' motivations and incentivizations.¹⁴³ The report highlighted that the majority of the public who were considered frequent contributors noted that they participated most for "fun" and were in fact not interested in increasing findability of collections or connecting with others.¹⁴⁴ This was seen by the team to indicate that tagging was an engaging activity in itself, and users enjoyed the experience, lending an early support for designing crowdsourcing projects with the expressed goal of creating an engaging experience.

The focus on the social aspect of tagging and the imperative of system design, attributes, and user incentives were first majorly investigated by Marlow, Naaman, Boyd, and Davis in 2006.¹⁴⁵ Marlow et al. focused on the characteristics of tagging systems which included: "tagging rights (who can tag what); tagging support (whether or not you see other tags, or if tags are suggested); aggregation (duplicate tags for the same resource); type of object (or what is tagged); source of material (from participants, system or Web); resource connectivity (links using tags or not); and social connectivity (links between users)," which continue to be important to tagging projects today.¹⁴⁶ They also found that key incentives for user participation could be broken down in to organizational motivations (future retrieval, contribution, and sharing) and social motivations (attracting attention, play and competition, opinion expression) which are key

¹⁴² Severson, Sarah. "Crowding the Library: How and Why Libraries Are Using Crowdsourcing to Engage the Public." *Partnership: The Canadian Journal of Library and Information Practice and Research*, Innovations in Practice, 14, no. 1 (2019). <https://doi.org/10.21083/partnership.v14i1.4632>.

¹⁴³ "Archives & Museum Informatics: Museums and the Web 2009: Paper: Leason, T. and Steve.Museum, Steve: The Art Museum Social Tagging Project: A Report on the Tag Contributor Experience." Accessed October 30, 2019. <https://www.museumsandtheweb.com/mw2009/papers/leason/leason.html>.

¹⁴⁴ "Archives & Museum Informatics: Museums and the Web 2009: Paper: Leason, T. and Steve.Museum, Steve: The Art Museum Social Tagging Project: A Report on the Tag Contributor Experience." Accessed October 30, 2019. <https://www.museumsandtheweb.com/mw2009/papers/leason/leason.html>.

¹⁴⁵ Marlow, C., Naaman, M., Boyd, D., & Davis, M. (2006a). HT06, "Tagging Paper, Taxonomy, Flickr, Academic Article", ToRead. Proceedings of the seventeenth conference on Hypertext and Hypermedia Odense, Denmark. <http://doi.acm.org/10.1145/1149941.1149949>.

¹⁴⁶ Trant, J. "Studying Social Tagging and Folksonomy", p. 6

to designing tagging programs and are even seen in the literature of crowdsourcing projects in recent years.¹⁴⁷

Sensenev, Koehl, and Nay's study in 2019 found that primary motivators included filling skills gaps or skill development, as well as developing an expertise or community around a given topic – two motivations based on the experience of the project more than the outputs created.¹⁴⁸ In the 2021 work "The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage" by Ridge, Blickhan, and Ferriter, participants in GLAM crowdsourcing consistently listed that contributing to a bigger cause was a primary motivation for their work.¹⁴⁹ However Ridge, Blickhan, and Ferriter found that motivations could include extrinsic motivations such as a grade, a score, or a record; intrinsic motivations such as fun, socializing, community, or interest in the subject; and altruistic motivations such as the above stated contributing to a bigger cause.¹⁵⁰

It is important to understand the variety of motivations and needs of participants so design choices can be made when building projects that fit a wider array of these motivations. Not only does this increase the chances of attracting users to create tags to increase access to collections, but it will also help attract a diverse set of volunteers important for diversity and representation.

Similarly, Perry Collins, a senior program officer at the National Endowment of Humanities Office of Digital Humanities, stated in 2015 that institutions should always consider public engagement with a collection as its own end goal to any crowdsourcing effort. In line with Goldman, Schmalz, Doering, and Gibson, Collins emphasized the process itself, stating, "The goal is not only to create hundreds of thousands of tags. A major goal is also to engage people in the digital humanities and in library collections. While the quality of what they do matters a lot, I think the process of what they do matters a lot, too."¹⁵¹

It is the values and missions of cultural heritage institutions that position them in the opportune place to invite public participation according to the Library of Congress' Trevor

¹⁴⁷ Trant, J. "Studying Social Tagging and Folksonomy", p. 6

¹⁴⁸ Sensenev, Megan, Eleanor Dickson Koehl, and Leanne Nay. "Collaboration, Consultation, or Transaction: Modes of Team Research in Humanities Scholarship and Strategies for Library Engagement | Sensenev | College & Research Libraries." Accessed March 8, 2021. <https://doi.org/10.5860/crl.80.6.787>.

¹⁴⁹ Ridge, M., Blickhan, S., Ferriter, M., Mast, A., Brumfield, B., Wilkins, B., ... Prytz, Y. B. (2021). The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage - community review version. Retrieved from <https://britishlibrary.pubpub.org/pub/introduction-and-colophon>

¹⁵⁰ Ridge, Blickhan, Ferriter, et. al, "The Collective Wisdom Handbook."

¹⁵¹ Enis, Matt. "Wisdom of the Crowd | Digital Collections." Library Journal. Accessed January 10, 2020. <https://www.libraryjournal.com?detailStory=wisdom-of-the-crowd-digital-collections>.

Owens.¹⁵² Owens supported the shift in mentality away from considering crowdsourcing as a way to outsource labor to a crowd, and instead as a way to invite participation of that crowd into the creation and development of the public good where the process is as important as the tags created. Perhaps at the forefront of this shift has also been the British Library's Mia Ridge.

As early as 2013, Ridge was advocating for cultural heritage institutions to take up crowdsourcing.¹⁵³ Though Ridge advocated for the usefulness of crowdsourcing in helping take time- and resource-intensive tasks and distributing that work amongst a crowd to improve content about collections, she was also one of the first people to articulate the importance of recognizing crowdsourcing as its own valuable form of public engagement with cultural heritage.¹⁵⁴ As she encouraged institutions to engage in crowdsourcing, she continually highlighted the act of crowdsourcing as a form of engagement and the value that process had for the public in and of itself. These interactive forms of creation and engagement have created a new way of thinking of crowdsourcing, but also a new form of attraction and interest for a wider array of public visitors,¹⁵⁵ helping to expand the value and relevance of the projects themselves.

By refocusing on crowdsourcing not just as a process by which to increase access points, or even to reach a more diverse range of voices to increase representational context of collections, but indeed as an engaging form of participation that in itself benefits participants, it is possible to see even more support for incorporating these types of projects in to the museum cataloging process. This shift in prioritizing the process as well as the outputs allows a refocusing on the value of the process of crowdsourcing and a better understanding of its need for resources and support institutionally while also framing the importance the process itself should take in project designs in order to motivate public participation. With the importance of the process and the act of participation made clear, it is now possible to focus on the modern considerations for motivations and learning objectives these projects can expand to.

Increasing Tagging through Gamification, Machine Learning and AI:

The previous sections and **Chapter 2: Contextual Review** highlighted a key limitation and critique of crowdsourcing metadata in museums: the need to attract and engage a large,

¹⁵² Owens, Trevor. "Digital Cultural Heritage and the Crowd." Curator: The Museum Journal 56, no. 1 (January 2013).

¹⁵³ Ridge, Mia. "From Tagging to Theorizing: Deepening Engagement with Cultural Heritage through Crowdsourcing." Curator: The Museum Journal 56, no. 4 (October 2013).

¹⁵⁴ Ridge, "From Tagging to Theorizing."

¹⁵⁵ Barnes, Pamela, and Gayle Mcpherson. "Co-Creating, Co-producing and Connecting: Museum Practice Today." Curator: The Museum Journal 62 (April 1, 2019): 257–67.

<https://doi.org/10.1111/cura.12309>.

diverse audience in order to make the projects worthwhile and relevant.¹⁵⁶ Museums have experimented with various strategies to motivate participants to participate in crowdsourcing projects and to publicize their collections as part of the transition towards engagement and participatory models.¹⁵⁷ As the 2010s dawned, social tagging in and of itself was not motivating enough, and projects based around gamification became the next generation of metadata crowdsourcing.

The majority of projects that launched were centered around gaming, taking advantage of the “for fun” category commonly selected by *steve.museum* participants (as part of the surveys on motivations) and building projects to appeal to this motivation. As Jenkins, Clinton, Purushotma, Robison, and Weigel reported in a MacArthur Foundation report, play and gamification were deemed one of the best ways to create learning experiences, as no matter the frustrations or determination expelled in the process, participants often only remember the fun.¹⁵⁸ In fact, this study supported the fact that gamification at its core was not about “fun” but actually engagement, reporting that individuals playing games often experience many moments that are not fun and in fact can feel like a grind; however, the effort feels deeply motivating and distracting in a way traditional tasks do not.¹⁵⁹

One of the earliest studies on user tagging of image-based collections was done by Von Ahn and Dabbish with the 2004 ESP Game, an application designed to encourage tagging of images through a gaming interface with the express mission to improve searchability on the web.¹⁶⁰ The ESP Game technology was deemed successful, with findings that 85% of the words for each image would be useful in describing it, and only 1.7% did not relate to the image at all. The ESP Game technology was later adapted to underpin the Google Image Search algorithms, further establishing interest in tagging by cultural heritage institutions.

In 2009, the Brooklyn Museum launched *Tag! You're it!* with the goals of making the data collected available to researchers and scholars, providing a way for a casual user to jump in and start visually navigating and creating an interface that would be mission driven and community

¹⁵⁶ “Archives & Museum Informatics: Museums and the Web 2009: Paper: Leason, T. and Steve.Museum, Steve: The Art Museum Social Tagging Project: A Report on the Tag Contributor Experience.” Accessed October 30, 2019. <https://www.museumsandtheweb.com/mw2009/papers/leason/leason.html>.

¹⁵⁷ Schlesinger, Morgan. “The Museum Wiki: A Model for Online Collections in Museums,” 2016, 48.

¹⁵⁸ Jenkins, Henry, Kate Clinton, Ravi Purushotma, Alice Robison, and Margaret Weigel. “Confronting the Challenges of Participatory Culture: Media Education for the 21st Century.” MacArthur Foundation, n.d.

¹⁵⁹ Jenkins, Henry, Kate Clinton, Ravi Purushotma, Alice Robison, and Margaret Weigel. “Confronting the Challenges of Participatory Culture: Media Education for the 21st Century.” MacArthur Foundation, n.d.

¹⁶⁰ Owens, Trevor. “Digital Cultural Heritage and the Crowd.” *Curator: The Museum Journal* 56, no. 1 (January 2013).

oriented.¹⁶¹ The Brooklyn Museum stated that the goal was not just to gain new search terms, but to allow visitors ownership of the collection, permitting them to share their tags via social media to create a social activity. A secondary game called *Freeze Tag* was added to remove inaccurate or inappropriate tags created in *Tag! You're It!* But both games were discontinued due to low participation rates, hinting that gamification itself was not enough motivation for project participation and success.¹⁶²

Further examining how tagging has adapted within the last decade, there must also be a discussion on the Metadata Games project. In much the same way that *Tag! You're It!* and *Freeze Tag* were formulated to elicit tagging through “fun”, so was the Metadata Games suite. From 2012 to 2019, Metadata Games, the National Standard open-source crowdsourcing game platform, was used with over 45 collections representing 11 institutions. These 45 collections consisted of tens of thousands of media items that generated over 315,000 tags, with even the least-tagged images receiving over 200 tags each.¹⁶³ The results of this suite of games helped reinforce earlier steve.museum findings that gamifying tagging provided an initial motivation of fun which participants flocked to. The project was run by TiltFactor at Dartmouth University. Project leads Mary Flanagan and Peter Carini pointed to issues found by the Brooklyn Museum’s foray into gamification, namely that gamification itself was not the final answer to user motivation questions and concerns and that the true challenge involved in making a metadata game was incentivizing players in ways that encouraged participation and high replay potential while still creating accurate metadata tags.¹⁶⁴

Projects like the 2012 *foldit*¹⁶⁵ puzzle game demonstrated the ability of gamification to incentivize participation that still led to accurate results, while the New York Public Library’s “What’s on the Menu?” project (2013),¹⁶⁶ Library of Congress’ Flickr project (2008),¹⁶⁷ and

¹⁶¹ “Brooklyn Museum Collection, Posse, and Tag! You’re It! | Museumsandtheweb.Com.” Accessed December 29, 2020.

https://www.museumsandtheweb.com/nominee/brooklyn_museum_collection_posse_and_tag_youre_it.html.

¹⁶² Pedro, Laila. “Can Social Tagging Deepen the Museum Experience?” Hyperallergic, November 3, 2017. <https://hyperallergic.com/409854/can-social-tagging-deepen-the-museum-experience/>.

¹⁶³ “About The Project – Metadata Games.” Accessed December 29, 2020. <https://metadatagames.org/about/>.

¹⁶⁴ Flanagan, Mary, Sukdith Punjasthitkul, Max Seidman, Geoff Kaufman, and Peter Carini. “Citizen Archivists at Play: Game Design for Gathering Metadata for Cultural Heritage Institutions,” n.d., 13.

¹⁶⁵ medGadget. “Another Victory for Foldit Gamers Shows the Power of Crowdsourcing.” The Atlantic, February 2, 2012. <https://www.theatlantic.com/health/archive/2012/02/another-victory-for-foldit-gamers-shows-the-power-of-crowdsourcing/252136/>.

¹⁶⁶ <http://menus.nypl.org/>

¹⁶⁷ Springer, Michelle. “For the Common Good: The Library of Congress Flickr Pilot Project,” n.d., 55.

Australian Newspaper Initiative (2012)¹⁶⁸ all demonstrated the ability of gamification and tagging projects to attract visitors to new and novel collections while increasing participation in crowdsourcing to tackle massive data sets.¹⁶⁹ Surveys showed these projects, and the gamification aspect in particular, helped motivate and incentivize users with experiences they found addictive, challenging, interesting, and/or competitive.¹⁷⁰

As Mia Ridge stated, “Games provide useful demonstrations of the power of scaffolded interactions. Crowdsourcing games, or Games with a Purpose (GWAP), in which ‘players perform a useful computation as a side effect of enjoyable game play,’ proved that games could bring mass audiences to computational problems such as describing the content of images with tags. Flanagan and Carini found that GLAM crowdsourcing games could generate more content per participant than non-game interfaces.”¹⁷¹ Not only did gamification show signs of increasing participation over its non-gamified counterparts, there were also early signs it could attract audiences who wouldn’t necessarily be intrinsically motivated or interested in the subject matter, two of the major motivations for traditional metadata tagging project participants shared previously.¹⁷²

The draw that gamification of tagging projects offered to avid gamers and traditional participants of crowdsourcing platforms made it a particularly interesting evolution of crowdsourcing projects in the mid-2010s.¹⁷³ An array of projects outside of the Metadata Games suite also reported increased participation and metadata tag creation including: Digitalkoot, a gamified crowdsourced project in Finland;¹⁷⁴ gamified design principles within citizen science platforms like Zooniverse.org¹⁷⁵; and Game Jams¹⁷⁶ at the British Library.¹⁷⁷ These projects

¹⁶⁸ Alam, Lubna. “Crowdsourcing Motivations in a Not-for-Profit GLAM Context : The Australian Newspapers Digitisation Program,” January 1, 2012. https://www.academia.edu/68931825/Crowdsourcing_motivations_in_a_not_for_profit_GLAM_context_the_Australian_newspapers_digitisation_program.

¹⁶⁹ Flanagan, Mary, Sukdith Punjasthitkul, Max Seidman, Geoff Kaufman, and Peter Carini. “Citizen Archivists at Play: Game Design for Gathering Metadata for Cultural Heritage Institutions,” 2014, 13.

¹⁷⁰ Alam, “Crowdsourcing Motivations in a Not-for-Profit GLAM Context,” pg. 6; Flanagan, Punjasthitkul, Seidman, Kaufman, and Carini, “Citizen Archivists at Play.”

¹⁷¹ Ridge, Mia. “From Tagging to Theorizing: Deepening Engagement with Cultural Heritage through Crowdsourcing.” Curator: The Museum Journal 56, no. 4 (October 2013).

¹⁷² Flanagan, Punjasthitkul, Seidman, Kaufman, and Carini, “Citizen Archivists at Play.”

¹⁷³ Flanagan, Punjasthitkul, Seidman, Kaufman, and Carini, “Citizen Archivists at Play.”

¹⁷⁴ Sterling, Bruce. “Digitalkoot, a Game-ified Social Finnish Cultural Endeavor.” *Wired*, March 17, 2011. <https://www.wired.com/2011/03/digitalkoot-a-game-ified-crowdsourced-finnish-cultural-endeavor/>.

¹⁷⁵ Greenhill, Anita, Kate Holmes, Chris Lintott, Brooke Simmons, Karen Masters, and Joe Cox. “Playing with Science: Gamised Aspects of Gamification Found on the Online Citizen Science Project - Zooniverse,” 2016, 8.

¹⁷⁶ “Events | UCL Transcribe Bentham.” Accessed February 14, 2020.

<https://blogs.ucl.ac.uk/transcribe-bentham/category/events/>.

¹⁷⁷ itch.io. “British Library Labs Crowdsourcing Game Jam.” Accessed January 25, 2021.

<https://itch.io/jam/britishlibrary>.

lauded gamification for the ability to take difficult and time intensive tasks of traditional crowdsourcing and, in creating a more engaging and fun design, increasing the rate of participation and number of participants involved.¹⁷⁸

The San Francisco Museum of Modern Art (SFMOMA) took a different approach,¹⁷⁹ demonstrating that gamification is not the only change to crowdsourcing on the horizon. SFMOMA instead took the tags created by their dedicated staff and created an application called “Send Me SFMOMA” where guests texted a word or phrase and got an SFMOMA object sent back that matched the word based on metadata tags. SFMOMA quickly learned they had a semantic gap of their own. Only 75% of texts received a match, partially due to language but partially because a third of users were texting emojis and emoticons which were not originally added to the project. Though a fun product to use with tags, the lack of public language used to create the tags that trigger responses demonstrates a semantic gap, as shown by previous crowdsourcing projects.

Though the team at SFMOMA does not offer public tagging projects, Kier Winesmith (project lead) did state that, “there’s oftentimes language that is a barrier to people’s engagement with work” which is why projects need to be built with a public audience and clear workflow in mind.¹⁸⁰ The SFMOMA was one of many projects that turned toward machine learning and AI algorithms over people-powered tagging projects to try to enhance discoverability of collections.

Whether due to the promise of machine learning to automate the description process (Hancher, 2014),¹⁸¹ to provide simple subject level descriptions (Bateman, et. al, 2007),¹⁸² to provide semantic metadata for audio visual materials (Padilla, 2019),¹⁸³ or to create a more robust, documented, and discoverable collection (Villaespesa and Murphy, 2021),¹⁸⁴ machine vision, automation, and AI have become a more prevalent part of the conversation on

¹⁷⁸ “Events | UCL Transcribe Bentham.” Accessed February 14, 2020.

<https://blogs.ucl.ac.uk/transcribe-bentham/category/events/>.

¹⁷⁹ Pedro, <https://hyperallergic.com/409854/can-social-tagging-deepen-the-museum-experience/>

¹⁸⁰ Pedro, <https://hyperallergic.com/409854/can-social-tagging-deepen-the-museum-experience/>

¹⁸¹ Hancher, Michael. “Seeing and Tagging Things.” *Representations* 155 (Summer 2021): 82–109. <https://doi.org/10.1525/rep.2021.155.4.82>.

¹⁸² Bateman, Scott, Christopher Brooks, Gordon McCalla, and Peter Brusilovsky. “Applying Collaborative Tagging to E-Learning,” January 2007, 7.

https://www.researchgate.net/publication/228614917_Applying_collaborative_tagging_to_e-learning

¹⁸³ Padilla, Thomas. “Responsible Operations: Data Science, Machine Learning, and AI in Libraries.” OCLC Research Position Paper, 2019. <https://doi.org/10.25333/xk7z-9g97>.

¹⁸⁴ Villaespesa, Elena, and Oonagh Murphy. “This Is Not an Apple! Benefits and Challenges of Applying Computer Vision to Museum Collections.” *Museum Management and Curatorship*, January 27, 2021, 1–22. <https://doi.org/10.1080/09647775.2021.1873827>.

crowdsourcing in cultural heritage in the last decade, with the majority of practitioners and scholars using these methods to replace human participation.

Machine vision and AI is still rather new and novel in museum cataloging and metadata projects, but it has been deployed in multiple institutions so far. Several museums, including the Metropolitan Museum of Art,¹⁸⁵ the Barnes Foundation,¹⁸⁶ Massachusetts Institute of Technology,¹⁸⁷ Philadelphia Museum of Art,¹⁸⁸ and Harvard Art Museums,¹⁸⁹ have employed machine vision to analyze, categorize, and interpret their collections images, and although application of AI to museums is still in its infancy, the results being reported show promise for enriching collections data.¹⁹⁰ However, limitations and subsequent critiques for the effectiveness of machine learning on its own have also begun percolating in the field.

As machine learning in cultural heritage advocates Villaespesa and Murphy noted, “At present, museums rely on third-party algorithms, or off the shelf tools to utilize these technologies from technology companies such as Microsoft, Google and IBM. These sophisticated computer vision tools have been trained using millions of images to create an algorithm that can identify visual trends and patterns.”¹⁹¹ However, though these platforms have created algorithms that can detect subject, color, and physical elements¹⁹² well, they can still struggle with contextual information, the *aboutness* that the core need for including human participants as shown thus far.

¹⁸⁵ Zhang, Chenyang, Christine Kaeser-Chen, Grace Vesom, Jennie Choi, Maria Kessler, and Serge Belongie. “The IMet Collection 2019 Challenge Dataset.” ArXiv:1906.00901 [Cs], June 3, 2019. <http://arxiv.org/abs/1906.00901>.

¹⁸⁶ “Using Computer Vision to Tag the Collection. | by Shelley Bernstein | Barnes Foundation | Medium.” Accessed March 22, 2021.

<https://medium.com/barnes-foundation/using-computer-vision-to-tag-the-collection-f467c4541034>.

¹⁸⁷ Kessler, Maria. “The Met x Microsoft x MIT: A Closer Look at the Collaboration | The Metropolitan Museum of Art.” Accessed March 22, 2021.

<https://www.metmuseum.org/blogs/now-at-the-met/2019/met-microsoft-mit-reveal-event-video>.

¹⁸⁸ Engineering, Penn. “Penn Engineering and the Philadelphia Museum of Art Join Forces to Envision the Future.” Medium, November 12, 2019.

<https://medium.com/penn-engineering/penn-engineering-and-the-philadelphia-museum-of-art-join-forces-to-envision-the-future-bde4cbfc282f>.

¹⁸⁹ Harvard Art Museums. “AI Explorer.” Accessed March 22, 2021. <https://ai.harvardartmuseums.org/>.

¹⁹⁰ Ciecko, Brendan. “AI Sees What? The Good, the Bad, and the Ugly of Machine Vision for Museum Collections.” *Museums and the Web 2020*, 2020.

¹⁹¹ Villaespesa, Elena, and Oonagh Murphy. “This Is Not an Apple! Benefits and Challenges of Applying Computer Vision to Museum Collections.” *Museum Management and Curatorship*, January 27, 2021, 1–22. <https://doi.org/10.1080/09647775.2021.1873827>.

¹⁹² (Villaespesa and Murphy, “This Is Not an Apple! Benefits and Challenges of Applying Computer Vision to Museum Collections,” pg. 3)

As Spiers et al. state, “although computer based analysis can address many research questions, it is yet to surpass human ability in a number of areas.”¹⁹³ Not only are these AI models limited in their ability to process complexity, but they are still trained by humans based on cataloging practices of museums which, as described in **Chapter 2: Contextual Review**, has noted issues with bias, creating exemplary tags for religious, Christian, and Westernized canonical images, but complications for the “other.”¹⁹⁴

Padilla¹⁹⁵ and Rea¹⁹⁶ were early critics of the bias being trained into AI models and emphasized the need to recognize the continued marginalization this could have. Responding to the ImageNext Roulette project, Rea demonstrated how humans categorizing what they saw in terms of race, gender, age, and emotion had injected their own conscious and unconscious biases into the very base of algorithms.¹⁹⁷ Similarly, Padilla warned in an OCLC Research Position Paper published in 2019 that the historic and contemporary biases in cultural heritage that had created the dominantly represented and underrepresented/marginalized communities could be perpetuated and amplified with the adoption of algorithmic methods.¹⁹⁸

Machine learning and AI have the promise to enrich metadata and collections, but also the threat to continue perpetuating biases clearly prevalent in cataloging by professional staff, as demonstrated in **Chapter 2: Contextual Review**. However, machine learning and AI could be rethought, not as a replacement for metadata crowdsourcing projects, as traditionally framed over the last decade, but instead as a motivation and incentivization for these crowdsourcing projects. In much the same way gamification has proven to be a motivation for the engagement with metadata tagging projects, so too could machine learning and AI models be included, not supplemented, within these projects.

As mentioned in the *Crowdsourcing - From Outsourcing to Engaging* section of the previous **Chapter 2: Contextual Review**, there have been many noted critiques to

¹⁹³ Spiers, Helen, Alexandra Swanson, Lucy Fortson, Brooke Simmons, Laura Trouille, Samantha Blickhan, and Chris Lintott. “Everyone Counts? Design Considerations in Online Citizen Science.” *Journal of Science Communication* 18, no. 1 (January 17, 2019). <https://doi.org/10.22323/2.18010204>.

¹⁹⁴ Ciecko, “AI Sees What?”

¹⁹⁵ Padilla, Thomas. “Responsible Operations: Data Science, Machine Learning, and AI in Libraries.” OCLC Research Position Paper, 2019. <https://doi.org/10.25333/xk7z-9g97>.

¹⁹⁶ artnet News. “How ImageNet Roulette, a Viral Art Project That Exposed Facial Recognition’s Biases, Is Changing Minds About AI,” September 23, 2019. <https://news.artnet.com/art-world/imagenet-roulette-trevor-paglen-kate-crawford-1658305>.

¹⁹⁷ artnet News. “How ImageNet Roulette, a Viral Art Project That Exposed Facial Recognition’s Biases, Is Changing Minds About AI,” September 23, 2019. <https://news.artnet.com/art-world/imagenet-roulette-trevor-paglen-kate-crawford-1658305>.

¹⁹⁸ Padilla, Thomas. “Responsible Operations: Data Science, Machine Learning, and AI in Libraries.” OCLC Research Position Paper, 2019. <https://doi.org/10.25333/xk7z-9g97>

crowdsourcing in the past including issues around labor exploitation and ethics,¹⁹⁹ but it is important to note that additional considerations need to be stated for the ethics around machine learning, artificial intelligence, and the use of technology with the public in general. Critical consideration for the use of technology should include a discussion of labor, as shown in the 2021 publication *Your Computer is on Fire*: “every single thing that ‘happens online,’ ‘virtually,’ and ‘autonomously’ happens offline first – and often involves human beings whose labor is kept deliberately invisible.”²⁰⁰

In much the same way that I have argued against the perceived neutrality of cultural heritage, including with the Museums are Not Neutral campaign featured in **Chapter 2: Contextual Review**, online technologies need to be seen as a political space lacking perceived neutrality. As Mar Hicks argues much of the disinformation and misinformation that permeates the web does so due to the fictitious idea that “the technology that shapes our lives can somehow be neutral or apolitical even though it has a clear and massive impact on our social relations.”²⁰¹ Throughout this thesis I have argued for the importance of recognizing human bias in cultural heritage from metadata production to cataloguing practices, but it is equally important to note that technology is not more just or fairer, though it may be dehumanized and anonymous in its decision making, it is still based on human input, values and judgements, imbuing biases into the machinery.²⁰²

Technology used in algorithmic or machine-learning techniques like those listed above is informed by and built on human inputs, and it is important to discuss the exploitation of human labor in this process. Throughout 2021, 2022, and 2023, artificial intelligence and machine learning have permeated news cycles. Though most researchers who focus on ethical AI have focused on the debiasing of data and models, and fostering transparency and model fairness, as even I advocated above, it is also critical to discuss the exploitation of labor in the AI industry.²⁰³ One of the most prolific AI platforms, ChatGPT, provides an example of this. In order to make the ChatGPT platform less toxic and problematic, OpenAI used outsourced Kenyan

¹⁹⁹ Agostino, Cristiano. “Museum Crowdsourcing as Playful Labour.” ICOFOM Study Series, no. 43a (June 1, 2015): 23–37. <https://doi.org/10.4000/iss.545>.

²⁰⁰ Mullaney, Thomas, Benjamin Peters, Mar Hicks, and Kavita Philip, eds. *Your Computer Is on Fire*. Cambridge, Massachusetts: The MIT Press, 2021. P. 6

²⁰¹ Mullaney, Thomas, Benjamin Peters, Mar Hicks, and Kavita Philip, eds. *Your Computer Is on Fire*. Cambridge, Massachusetts: The MIT Press, 2021. P. 12

²⁰² Mullaney et al.. *Your Computer Is on Fire*, p. 52

²⁰³ Williams, Adrienne. “The Exploited Labor Behind Artificial Intelligence,” October 13, 2022. <https://www.noemamag.com/the-exploited-labor-behind-artificial-intelligence>.

laborers to feed their AI labeled examples of violence, hate speech, and sexual abuse from web content.²⁰⁴

The data labelers employed to do this work were paid a take-home rate of between \$1.32 and \$2 per hour depending on their seniority and performance.²⁰⁵ In fact the AI industry runs on these low-wage workers. Companies hire people from poor and underserved communities throughout the Global South, targeting refugees, incarcerated people and others with few job options, while often employing through third party firms as contractors rather than full time employees.²⁰⁶ These companies keep these workers in precarious positions making it difficult for laborers to push back on unethical practices for fear of losing jobs they cannot afford to lose; all while portraying their platforms as superintelligent machines with their own agency and decision-making power, obfuscating the real human lives placed at risk to build run these platforms.²⁰⁷

Additionally, when looking at technology and colonialism it is also important to again reiterate the limitations that come with any Internet based project, in particular that of the English dominated web. As Kavita Phillip states, “3/4 of the online population of the world today comes from the global South—from Asia, from Africa, from Latin America. And nearly half those online are women. Yet most public knowledge online has so far been written by white men from Europe and North America.”²⁰⁸ Even attempts to bridge the digital divide by bringing infrastructure to these communities or collecting data on these societies seems to inadvertently reinvigorate “colonial models of backwardness and ‘catch up strategies’ of modernization,” many of which can be seen mirrored within cultural heritage institutions’ own struggles with colonialism.²⁰⁹ It is not within the scope of this thesis to delve deeper into these issues or even to try to find solutions, however, it is imperative to recognize the “messiness”²¹⁰ of the internet, as a political domain that can either enhance or suppress political powers, shifting our understanding of the public sphere.²¹¹ By treating the data created in online projects, including

²⁰⁴ Time. “Exclusive: The \$2 Per Hour Workers Who Made ChatGPT Safer,” January 18, 2023. <https://time.com/6247678/openai-chatgpt-kenya-workers/>.

²⁰⁵ Time. “Exclusive: The \$2 Per Hour Workers Who Made ChatGPT Safer,” January 18, 2023. <https://time.com/6247678/openai-chatgpt-kenya-workers/>.

²⁰⁶ Williams, Adrienne. “The Exploited Labor Behind Artificial Intelligence,” October 13, 2022. <https://www.noemamag.com/the-exploited-labor-behind-artificial-intelligence>.

²⁰⁷ Williams, Adrienne. “The Exploited Labor Behind Artificial Intelligence,” October 13, 2022. <https://www.noemamag.com/the-exploited-labor-behind-artificial-intelligence>.

²⁰⁸ Mullaney et al.. *Your Computer Is on Fire*, p. 91

²⁰⁹ Mullaney et al.. *Your Computer Is on Fire*, p. 96

²¹⁰ Mullaney et al.. *Your Computer Is on Fire*, p. 110

²¹¹ Mullaney et al.. *Your Computer Is on Fire*, p. 111

crowdsourcing projects, as a social construct created by humans it is possible to be more transparent in claims and experiences.

A major lesson of these 15 years of research into crowdsourcing within cultural heritage is that metadata is not exclusive or static. By allowing other users to continue to add information, creating files that are described in varied ways with varied language, and even incorporating the language of machine learning, metadata can grow with users. These additional tags benefit the searcher and user, but also the institution as they look to do more projects geared towards public engagement. As stated by Trevor Owens, these early projects succeeded by inviting participation from engaged members of the public, building upon a long-standing tradition in cultural heritage institutions of volunteerism and involvement of citizens and communities to help institutions create and develop towards the public good.²¹² In the 2020s, the questions are not “Do crowdsourced projects work?”, “Is a folksonomy worthwhile?”, or even “Will the public participate?” Instead, the focus needs to move to optimization of these techniques and projects that decades of literature and prototypes have supported, with gamification and machine vision models being incorporated into project designs to motivate diverse groups of participants to participate in crowdsourcing projects that will increase access to collections through novel and representational language via engaging experiences built around the museum’s mission.

Conclusion:

As crowdsourcing in general (including devoted sites such as Zooniverse.org, Smithsonian Transcription Center, or LibCrowds) has transitioned from being solely to disperse a workload across a crowd and instead to serve an educational or mission-driven purpose, tagging should also be reimagined in this light. In 2013, Mia Ridge published an article in the *Curator: The Museum Journal* focused on deepening engagement with cultural heritage through crowdsourcing.²¹³ Ridge wrote, “crowdsourcing is a useful framework for inviting audiences to help with the resource-intensive tasks of creating or improving content about collections...I argue here that participation in crowdsourcing should also be recognized as a valuable form of public engagement with cultural heritage.”²¹⁴ I believe this is of particular importance to

²¹² Owens, Trevor. “Digital Cultural Heritage and the Crowd.” *Curator: The Museum Journal* 56, no. 1 (January 2013).

²¹³ Ridge, Mia. “From Tagging to Theorizing: Deepening Engagement with Cultural Heritage through Crowdsourcing.” *Curator: The Museum Journal* 56, no. 4 (October 2013).

²¹⁴ Ridge, “From Tagging to Theorizing.”

museums and cultural heritage institutions, many of which expressly state within their missions that they are committed to engaging the public with their specific brand of cultural heritage.

By focusing on crowdsourcing as a form of engagement with the institution and the public working towards a shared, significant goal, the institution can ask the public to undertake certain tasks that they cannot do themselves (either because they cannot be automated or due to limited budgets or staff time), and the public understands the importance of why they are being asked to do this work, not just to create an output, but to change a process towards achieving a shared and significant goal.²¹⁵ In 2019, the museum tour company “Museum Hack” even wrote about metadata tagging, folksonomy, and the use these projects could have in shifting the focus to intersect both the collection and visitor as a way to engage and appeal to any visitor.²¹⁶

It is this emphasis on engagement and doing for oneself that further supports my own thesis that metadata tagging can be used most effectively when viewed as an engagement technique through public projects that transparently lay out the lack of diversity in museums’ documentation and the semantic gap present, calling for users to help fill that gap and learn more about the collections and the bias of information retrieval sites in other parts of their lives as they go. As Wood, Tisdale, and Jones stated, “if people outside museums were invited to enhance, contribute to, or even redefine these identities, items could be given lives outside the expected museum narrative and objects could be experiences, appreciated, and known in a new light.”²¹⁷

²¹⁵ Ridge, “From Tagging to Theorizing.”

²¹⁶ Museum Hack. “Collecting Cultural Colloquialisms: The Art of Social Tagging,” January 4, 2018. <https://museumhack.com/art-social-tagging/>.

²¹⁷ Wood, Elizabeth, Rainey Tisdale, and Trevor Jones. *Active Collections*. New York, NY: Routledge, 2018.

Chapter 4: Methodology & Project Design:

Introduction:

As previously stated, this thesis began as a questioning of the ways in which the curatorial control over GLAM data and the task of metadata creation have not only limited representation but also connection with audiences and communities, thus creating and enforcing inherent biases in cultural heritage both onsite and online. Within **Chapter 2: Contextual Review**, I demonstrated the ways in which this bias has been recognized as permeating the work done in the field and leading to a lack of trust within the public, and within **Chapter 3: Literature Review**, I highlighted the previous uses for crowdsourcing/citizen science tagging projects. This thesis will reflect my own attempts to test and document the use of community-centered crowdsourcing, specifically of tagging projects, as an engaging experience that centers the user as part of a transparent documentation process, helping to fill the semantic gap in collections and bridge the gap in public trust. This will lead to a project type that not only benefits the museum in adding additional access points and diverse voices, but also in building public trust and understanding of information retrieval biases across the digital products they use.

The focus of this project on the experience of tagging itself, on the importance of the engagement with the experience, is to help emphasize the importance of transparency. Aligned with the work of Lynch, my own research asserts that it is not enough to create participatory experiences that view the participants as passive beneficiaries. They must be active agents, invited into the process of tagging with a sense of real power and purpose.¹ By focusing this project with this transparency in mind, it is possible to see that the purpose of this thesis is not to just add more entry points to the data. As stated in “Information Interaction Design”, “data is fairly worthless to most of us; it is the product of research or creation (such as writing) but it is not an adequate product for communicating. To have informational value, it must be organized, transformed, and presented in a way that gives it meaning.”²

This thesis will attempt to demonstrate that the activity of tagging via a crowdsourcing application can be the transformational experience that helps to redistribute the power of cataloging within cultural heritage institutions, in turn affecting the power of searchability and

¹ Lynch, Bernadette. “Reflective Debate, Radical Transparency and Trust in the Museum.” *Museum Management and Curatorship* 28, no. 1 (February 1, 2013): 1–13.
<https://doi.org/10.1080/09647775.2012.754631>.

² Shedroff, Nathan.. “Information Interaction Design: A Unified Field Theory of Design | Nathan.Com.” Accessed February 24, 2020.
<http://nathan.com/information-interaction-design-a-unified-field-theory-of-design/>.

representation within these catalogs while also proposing changes to the way these institutions catalog for the public. “At its best, digitally-enabled participation creates meaningful opportunities for the public to experience collections while undertaking a range of tasks that make those collections more easily discoverable.”³ This is central to this thesis as it looks to determine the optimal ways in which to build a project not only for maximum engagement, but also for optimal diversification in participation, tag production, and public trust by testing interactivity of the project via subtle changes in workflows, tools, content, and choices.⁴

At the time of writing this thesis and running this project, the COVID-19 pandemic forced many museums and cultural heritage sector institutions to shutter and close to the public, with focus being diverted to digital spaces and online engagement. As such, this project was altered to fit this reality, as mentioned below (*pg. 105*), but it also evolved to discuss moving museums into worldwide digital space to expand mission, reach, and audiences. It has been noted for over a decade that virtual access to cultural heritage institutions “reinforces the physical presence of cultural heritage, extends the opportunity of interaction, extends access within and without the cultural organization, extends the opportunity of interorganizational collaboration, and it reinterprets and establishes a digitally interactive relationship to cultural heritage.”⁵ In particular, this thesis will look at how the online components of cultural heritage institutions handle this digitally interactive relationship in terms of tackling the semantic gap and digital divide.

The digital divide is a socio-political issue that often refers to the socioeconomic gap between communities that have access to computers and the internet and those that do not.⁶ In America, this gap is defined by the Pew Research Center as 90% of adults use the internet, and 73% have access to the internet from home as of February 2019.⁷ However, it is important to note that the digital divide goes beyond access to the internet, also referring to the knowledge gap that exists between groups regarding their ability to use information and communications technologies.⁸ It is this definition of digital divide, gaps that exist between groups regarding their ability to use information and communications technologies effectively,⁹ that will be utilized in

³ “Collective Wisdom - the State of the Art in Crowdsourcing in Cultural Heritage.” Accessed March 10, 2021. <https://collectivewisdomproject.org.uk/>

⁴ “Information Interaction Design: A Unified Field Theory of Design,” <http://nathan.com/information-interaction-design-a-unified-field-theory-of-design/>.

⁵ Cameron, Fiona, and Sarah Kenderdine. *Theorizing Digital Cultural Heritage*. Media in Transition 6. The MIT Press, 2007, pg. 233.

⁶ Cameron and Kenderdine, *Theorizing Digital*, pg. 230

⁷ Pew Research Center: Internet & Technology, “Internet/Broadband Fact Sheet,” <https://www.pewresearch.org/internet/fact-sheet/internet-broadband/>

⁸ Cameron and Kenderdine, *Theorizing Digital*, pg. 230

⁹ Cameron and Kenderdine, *Theorizing Digital*, pg. 230

this thesis, specifically highlighting the ability, or inability, of audiences/users to search and discover using cultural heritage sites. As openness in information standards helps to facilitate access, this thesis will subscribe to Cameron and Kenderdine's assertion that "cultural practitioners must transfer the social awareness, integral to their roles as cultural information creators and knowledge enablers, into their shaping of information standards for digital cultural heritage,"¹⁰ in particular by designing tagging projects to engage the public and create transparency in cataloging standards while adding additional access points.

This chapter will document the reasons for centering this project within the practice-based action research methods, for the rationale of the project design choices, for the participant identification and recruitment practices, for data collection and analysis, as well as a highlight on the limitations of this chosen method and project design.

Practice-Based Action Research and Collaboration:

In order to test the assertion that the activity of tagging via a crowdsourcing application can be a transformational experience that helps to redistribute the power of cataloging within cultural heritage institutions, in turn affecting the power of searchability and representation within these catalogs, this thesis will center around a case study of various workflows hosted at the Adler Planetarium in Chicago, Illinois, USA. These projects will include variation in workflow, platform, and audiences to determine the optimal ways in which to build a project not only for maximum engagement, but also for optimal diversification in participation, tag production, and public trust. The workflows will center around a single set of records from the Adler Planetarium specifically to see how subtle changes in tagging project design can affect tag creation, engagement, and audience feedback across a stable test subject. The workflows will be mainly shared on the Zooniverse.org platform, though also as part of a gamified workflow prototype shared with a UK-based audience as part of the 2021 *Being Human Festival* and a US-based audience as part of a 2022 social media and email listserv campaign by the Adler Planetarium.

Through these case studies, a practice-based action research approach¹¹ is being followed. The approach being adapted in this thesis and the case study associated is done in recognition that the research draws on, is conducted through, and aims to impact the practices

¹⁰ Cameron and Kenderdine, *Theorizing Digital*, pg. 235

¹¹ Pringle, Emily. "Provisional Semantics: Addressing the Challenges of Representing Multiple Perspectives within an Evolving Digitised National Collection." Interim Report. Foundation Projects. Tate, Imperial War Museums, The National Trust, University of the Arts London, National Maritime Museum, December 2020.

<https://www.nationalcollection.org.uk/sites/default/files/2021-01/Provisional%20Semantics.pdf>.

within cultural heritage institutions.¹² In this way, the research aligns with practice-based research. Like practice-based research, this thesis is set in a specific context (within the Adler Planetarium), but the effects will reach beyond this particular case study with a focus on the research output contributing and informing practice within the cultural heritage field.¹³ As stated by Linda Candy and Ernest Edmonds, “new knowledge about practice that informs practice may at times only be obtainable by adopting a practice-based approach.”¹⁴ In particular, this thesis will work within the variant of Practice as Research practice-based approach that was proposed by Smith and Dean, an iterative cycle of practice-led research.¹⁵ As this research leads primarily to new understandings about the practice of cataloging and cultural heritage language, it is more in line with practice-led research – a subsection of practice-based research.¹⁶ As the creative work of this thesis, the tags created by the users and the project workflows themselves are not serving just as illustrations to this thesis but are, in fact, a subject of interest in themselves, this thesis squarely falls within the practice-based (practice-led) research model.¹⁷

However, it is important to also recognize that though this thesis will follow a practice-based research model, it will also integrate action-led research. I am, myself, a practitioner within the cultural heritage field. At the time of proposing this thesis, and throughout the project period, I was also employed as the digital collections access manager at the Adler Planetarium. As a practitioner seeking to gain knowledge on how to improve practice through undertaking these case study projects, gathering data to evidence changes, and analyzing and reflecting on the data to disseminate knowledge obtained throughout the process, I am working squarely in line with action research models as well.¹⁸ Action research is employed when the project team (or researcher) is interested in the ways in which knowledge is actively constructed from experience, the creation of the “know-how.”¹⁹

Action research is best viewed as a methodology consisting of diverse intellectual traditions that are distinct communities of thought in constant evolution.²⁰ This thesis utilizes

¹² Pringle, “Provisional Semantics,” pg. 4

¹³ Candy, Linda, and Ernest Edmonds. “Practice-Based Research in the Creative Arts: Foundations and Futures from the Front Line.” *Leonardo* 51, no. 1 (February 2018): 63–69. https://doi.org/10.1162/LEON_a_01471. pg. 63

¹⁴ Candy and Edmonds, “Practice-Based Research in the Creative Arts,” pg. 63

¹⁵ Candy and Edmonds, “Practice-Based Research in the Creative Arts,” pg. 63

¹⁶ Candy and Edmonds, “Practice-Based Research in the Creative Arts,” pg. 64

¹⁷ Candy and Edmonds, “Practice-Based Research in the Creative Arts,” pg. 65

¹⁸ Pringle, “Provisional Semantics,” pg. 10

¹⁹ Bashforth, Martin, Mike Benson, Tim Boon, Lianne Brigham, Richard Brigham, Karen Brookfield, Peter Brown, et al. “Socialising Heritage/ Socialising Legacy.” In *Valuing Interdisciplinary Collaborative Research*, 1st ed., 272. Bristol University Press, 2017. <https://doi.org/10.2307/j.ctt1t895tj.11>.

²⁰ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 11

traditions developed and pioneered by scholars such as Kurt Lewin (Action Research and Organizational Development/Learning),²¹ Charles Argyris (Action Science),²² Miles Horton and John Gaventa (Participatory Research) and Jurgens Habermas (Emancipatory Interest).²³

Lewin believed that “knowledge should be created from problem solving in real-life situations,”²⁴ which is a core tenet within this thesis; looking to solve problems in cataloguing through innovations to the cataloguing process. This tradition was utilized for over 40 years with a focus on manipulating isolated variables to enact change.²⁵ Looking towards optimization of participation and metadata generation, I used this specific tradition to change individual variables in isolation to be able to determine which causes specific outcomes to shift. However, I was not solely using an Action Research and Organizational Development Learning tradition. Action Science, which brought in aspects of critical theory, was also implemented in this thesis. Argyris argued that “the problem-solving focus of action research has moved it too far away from the task of theory building and testing,” and Action Science as a tradition should focus on connecting research back to reality it is designed to understand.²⁶

The emphasis in this thesis on combining practice and theory in regards to cataloguing is strongly reflected in Action Science traditions, following Robinson, a former student of Argyris, who saw the major failings of research models to be due to a separating practices from pre-theorized problem-solving processes.²⁷ By focusing my own action research methodology to center the need to change the practice of cataloguing (incorporating the public into the process) in order to fulfill the theoretical mission of the practice (representation) this thesis also uses Action Science traditions.

The response of this thesis towards social movements, and its alignment to Critical Heritage Studies, as shown in the **Chapter 2: Contextual Review** (pgs. 46-51), also require the use of Participatory Research traditions within action research. Scholars Kenmis and McTaggart provided a set of characteristics for Participatory Research traditions that include an emphasis

²¹ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 12.

²² Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 15.

²³ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 34.

²⁴ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 12.

²⁵ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 13.

²⁶ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 15.

²⁷ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 16.

on the research being: a social process focused on the interrelationship between an individual and their social environment, a fundamentally participatory experience where participants go to work examining the relationship between knowledge and practice themselves, a collaborative process investigating relationships and practice, and a critical process which encourages participants to question the ways they are positioned to view the world.²⁸ With my own thesis focusing on equity, participation of the individual, and the questioning of oppressive problems, the incorporation of Participatory Research traditions into this thesis are important, and as such the locus of power and relationships will be essential within communications and methods in this thesis.

In closing, the work of Habermas to recognize the ways in which knowledge production is never neutral²⁹ will be present through the methodological approaches of this thesis. Throughout this thesis I will attempt the process of self-reflection, insisted upon by Habermas. Self-reflection as a process helps to shatter the illusion that there is any form of methodological practice that is empirical-analytical in nature that can separate the bias of the researcher from the subject being researched.³⁰ By continuing to point to biases within my own positionality within the research, as well as the biases of participants and practitioners as well, I aim to adopt an emancipatory interest.³¹ “An emancipatory interest orients the researcher toward the release of human potential and the investigation of ideology and power within the organization and society.”³² By incorporating this kind of methodology into my own research the goal is to emancipate participants from precedent, habit, and traditions by focusing on problem posing rather than merely problem solving;³³ within this thesis this includes the traditions and precedents of cataloguing best practices and standards. This research paradigm is born from awareness, an understanding of individual biases, and as Mertens connects it is a transformative research method that connects to the disabled community’s calls for “nothing about us, without us.”³⁴

²⁸ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 17-18.

²⁹ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 34.

³⁰ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 35.

³¹ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 35.

³² Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 35.

³³ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 35.

³⁴ Noel, Lesley-Ann. “Promoting an Emancipatory Research Paradigm in Design Education and Practice.” *In Future Focused Thinking*. Brighton, UK, 2016.

As with action research approaches, this thesis also focused the case study around iterative processes, adapting to challenges posed by the COVID-19 pandemic and the 2020 call for museums and heritage organizations worldwide to act upon and challenge racism within their institutions.³⁵ The “cyclical nature of action research as well as its purposes, which transcend mere knowledge generation to include personal and professional growth, and organizational and community empowerment,”³⁶ is one of the major appeals to incorporating action research into the methodological approach of this thesis. This focus on iterative design, the aim to impact the practices within cultural heritage institutions, and the using of data to disseminate knowledge obtained throughout the process of a specific project that applies outside the contexts of a single institution and instead across a field, aligns with the need to conduct this project in the hybrid style of practice-based action research.

Additionally, of importance to this particular project and thesis is a focus on collaboration. In line with standards and ethics for this thesis, I can attest that the work that was done as part of the case study at the Adler Planetarium, as well as the data analysis and reporting within the project and this thesis, was conducted completely by myself. However, it is important to credit and note the collaboration that was necessary to this project, both in respect to collaboration with project team members and with project participants. This collaboration has been key not only in practice-based action research projects, but in digital humanities projects as a field. The Taxonomy of Digital Research Activities in the Humanities offers a broad definition of collaboration, “any research activity being done jointly by several researchers, possibly in different places and at different times.”³⁷

“Historically, action researchers were academics or professional researchers who involved research participants in their studies to a greater extent than was typical with traditional research...in some cases, participants are involved from the inception of the research to the writing and presentation of the final report.”³⁸ As I will show in the following section on project design, this focus on including research participants (and in particular for this project, Zooniverse users and Adler Planetarium guests) in the iterative design process of the project is integral to the success of this project. In order to design a crowdsourcing project that maximizes tagging output and user engagement, it was critical to include the participants in the iterative

³⁵ Pringle, “Provisional Semantics,” pg. 10

³⁶ Herr, Kathryn, and Gary Anderson. *The Action Research thesis: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015.

³⁷ Senseney, Megan, Eleanor Dickson Koehl, and Leanne Nay. “Collaboration, Consultation, or Transaction: Modes of Team Research in Humanities Scholarship and Strategies for Library Engagement | Senseney | College & Research Libraries.” Accessed March 8, 2021. <https://doi.org/10.5860/crl.80.6.787>.

³⁸ Herr and Anderson, *The Action Research thesis*, pg. 2

design of the project, with each test and each response the project changed to accommodate the users better. As this project looks to shift the locus of control over cataloging language, it falls squarely into the action research feature that favors control being shifted from the researcher or professional to the subjects of the research, in this case the user of the cultural heritage sites.³⁹

As stated by Herr and Anderson, “many argue that action research should always be collaborative regardless of whether the researcher is an outside or insider to the setting of the study...how action researchers position themselves vis-a-vis the setting under study will determine how one thinks about power relations, research ethics, and the validity or trustworthiness of the study’s findings.”⁴⁰ As this thesis is a reaction to the power dynamics and trustworthiness of cultural heritage institutions, it is important that users and contributors to the case study projects have a sense of empowerment and understanding of how the projects truly incorporate their work and contributions in not only a transparent way, but also a collaborative way. In order to create an experience where users feel a sense of trust for the institution, the users cannot be left to their own devices; rather, there must be an almost symbiotic relationship between the organization and the users.⁴¹ This is a key aspect of the citizen science/history approach to crowdsourcing. For these purposes in particular, I assert that one cannot divorce the importance of collaboration from the practice-based action research methodology of this project, especially in the case of user contributions.

With that said, it is still imperative to recognize the ways in which collaboration with other professionals is integral to this thesis and to the digital humanities field in general. One thing that became clear early on in this project was that the goals of cultural heritage staff members vary depending on their positionality within the institution. As I will show later, the goals of my colleagues varied with differences abounding between curatorial, marketing, citizen science, and guest experience teams. Recognizing these differences of project team member’s goals and intentions is as helpful, if not more so, than recognizing the similarities of our shared goals and missions. As stated by Bashforth et al., “we carried with us different inheritances - legacies - from our disciplines, professional backgrounds, organisations, and places. As such, the other crucial thing we had in common was an interest in the potential of rethinking ‘heritage’ offered by drawing on many different perspectives and working across hierarchies and institutional

³⁹ Herr and Anderson, *The Action Research thesis*, pg. 2

⁴⁰ Herr and Anderson, *The Action Research thesis*, pg. 3

⁴¹ Heppler, Jason, and Gabriel Wolfenstein. “Crowdsourcing Digital Public History.” Organization of American Historians: The American Historian (blog). Accessed March 8, 2021. <https://tah.oah.org/content/crowdsourcing-digital-public-history/>.

boundaries. We used both these shared commitments and our different perspectives to collaboratively design our project.”⁴² I will highlight how my own collaborations functioned further below (*pgs. 108, 117, 130, 140-143*), but for now, the key takeaway is that collaboration is integral in any project design as differing perspectives of staff members only help to grow the relevance of the project for the public.

Collaboration is not just a key piece to practice-led action research, but it is also a cornerstone in digital humanities research and practices. “Collaboration is described as a defining characteristic of digital humanities, due in part to the fact that many DH projects require human and material resources spanning disciplinary and institutional boundaries.”⁴³ It will become evident below how many expertises are required to create a digital humanities project, highlighting the importance of collaboration. The need for collaboration in digital humanities helps to develop and provide scaffolding for more productive project processes, outcomes, and integrations of results.⁴⁴ The likelihood of creating interdisciplinary engaging projects and more innovative and impactful research and outcomes is reliant on collaboration for the ability to distribute the burden of knowledge across research teams⁴⁵, introducing varied expertise that would likely be missing from a single person. A primary motivation for participating in collaborative humanities research, as identified by Senseney, Koehl, and Nay, is to fill skills gaps, in particular in areas such as computer science, programming, statistics, and data management.⁴⁶ Helen Graham similarly found that crossing boundaries and collaboration was one of the four keys to working that develops legitimacy, with collaboration interwoven into several of the four keys, including: connect, which draws attention to the importance of building networks across institutional boundaries and between professionals and activists; reflect - seeing your work through others’ eyes, focused on the power of seeing issues from various perspectives; and situate - a way of understanding your work in context using action research approaches.⁴⁷ Within this project, my use of collaboration was primarily for filling a gap in my own skills with computer programming, but also for these focuses on connecting, reflecting, and situating my research with not only other professionals and researchers, but also with users and the public.

⁴²Bashforth et. al, “Socialising Heritage.”

⁴³ Senseney, Koehl, and Nay, “Collaboration, Consultation, and Transaction.”

⁴⁴ Senseney, Koehl, and Nay, “Collaboration, Consultation, and Transaction.”

⁴⁵ Senseney, Koehl, and Nay, “Collaboration, Consultation, and Transaction.”

⁴⁶ Senseney, Koehl, and Nay, “Collaboration, Consultation, and Transaction.”

⁴⁷ Graham, Helen. “Legitimate Expertise: How Decisions Are Made.” *Institute of Historic Building Conservation*, no. 142 (November 2015): 1517. - pg. 17

Whether discussing collaboration with internal project teams and staff or with project participants and users, it is important to also note that collaborations are most successful when collaborators have equal stake in the project.⁴⁸ This, perhaps more than anything, helps to underline the importance of the iterative design process employed within this project. As I will show below (*pgs. 113-121*) when discussing the project design and rationale, many of the decisions made regarding how the project functioned were decided, and changed, due to comments or suggestions raised by Adler Planetarium staff in marketing, guest experience, or citizen science roles, or by beta testers and project participants on the Zooniverse.org platform. This idea of distributing power was also key in writing the Zooniverse.org project description, as well as in discussions amongst Adler Planetarium staff, as a project that is focused on decentralizing the authority of curatorial voice and expert cataloging metadata needs to have a transparent discussion on how the approval process and incorporation of user tags will be processed. The above supports the assertion that “crowdsourcing’s greatest strength is two-fold, at least for humanities researchers: first, it fosters engagement with new publics, and second it opens up data sets and skills that were formerly difficult, if not impossible to access.”⁴⁹

The power dynamic of this project, however, cannot accurately be described as Collaborative Research Mode “in which a group of researchers work together with shared decision making and multidirectional information exchange,”⁵⁰ as I was the sole researcher and was making final decisions myself. However, it can be described as Consultative Research Mode, “in which researchers seek assistance from an expert(s) who advises on a limited basis and with unidirectional information exchange.”⁵¹ Though the information exchange was multidirectional at times, the decision making was unilateral, and for this reason, I found it important to share with Zooniverse.org participants and Adler Planetarium staff alike where the power and authority of this project was decentralized, and where, for the purposes of this thesis, it was not. Not only is this transparency key to collaboration, but also to project participation, further highlighted below (*pgs. 114-117, 150*).

Through the collaboration described above, integral to a digital humanities project, and the practice-based action research methodology employed throughout this project, and in particular its focus on iteration, there is also an increased sense of legitimacy to the project. The iterative approaches central to co-production, or in this case the crowdsourced tagging

⁴⁸ Senseney, Koehl, and Nay, “Collaboration, Consultation, and Transaction.”

⁴⁹ Heppler and Wolfenstein, “Crowdsourcing Digital Public History.”

⁵⁰ Senseney, Koehl, and Nay, “Collaboration, Consultation, and Transaction.”

⁵¹ Senseney, Koehl, and Nay, “Collaboration, Consultation, and Transaction.”

ontologies, have been stated by Graham⁵² and others⁵³ to imply that having more people involved can improve outcomes while also stabilizing their legitimacy.⁵⁴ It is also the very idea that this project sits within the heritage sector, and as such works towards a common interest and public representation, that demands collaboration to create a more expansive and participatory approach as done here to legitimize the project and results.⁵⁵

Tag Along with Adler - Project Design:

As stated above, this thesis includes a case study of various workflows and project designs to test for optimal diversity in tag generation, users participating, and engagement with the project. In order to do this, I designed a project with the Zooniverse.org platform which allowed for multiple workflows as well as limitless changes to design – iteration. For the purposes of this project, I wanted to test a variety of factors that could impact users’ motivations to tag, their tags generated, as well as factors that introduced learning objectives of this project including language choice, human and machine bias in search, and trust in cultural heritage institutions. These were questions that had lingered after the tagging projects of the late 2000s to early 2010s. To do this, I focused on two distinct projects: the first, a test of various workflows on the Zooniverse.org application with Zooniverse users, and the second, a prototype gamified workflow to be tested online as part of the *Being Human Festival* and as part of Adler Planetarium virtual programming. Below I discuss the design choices and rationale behind both projects. It is important to note up front that the projects both relied on the same subject set of images and a third planned case study to bring the Zooniverse project to the Adler exhibition space was canceled due to COVID-19.

The subject set for this case study of various projects was selected based on descriptive choices in cataloging. As discussed in the **Chapter 2: Contextual Review** and **Chapter 3: Literature Review**, cataloging and professional expert language often centers on physicality – what something is (materiality, date, creator, location, etc.) but not on what it is about or reflecting. As both review chapters demonstrated, this is the semantic gap in cataloging, as the

⁵² Graham, Helen. “Publics and Commons: The Problem of Inclusion for Participation.” *ARKEN Bulletin* 7 (2017): 150–68. - pg. 151

⁵³ Spiers, Helen, Alexandra Swanson, Lucy Fortson, Brooke Simmons, Laura Trouille, Samantha Blickhan, and Chris Lintott. “Everyone Counts? Design Considerations in Online Citizen Science.” *Journal of Science Communication* 18, no. 1 (January 17, 2019). <https://doi.org/10.22323/2.18010204>.

⁵⁴ Graham, Helen. “The ‘co’ in Co-Production: Museums, Community Participation and Science and Technology Studies.” *Science Museum Group Journal, Science Museums and Research*, no. Spring 2016 (March 9, 2016). <http://dx.doi.org/10.15180/16050>.

⁵⁵ Graham, Helen. “Legitimate Expertise: How Decisions Are Made.” *Institute of Historic Building Conservation*, no. 142 (November 2015): 1517. - pg. 15

majority of users are searching collections based on the context, or “aboutness,” of objects. Additionally, this thesis looks to expand the collection types included in the tagging process to expand the relevancy of this study. In the past, the majority of metadata crowdsourcing projects centered around art museum collections.⁵⁶ With this in mind, I selected 1,090 objects within the Adler Planetarium’s collections that were specifically two dimensional and visual based but that accounted for pieces from the museum collection, library collection, and archival collection. This broke down across collections to include 613 Works on Paper, 195 Archival Rare Photographs, and 282 Rare Book Illustrations. These 1,090 objects were used across projects and workflows to keep consistency in order to test the variations in workflows, audiences, and platforms in regards to engagement of users and tags created.

Prior to building the projects and launching to the public, I used these 1,090 images to pull the Adler Planetarium collections catalog data for each individual object. I pulled every term that was searchable for these objects by the public online, specifically only taking the terms that are publicly searchable as these are the terms that create the Adler’s professional cataloging ontology that facilitates or hinders public search. This language was added to a spreadsheet and is available for reference in **Appendix 1**.⁵⁷ I also ran these same images through two separate AI tagging models.

The inclusion of the AI tags in this thesis was specifically selected to reflect emerging projects in the sector within the last five to ten years. Several museums, including the Metropolitan Museum of Art,⁵⁸ the Barnes Foundation,⁵⁹ Massachusetts Institute of Technology,⁶⁰ Philadelphia Museum of Art,⁶¹ and Harvard Art Museums,⁶² have employed

⁵⁶ Steve.museum project participants included the Guggenheim Museum, the Cleveland Museum of Art, the Metropolitan Museum of Art and the San Francisco Museum of Modern Art. The Art UK Tagger features the UK’s national art collection.

⁵⁷ **Appendix 1: Metadata Project WOP Data Set**

<https://docs.google.com/spreadsheets/d/17qbNoD3Sv42GjV-Yw9uR3lucd2L0LO9BBZXmqb1h3oQ/edit?usp=sharing>

⁵⁸ Zhang, Chenyang, Christine Kaeser-Chen, Grace Vesom, Jennie Choi, Maria Kessler, and Serge Belongie. “The IMet Collection 2019 Challenge Dataset.” ArXiv:1906.00901 [Cs], June 3, 2019. <http://arxiv.org/abs/1906.00901>.

⁵⁹ “Using Computer Vision to Tag the Collection. | by Shelley Bernstein | Barnes Foundation | Medium.” Accessed March 22, 2021. <https://medium.com/barnes-foundation/using-computer-vision-to-tag-the-collection-f467c4541034>.

⁶⁰ Kessler, Maria. “The Met x Microsoft x MIT: A Closer Look at the Collaboration | The Metropolitan Museum of Art.” Accessed March 22, 2021. <https://www.metmuseum.org/blogs/now-at-the-met/2019/met-microsoft-mit-reveal-event-video>.

⁶¹ Engineering, Penn. “Penn Engineering and the Philadelphia Museum of Art Join Forces to Envision the Future.” Medium, November 12, 2019. <https://medium.com/penn-engineering/penn-engineering-and-the-philadelphia-museum-of-art-join-forces-to-envision-the-future-bde4cbfc282f>.

⁶² Harvard Art Museums. “AI Explorer.” Accessed March 22, 2021. <https://ai.harvardartmuseums.org/>.

machine vision to analyze, categorize, and interpret their collections images, and although application of AI to museums is still in its infancy, the results being reported show promise.⁶³ AI already underlies many routine aspects of our lives, and part of the inclusion of AI tags in this project was specifically to raise with project participants the ways in which these tags are instrumental to their daily search and discovery taste, often in ways they do not realize.⁶⁴

In this thesis, when I speak of machine vision or artificial intelligence (AI), the definitions I am applying are as follows. In the most simple terms, machine vision can be understood as “the eyes of the machine.” This technology has a variety of applications but focuses on detection of visual aspects and is quickly becoming one of the most important applications of artificial intelligence.⁶⁵ Reviewing the literature, it is evident that machine vision and AI tagging have become advanced enough to detect subject matter and objects depicted across various content types including painting, photographs, and cultures. They have been used by various institutions already to expand and enrich existing metadata tags.⁶⁶

One standing question has been “just how well does machine vision do? Can it offer accurate tags? Is the metadata generated useful and correct?”⁶⁷ According to research by Electronic Frontier foundation, a group measuring the progress of artificial intelligence, the error rate has fallen from around 30% in 2010 to approximately 4% in 2016, making it on par with human classification accuracy.⁶⁸ Still, there are recognized issues with AI and machine vision that keep institutions from readily adopting it. As Spiers et al. state, “although computer based analysis can address many research questions, it is yet to surpass human ability in a number of areas.”⁶⁹ Not only are these AI models limited in their ability to process complexity, but they are still trained by humans based on collections within museums, creating exemplary tags for religious, Christian, and Westernized canonical images, but complications for the “other.”⁷⁰ “Classification is a basic, integral and historically significant human function,”⁷¹ and yet as shown in the contextual and literature reviews, it is a function that humanity continues to ingrain with bias. The importance here is to recognize that, by switching to a machine, bias is not

⁶³ Ciecko, Brendan. “AI Sees What? The Good, the Bad, and the Ugly of Machine Vision for Museum Collections.” *Museums and the Web* 2020, 2020.

⁶⁴ Ciecko, “AI Sees What?”

⁶⁵ Ciecko, “AI Sees What?”

⁶⁶ Ciecko, “AI Sees What?”

⁶⁷ Ciecko, “AI Sees What?”

⁶⁸ Ciecko, “AI Sees What?”

⁶⁹ Spiers, Helen, Alexandra Swanson, Lucy Fortson, Brooke Simmons, Laura Trouille, Samantha Blickhan, and Chris Lintott. “Everyone Counts? Design Considerations in Online Citizen Science.” *Journal of Science Communication* 18, no. 1 (January 17, 2019). <https://doi.org/10.22323/2.18010204>.

⁷⁰ Ciecko, “AI Sees What?”

⁷¹ *Humanities Quarterly* 9, no. 1 (2015). <http://www.digitalhumanities.org/dhq/vol/9/1/000204/000204.html>.

removed. In fact, it is trained into it. Furthermore, as shown by Spier et al., machine vision tends to produce the most accurate tags for photographs, as opposed to painting or sculptures, as most algorithms and models are trained using primarily photographs. The complexity that can be present in paintings also can overwhelm the machine vision programming, creating a struggle to accurately describe such pieces.⁷²

With this said, the challenges of applying computer vision to museums collections are indeed complex; however, if acknowledged, documented, and engaged with, they can be mitigated to still provide opportunities for computer vision to be utilized to create more robust metadata and a more discoverable collection.⁷³ As Villaespesa and Murphy state, this process of AI tagging is still in a novelty stage, and as such, there is limited peer-reviewed research on the processes and challenges behind this technology.⁷⁴ And though it is in fact still an emerging technology in cultural heritage institutions, third-party technology companies have been busy building machine vision and AI-enabled technologies. Because of this, at the present, “museums rely on third-party algorithms, or off the shelf tools to utilize these technologies from technology companies such as Microsoft, Google and IBM. These sophisticated computer vision tools have been trained using millions of images to create an algorithm that can identify visual trends and patterns.”⁷⁵

For the purposes of this project, I opted to use the iMet Collection Attribute Classifier and the Google Cloud Vision API taggers precisely for this reason. As described below within the “Limitations” section of this methodology, I chose these two tagging models specifically because they have been trained using more images than the Adler Planetarium has access to, and both are publicly available for use by any institution. I also selected them to reflect a tagging model specifically trained for museum collections (the iMet Collection 2019), and one that was trained with millions of images and would be most similar to the algorithms encountered by users in their daily lives doing image searches online (Google Cloud Vision API). In summation, the inclusion of AI tags was done to expose project participants to this emerging technology and both its positives and negatives, but also to gauge various questions including: 1. How does exposure to AI tags affect the tags a user creates?, 2. How accurate do users find AI-generated tags?, 3. Do users favor terms created by a museum-specific tagger or a generalized image tagger?

⁷² Ciecko, “AI Sees What?”

⁷³ Villaespesa, Elena, and Oonagh Murphy. “This Is Not an Apple! Benefits and Challenges of Applying Computer Vision to Museum Collections.” *Museum Management and Curatorship*, January 27, 2021, 1–22. <https://doi.org/10.1080/09647775.2021.1873827>.

⁷⁴ Villaespesa and Murphy, “This is Not an Apple!”, pg. 2

⁷⁵ Villaespesa and Murphy, “This is Not an Apple!”, pg. 3

To gauge answers to these questions, I ran the entire data set through both AI tagging models. The tags generated by the AI taggers were added to a spreadsheet available for reference in **Appendix 1**.⁷⁶ With these initial decisions and data management settled, it was possible to begin testing the various workflows and projects. Below, I will document design choices and rationale for the separate projects described above: Zooniverse online, and Gamified Workflow.

Zooniverse Online:

For the project hosted on the Zooniverse.org platform, multiple workflows were created for users. This project was entitled *Tag Along with Adler*, and launched on the Zooniverse.org platform on 2 February, 2021 for beta testing, and to the public on 23 March, 2021. The beta testing review of the *Tag Along with Adler* project allowed for the receipt of feedback and data on the entirety of the project build, including the project text, instructions, workflow usability, and the actual results of the crowdsourcing task. Utilizing an Action Research and Organizational Development Learning tradition, the beta test allowed for early testing to be analyzed, with changes then enacted back on to the project in an iterative design sensibility.

In order to prepare the project for the beta test stage on Zooniverse, the project was first created using the Zooniverse Project Builder,⁷⁷ which any registered user can do.⁷⁸ Though there is a lack of customization within the Project Builder, as a free software it was easy to use with little coding knowledge. After conversations within the Adler, and particularly with colleagues who are a part of the Zooniverse team, I was advised to make sure that the description and text added to the project was as clearly executed and strong as the project build itself.⁷⁹

I chose the title *Tag Along with Adler* as it centered what task I was trying to accomplish while also centering the collection and source of my dataset. From there, I added a short description of the project, “Help the Adler Planetarium Tag our Collections to expand how we

⁷⁶ **Appendix 1: Metadata Project WOP Data Set**

<https://docs.google.com/spreadsheets/d/17qbNoD3Sv42GjV-Yw9uR3lucd2L0L09BBZXmqb1h3oQ/edit?usp=sharing>

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https://help.zooniverse.org/getting-started/?_ga=2.172897696.2010710078.1613746401-631436202.1612287942

⁷⁸ Trouille, Laura, Chris Lintott, Grant Miller, and Helen Spiers. “DIY Zooniverse Citizen Science Project: Engaging The Public With Your Museum’s Collections And Data.” *Museums and the Web* 2017, January 30, 2017.

<https://mw17.mwconf.org/paper/diy-your-own-zooniverse-citizen-science-project-engaging-the-public-with-your-museums-collections-and-data/>.

⁷⁹ Trouille, Lintott, Miller, and Spiers. “DIY Zooniverse Citizen Science Project.”

catalog our objects, and how our users can find them!” which serves as the largest-format text on the project page. This text is meant to be short, attention grabbing, and informative of what task is being asked and why – as Zooniverse states, “This should be a one-line call to action for your project.”⁸⁰

The introduction allows for more space and is the area to focus more on why the research team is asking Zooniverse volunteers to participate. It is displayed on the homepage of the project and is considered the place to grab volunteers’ attention. The text that I initially wrote for this introduction can be seen in the Zooniverse *Tag Along with Adler* project text page.⁸¹ The introduction established the need for this project to incorporate a diverse crowd in responses to help bridge the expectation gap – a gap between what the user believes their purpose is and the expected/anticipated purpose the project creators have for the user. By tackling this expectation gap within the project design, the Action Science tradition methodology is infused into the project. As described by Gibbs and Owens, “tool builders ought to think about their work as establishing a social contract between them and the user. For a user to even consider using a tool, the tool’s website needs to establish that the time devoted to deploying it will generate results that warrant the investment.”⁸² By setting up in the introduction this need for the user to generate the proposed outcome while also setting up the expectation for their work, the design of this section addresses the points of Gibbs and Owens while also connecting the research to the reality it is designed to understand per Argyris.⁸³

The next section was to write a workflow description, which for my project included very short descriptions of the two different workflows available to Zooniverse volunteers as part of this project. This section is a quick introduction that helps volunteers understand the differences in multiple workflows. It is encouraged on the Project Builder to keep this section short and succinct, and as such, I stuck to single sentences: “Verify AI Tags - Help us verify the accuracy of image tags generated by AI models. Tag Images - View images and add your own terms and words. There are no wrong answers!” The focus here was to introduce that one workflow (Verify AI Tags) was aimed first and foremost at gauging the validity of AI tagging models and introducing the public to the positive and negative effects these models can have in their

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https://help.zooniverse.org/getting-started/?_ga=2.172897696.2010710078.1613746401-631436202.1612287942

⁸¹Reference the project text here:

<https://www.zooniverse.org/projects/webster-institute/tag-along-with-adler>

⁸² Gibbs, Fred, and Trevor Owens. “Building Better Digital Humanities Tools: Toward Broader Audiences and User-Centered Designs.” *Digital Humanities Quarterly* 006, no. 2 (October 12, 2012).

⁸³ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 15.

everyday lives and to introduce that the other workflow (Tag Images) was focused on user-generated language and the diversity of opinions, not on consensus. Throughout the project text, I focused on this divergence from other Zooniverse projects: I am not looking for consensus nor for a single “right” answer. For many Zooniverse volunteers, this would prove to be the most challenging part of this project.

One piece that my Zooniverse colleagues pushed for me to include on the project homepage was the option to include “Words from the Researcher.” In previous projects I had worked on, we had skipped this field, but I was encouraged to add my own words here to drive home that this project was not only being used by the Adler Planetarium to enrich their metadata, but by myself as part of this thesis work. The quote I included was, “One person, one expert, and even one department, cannot anticipate the language used by, or search goals for, all people; which is why we are asking you to help us enrich these collections with your own terms. - Jessica BrodeFrank, Digital Collections Access Manager at the Adler Planetarium, and doctoral research student at the University of London.” I included both my position title at the Adler Planetarium and my status as a doctoral researcher to drive home the duality of this project, again following Gibbs and Owens recommendation of transparency and establishment of a social contract between researcher/project team and user.⁸⁴ By continuing to point to my own positionality and biases as a researcher, this section reflects the emancipatory interest undertaken in this thesis.

This concluded the text that was included on the homepage of the *Tag Along with Adler* homepage; however, the Zooniverse platform has many additional fields that are found under a “Learn More” button on the homepage. It is in this section that there are tabs to learn about the “Research”, “The Team,” “Education” and “FAQs” surrounding the project. Before launching the beta test, I populated each of these fields with specific hopes that the beta users would provide helpful responses on these sections.

The “Research” tab was used in particular to describe this unique project as being a hybrid of both the Adler Planetarium’s work to enhance their metadata fields and my own research into the tagging language of users and the ability to use these projects for not only enrichment but also engagement. In this section, a disclosure of how the data would be used both as part of my work with the University of London and as part of my role at the Adler Planetarium was shared. It stated:

⁸⁴ Gibbs, Fred, and Trevor Owens. “Building Better Digital Humanities Tools: Toward Broader Audiences and User-Centered Designs.” *Digital Humanities Quarterly* 006, no. 2 (October 12, 2012).

This project is being undertaken as part of the work of the Adler Planetarium's Collections and Zooniverse teams, as well as part of the doctoral research of Adler's Digital Collections Access Manager, Jessica BrodeFrank. The tags and terms generated by this project will be used in the research of Jessica BrodeFrank for her thesis and research at the University of London but will also be used to enrich the Adler Planetarium's collection's metadata and online search catalogs. Below the research aims of the thesis and the project are explained.

The next sections focused on the background of the research, condensing much of what I have written in my previous chapters into a few hundred words for the volunteers. The Zooniverse team at the Adler Planetarium was insistent that the volunteers particularly like to work on projects that are being used for active research, and, as much as possible, being able to put a name to that research helps attract volunteers.⁸⁵ This also helped to reinforce the importance of the emancipatory interest orientation of this project's methodology. For this reason in particular, this section is so focused on the "why" of not only my research but also of the Adler's attempts to enrich their metadata. The transparency is in line with the radical transparency discussed in the **Chapter 2: Contextual Review**, and the hope was that this transparency would also ease users into feeling comfortable with participating. The "Research Background" section as shared in the beta testing process is available in **Appendix 2**.⁸⁶

After highlighting the background for why the Adler Planetarium and myself as a doctoral researcher were undertaking this project, it was also suggested by Zooniverse colleagues to add a section that called directly to why this was being done on Zooniverse as a platform. In this section, there was an expansion not only on what this project and research goal looked like on the Zooniverse platform, but also a reiteration of how this project differs from other Zooniverse projects that users may have encountered. This was specifically added in this section (as well as multiple other locations in the project) to continue to highlight differences in a way to ease active Zooniverse users into a different style of project: one not centered on consensus, rightness, or limitations, but one that celebrates unique thought, diversity, divergence, and even disconsensus, a true Participatory Research project. This was also done as a way to center the positionality of the action research methodology of this thesis, in particular the use of Insider in

⁸⁵ Spiers, Helen, Alexandra Swanson, Lucy Fortson, Brooke Simmons, Laura Trouille, Samantha Blickhan, and Chris Lintott. "Everyone Counts? Design Considerations in Online Citizen Science." *Journal of Science Communication* 18, no. 1 (January 17, 2019). <https://doi.org/10.22323/2.18010204>.

⁸⁶ **Appendix 2: Beta Test Language & Design**
https://docs.google.com/document/d/1LLM_xKG9OlorwxH3IB-xkFyHVAzNPiquNopWAcAHpFc/edit?usp=sharing

Collaboration with Outsider position. Being a less common position within research projects, it was important to discuss how initiating collaborations with outsiders within research worked.⁸⁷ This positionality helped to bridge the expectation of Zooniverse users with the reality of how this project diverged; outsiders were still being called to collaborate in research, even as they experienced a different experience in having their individual contributions favored over a group consensus. By combining this positionality with an emancipatory research focus, this project was able to transparently lay out that the power imbalance between those who create the metadata and those who rely on the metadata for search was part of the issue being addressed by the participation of the public in the process.⁸⁸

The last piece of information included in the “Research” section was a brief description of the research outputs. This again focused on the hybrid nature of this project as not only an Adler Planetarium project, but also as my own case study for doctoral research. The bulk of the text for the *Tag Along with Adler* project was centered in this “Research” tab; however, the three additional tabs were still utilized. For “The Team” tab, short bios were added for the three Adler Planetarium staff members who are affiliated with the project in an official capacity at the Adler Planetarium: myself; Dr. Samantha Blickhan, the Zooniverse humanities research lead based at the Adler Planetarium; and Dr. Pedro Raposo, director of collections and curator at the Adler Planetarium. This focus on the collaborative nature of the project was specifically added to demonstrate the variety of expertise needed in a project of this nature, as described above (pg. 103).

As this project was designed to be fully online, “The Team” tab also served as a way to introduce the staff who would be actively engaging with project participants throughout the course of the research project. In order to effectively utilize the iterative nature of action research, and in particular the Action Research and Organizational Development Learning tradition, in a fully online project, it was imperative to plan for daily observations of the project. In order to be responsive in a manner expected within action research, I arranged for daily checks on the Zooniverse Talkboard feature, as well as daily checks of the associated Zooniverse project email account, and the qualitative survey. By presenting users with whom the staff associated with the project were, and what their Zooniverse handles were, the kind of direct feedback essential to action research and participatory research was possible.

⁸⁷ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 47.

⁸⁸ Noel, Lesley-Ann. “Promoting an Emancipatory Research Paradigm in Design Education and Practice.” *In Future Focused Thinking*. Brighton, UK, 2016.

The “Education” tab included a limited bibliography of articles that volunteers could access for more information on “Bias in Cataloging and Limitations in Search,” and “A Primer on Previous Metadata Tagging Projects in Museums.” These were added at the suggestion of the Adler’s Zooniverse team as a way to include additional sources for any volunteers interested in reading for themselves about where this project sits within research and literature.

The final tab accessible on this “Learn More” section is the “FAQ” section, and it is likely the most frequently viewed of the additional materials tabs. When building this section of the project, I broke up the FAQs into two workflows: one section for “Verify AI Tags” and one section for “Tag Images.” These FAQs were designed based on questions I could only guess the volunteers would have, and for the most part, they centered around questions I assumed may arise from the workflows themselves or from the divergent nature of this project as opposed to other Zooniverse projects the volunteers may have come into contact with. For this reason, the following FAQs were added, for reference in **Appendix 2**.⁸⁹ These FAQs were an early attempt to answer questions that had been troublesome both in previous metadata tagging projects such as *steve.museum* or *MetadataGames*, in particular questions on formatting, spelling, capitalization, etc., as well as anticipating questions on choices made in this project that would be unfamiliar for avid or previous Zooniverse participants, in particular questions on consensus, retirement rates, and project goals. Typically when looking for consensus, retirement rates (the number of users who must complete classifications for a single image before it is considered complete) can be set between 5 and 25 participants (dependent on the data set)⁹⁰, but for this project, the retirement rate was set to 50. The Zooniverse team at the Adler worried that some avid Zooniverse participants may be frustrated at the choice or even see it as wasting volunteers’ time, so I made the decision to follow Gibbs and Owens,⁹¹ transparently explaining that this extended retirement rate was specifically to get a larger set of responses, an attempt to maximize the diversity of tags while reiterating this project as divergent in its goals not for consensus but for diversity.

⁸⁹ **Appendix 2: Beta Test Language & Design**

https://docs.google.com/document/d/1LLM_xKG9OlorwxH3IB-xkFyHVAzNPjquNopWAcAHpFc/edit?usp=sharing

⁹⁰ Trouille, Laura, Chris Lintott, Grant Miller, and Helen Spiers. “DIY Zooniverse Citizen Science Project: Engaging The Public With Your Museum’s Collections And Data.” *Museums and the Web* 2017, January 30, 2017.

<https://mw17.mwconf.org/paper/diy-your-own-zooniverse-citizen-science-project-engaging-the-public-with-your-museums-collections-and-data/>.

⁹¹ Gibbs, Fred, and Trevor Owens. “Building Better Digital Humanities Tools: Toward Broader Audiences and User-Centered Designs.” *Digital Humanities Quarterly* 006, no. 2 (October 12, 2012).

Outside of these textually heavy sections that serve mainly as background and description for the project itself, I also worked to design additional materials that aid Zooniverse volunteers participating in the project, in particular Talkboards and a Field Guide. The Talkboards, or “Talk”, is the name of the discussion boards that are attached to a Zooniverse project. This is where volunteers can discuss the project as well as specific subjects they encounter and engage in conversations with other researchers and the research team. Talkboards and the creation of these virtual communities can be vital in sustaining engagement with volunteers by creating a feeling of belonging and a relationship among members.⁹² Zooniverse itself states, “Maintaining a vibrant and active ‘Talk’ is important for keeping your volunteers engaged with your project. Conversations on ‘Talk’ also can lead to additional research discoveries.”⁹³ For this reason, I created a “Notes” board where comment threads center around individual subjects (in this case specific images in either the “Tag Images” or “Verify AI Tags” workflows), an “Introduce Yourself” board where volunteers are encouraged to introduce themselves to the research team and each other, and a “Troubleshooting” board that is specifically to ask for help or to report technical problems with the project, workflows, or subjects.

The “Field Guide” is a place to store general project-specific information that volunteers may need to understand in order to complete classifications or tasks. The “Field Guide” lives on each page of the workflow, as a tab on the right-hand side of the screen.⁹⁴ The purpose of this “Field Guide” was to serve as a support or crutch should the volunteers encounter a subject they felt was too foreign or too difficult to describe without some guidance to recognize it. However, I specifically aimed to keep the “Field Guide” basic and more of an overarching introduction so as not to encourage specific tags to become prevalent or to provide any kind of perspective that there were, in fact, specific subjects we favored over others.

With these supports (for example, the “FAQs” and “Field Guide”) and descriptions of the project goals and purpose in place, I was then able to focus on the actual design of the workflows, the subject sets, and additional “Help Text”. As discussed previously, I selected a representative set of images from the Adler Planetarium’s visual “arts” collections, crossing the object, rare books, and archival photograph collections. Processing these images was a required stage before ingesting them into the Zooniverse platform. In particular, all the images

⁹² Zwass, Vladimir. “Co-Creation: Toward a Taxonomy and an Integrated Research Perspective.” *International Journal of Electronic Commerce* 15, no. 1 (Fall 2010): 11–48.

⁹³ <https://help.zooniverse.org/getting-started/>

⁹⁴ **Appendix 2: Beta Test Language & Design**

https://docs.google.com/document/d/1LLM_xKG9OlorwxH3IB-xkFyHVAzNPiquNopWAcAHpFc/edit?usp=sharing

regardless of their workflow needed to be converted into small-scaled JPEG files due to constraints on the Zooniverse system. Following the advice of the Zooniverse platform, the images were scaled to be no larger than 999KB, and in fact, the Zooniverse system will not allow any images larger than this size. The majority of the images were scaled to the suggested 600KB size, however.⁹⁵ These choices were made to allow access to the project across low-technology spaces, a thoughtful design intervention centering ‘the periphery’ and addressing the “disparate relationship of power and privilege” between those with developed and developing infrastructure.⁹⁶

Additionally, due to constraints of how the Zooniverse classifications work, the “Verify AI Tags” workflow required additional preprocessing. In order to make the results of this thesis reproducible by any cultural heritage institution or researcher, I was determined to use only the tools native to the Zooniverse platform. With this in mind, the verification workflow proved to be the most difficult. In order to associate the tags that were created by the Metropolitan Museum of Art iMet tagger and the Google Cloud Vision API tagger for each specific image, a workaround was required. Zooniverse has the option to allow classifications to pull from a multiple choice menu; however, it does not allow for that multiple choice menu to be specific to a single image. Had I opted to use a multiple choice menu, it would have needed to be inclusive for all 613 tags created by these two AI taggers. This also would not have been representative of the verification task, as no single image received more than 10 tags from these taggers, and selecting from the full list would include options not originally assigned to that specific image.

With this in mind, I used the Adobe Photoshop software to add the tags created by both the Metropolitan Museum of Art iMET tagger, and the Google Cloud Vision API tagger, directly onto the image that the tags were associated with. I then added a small box to the right of each tag, so that the images were optimized for the preexisting Zooniverse task family “Drawing” and, in particular, the “Drawing” type of “point.” The instructions were then set to say that the first task asked of volunteers in the “Verify AI Tags” workflow was to “Look at the tags created by our AI Models. Point at the box next to each tag you think accurately describes the image you are seeing.” Below is a screenshot of how this task was presented during the beta testing period from 2-9 February 2021 (**Figure 1**).

Once the image files were resized, and, in the case of the “Verify AI Tags” image set, reformatted, they were uploaded as 22 different subject sets: 11 sets for the “Tag Images” workflow, 10 sets consisting of 100 image files and 1 set consisting of 90 image files, and 11

⁹⁵ Trouille, Lintott, Miller, and Spiers. “DIY Zooniverse Citizen Science Project.

⁹⁶ Noel, Lesley-Ann. “Promoting an Emancipatory Research Paradigm in Design Education and Practice.” In *Future Focused Thinking*. Brighton, UK, 2016.

sets for the “Verify AI Tags workflow, 10 sets consisting of 100 image files and 1 set consisting of 90 image files. The decision to break these sets of images up into smaller sets was made based on the Spiers et al. findings that sustained volunteer engagement emerged from incremental releases of small amounts of data in a single project.⁹⁷

In order to add these images to these subject sets, I also needed to upload a “manifest” file for both sets of images. This “manifest” featured not only the file name for each individual image but also the license information for each image which for this project was “Public Domain <http://creativecommons.org/publicdomain/mark/1.0/>”, as the data set was selected specifically to only include images with no copyright concerns and that the Adler Planetarium was willing to share publicly under “Creative Commons: Public Domain Mark 1.0.”

With the images uploaded and formatted to work within the Zooniverse task capabilities, I began building the two distinct workflows for the beta test. For the “Verify AI Tags” workflow I first added the “Drawing” task, and in particular the “point” task described above. However, I also added a “Text” task to follow, which presented volunteers with a text box and the instruction, “Add words or phrases that best describes or identifies key elements or features of this image. Please place commas between each individual tag (word or phrase).” Originally, I had tested this free-tagging task with an eight-task combo that instructed users to add one term per individual box; however, it led to confusion in beta testing. As can be seen in this screenshot (**Figure 2**), the instruction was also duplicated with all eight text fields, which made it difficult to type without having to scroll down, which inevitably meant after the fifth field, the text boxes were no longer in sight of the image. This proved problematic and was reported by users in the survey as an issue, as discussed later.

After testing, the change was made to include one text box and one instruction line that was changed to include instructions to separate various tags with commas (**Figure 6**). As I designed the workflow for the “Verify AI Tags”, I also worked on the “Help Text” which is a part of Zooniverse that functions as a pop-up help window that can use text and images. When volunteers click on the button for more help next to the main text of the task, it opens this pop-up.

For the “Verify AI Tags” “Help Text” for the beta test, I focused on questions that seemed probable to arise with this workflow, in particular hitting on how to do the “point” task for verification, as well as how to add their own tags. I included images for reference points and the help text for the verification task (the “point” tool of the “drawing task”) looked like **Figure 3** and **Figure 4** shown here. I included what the verification stage would look like with images that

⁹⁷ Spiers et al., “Everyone Counts?”

have tags formatted on both the vertical of the image (**Figure 3**) and the horizontal of the image (**Figure 4**) as I anticipated the dual format may become confusing for users as to which box was associated with which tag. Providing image and help text examples for both orientations was an attempt to clear up possible confusion caused by both orientations requiring selecting the box to the right of the tag.

The help text for the next step in the “Verify AI Workflow”, the free tagging task to add volunteers’ own tags/terms, was formatted to reflect some of the information shared in the “FAQ” section, in particular highlighting formatting. For this help text, I designed again two separate image examples, the first of which (**Figure 5**) demonstrates how not to add tags, with the second image (**Figure 6**) demonstrating the format we would like to see tags added in. These examples cover only one tag per line, a space between words, and no special characters like underscores or dashes.

Following the same structure, I also built the “Tag Images” workflow after uploading the images into Zooniverse, and this workflow also included tasks, instructions, and “help text.” For the “Tag Images” workflow, I tested an initial “Question” task which allows volunteers to select from a multi-choice list, testing one of the standing questions around museum metadata tagging projects that had run in the past, how to ease volunteers into the task, as a key component of success for these types of projects is the capacity of the project to engage volunteers.⁹⁸ With Zooniverse, project design tasks are often laddered to ease users into classifications, helping to encourage participation with a low barrier to entry, and with this in mind, I decided to use the beta test to see if having the first task for “Tag Images” free tagging workflow be a multi-choice selection would perform the dual task of easing users into the task and making them comfortable, as well as focusing the volunteers’ attention on the subjects of the images they were going to be asked to tag.

The “Question” task came with the instruction: “Which best describes the subject of the image shown?” The choices that the users could select were pulled from the “Field Guide”: People; Animals; Architecture; Landscape; Mythological Representation; Planets, Asteroids, Meteors, etc.; Buildings; Exhibitions; Text; Scientific Instrument; Shapes; Map. The initial beta test showed that this task was skipped by over 70% of the beta testers, though it was never mentioned in the optional survey, and I therefore utilized the Action Research and Organizational Development Learning tradition of iteration, removing the task. Instead, the “Tag Images” workflow is built to be the exact same free-tagging task that accompanies the “Verify AI

⁹⁸ Ponciano, Lesandro, and Francisco Brasileiro. “Finding Volunteers’ Engagement Profiles in Human Computation for Citizen Science Projects.” *Human Computation* 1, no. 2 (December 20, 2014). <https://doi.org/10.15346/hc.v1i2.12>.

Tags” project. Using the same prompt, “Add words or phrases that best describes or identifies key elements or features of this image. Please place commas between each individual tag (word or phrase)”, I was able to keep consistency in the task, which allowed me to examine the ways in which framing the workflow with AI tags visible before entering text possibly affects the tags created versus if there are no AI tags visible first.

The last things built for the Zooniverse.org workflows were accompanying “Help Text” and “Tutorials.” The “Help Text” and workflow main text for both “Verify AI Tags” and “Tag Images” workflows were also accompanied by a “Tutorial” function that the Zooniverse platform allows to be linked to a specific workflow. In this case, I built two tutorials, one for “Verify AI Tags” and the other for “Tag Images.” The “Tutorial” functions as a pop-out box that allows project builders to show volunteers how to contribute to the project. Though Zooniverse supports images as part of the “Tutorial,” I designed both of my tutorials without images in an attempt to not model specific tagging behaviors or encourage specific tags for the sample image types. Again, I designed the tutorials for the beta tests in much the same way I had designed the “FAQ” section or the “Help Text,” trying to anticipate what could give users the most pause or concern, as well as incorporating early beta test survey comments seen in **Appendix 3**,⁹⁹ while also trying to give easy instructions on how to actually move through the workflows, in particular for any user not as well acquainted with the Zooniverse system. I designed specifically around these ideas of what might trip up or cause issues for a user, taking Ponciano and Brasileiro’s research into account, in particular that an important requirement for designing for volunteer engagement is having a clear understanding of the typical engagement of volunteers and designing for human experience.¹⁰⁰ The “Tag Images” and “Verify AI Tags” tutorials can be referenced here.¹⁰¹

When looking at the “Tutorial” designed for the “Verify AI Tags” workflow, it is evident that some of the same concerns were addressed in this tutorial as in the tutorial designed for the “Tag Images” workflow, in particular the “Adding your own terms,” “How do I know I’m right?” and “Want more info?” sections are copied verbatim. This was because I anticipated volunteers in both workflows would require assurances that the project is gauging user language with no

⁹⁹ **Appendix 3: Beta Test Survey Results**

https://docs.google.com/spreadsheets/d/1KKpX6qrWp31ZV8p5QSWRaFZw59jsIZwTQ_Ldp78SYwU/edit?usp=sharing

¹⁰⁰ Ponciano, Lesandro, and Francisco Brasileiro. “Finding Volunteers’ Engagement Profiles in Human Computation for Citizen Science Projects.” *Human Computation* 1, no. 2 (December 20, 2014).

<https://doi.org/10.15346/hc.v1i2.12>.

¹⁰¹ **Appendix 2: Beta Test Language & Design**

https://docs.google.com/document/d/1LLM_xKG9OlorwxH3IB-xkFyHVAzNPiquNopWAcAHpFc/edit?usp=sharing

aim towards a specific answer or consensus, as well as needing paths to the additional information that volunteers can access in the project “About” section, “FAQ” section, or “Talk” boards. Where the “Tutorial” for “Verify AI Tags” diverged was to include information on the two taggers used to generate the tags, as well as describing the verification task as clicking on the “box,” not the “word”. This particular instruction was added to aid my own aggregation of this task, to be discussed later. The addition of the “What if I don’t think any of the terms/tags are accurate?” option was also used to encourage skipping and a reassurance that some of the tags generated by the AI models will, in fact, not always be deemed accurate. Expecting this to be a question, it felt necessary to include the permission to skip the step so as not to encourage users to make a selection because they felt they had to.

This section covers how the project was built and designed, but one additional piece was created for the beta test. The Zooniverse team, as part of the required beta testing of all projects on the site, includes a survey that users can opt in to submit. The survey is not required to participate in the beta test, but it is posted as a header on the project page. The survey is presented in the form of a Google Form, and there is an associated Google Sheet spreadsheet that tracked the submissions in real time. The report did not feature any user identification information, it only tracked the time at which the submission was made. The questions presented on the “Tag Along with Adler Feedback Form” which stated, “Thanks for helping us test our newest proposed project! Your feedback will be vital to us as we improve this site and decide whether or not to promote it as an official Zooniverse project,” and the results of the *Tag Along with Adler* beta test survey can be seen here (**Appendix 3**).¹⁰²

I had no say in the language of this survey, nor the questions, as this is a survey used for all projects in the beta review process on Zooniverse. However, this survey did encourage me to create and include a survey of my own upon *Tag Along with Adler’s* public launch, which will be covered in the “Participant Identification and Recruitment Practices” section below.

As seen in this section, the two different workflows created as part of the Zooniverse.org online project were specifically designed to incorporate current literature of best practices for crowdsourcing projects, while also answering standing questions around user engagement, optimization of tag creation, and emerging use of AI tagging models. By not only reflecting current standards for crowdsourcing projects but also answering these lingering questions, I hope to demonstrate how a project created on a free third-party platform (such as Zooniverse) can still be optimized for engagement, transparency, tag creation, diversification, and usability.

¹⁰² **Appendix 3: Beta Test Survey Results**

https://docs.google.com/spreadsheets/d/1KKpX6qrWp31ZV8p5QSWRaFZw59jslZwTQ_Ldp78SYwU/edit?usp=sharing

Gamified Workflow:

A lingering question within crowdsourcing, and within museum engagement work has been how to entice users to participate in programs, specifically online-hosted programs. Gamification has promised increased engagement from a variety of users that can assist in acquiring a broader and more diverse array of metadata for collections.¹⁰³ When looking at motivations for participation in crowdsourcing, there are three emerging motivation groups as identified within *The Collective Wisdom Handbook* published in 2021. These are extrinsic, intrinsic, and altruistic motivations.¹⁰⁴

Gamification promises to appeal to both extrinsic and intrinsic motivations. Extrinsic motivations include tangible rewards such as high scores or grades, whereas intrinsic motivations make the participation itself inherently rewarding, such as aspects of a project being fun or sociable.¹⁰⁵ Alam, Sun, and Campbell explored the initial motivation of high performing volunteers within GLAM-based citizen science-run projects, finding that though motivations can change over time, the majority of so-called high-performing volunteers were motivated by a combination of factors when initially joining projects; however, those driven by external motivations had the greatest rates of long-term participation.¹⁰⁶ As the UCL Transcribe Bentham project found, gamification is relevant and worthwhile due to the work of citizen science and crowdsourcing projects being quite difficult and time-consuming for a volunteer to undertake.¹⁰⁷ How can fun work as an incentive for participation?

Jenkins, Clinton, Purushotma, Robison, and Weigel confronted this very question over fifteen years ago as part of a MacArthur Foundation 2006 report.¹⁰⁸ This report stated:

¹⁰³ Manzo, Christina, Geoff Kaufman, Sukdith Punjasthitkul, and Mary Flanagan. “By the People, For the People’: Assessing the Value of Crowdsourced, User-Generated Metadata.” *Digital Humanities Quarterly* 9, no. 1 (2015). <http://www.digitalhumanities.org/dhq/vol/9/1/000204/000204.html>.

¹⁰⁴ Ridge, Mia, Samantha Blickhan, Meghan Ferriter, Austin Mast, Ben Brumfield, Brendon Wilkins, Daria Cybulska, et al. *The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage - Community Review Version*. PubPub, 2021. <https://britishlibrary.pubpub.org/pub/introduction-and-colophon/release/2>.

¹⁰⁵ Ridge, Mia, Samantha Blickhan, Meghan Ferriter, Austin Mast, Ben Brumfield, Brendon Wilkins, Daria Cybulska, et al. *The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage - Community Review Version*. PubPub, 2021. <https://britishlibrary.pubpub.org/pub/introduction-and-colophon/release/2>.

¹⁰⁶ Alam, S. L., Sun, R., & Campbell, J. (2020). Helping Yourself or Others? Motivation Dynamics for High-Performing Volunteers in GLAM Crowdsourcing. *Australasian Journal of Information Systems*, 24. <https://doi.org/10.3127/ajis.v24i0.2599>

¹⁰⁷ “Events | UCL Transcribe Bentham.” Accessed February 14, 2020. <https://blogs.ucl.ac.uk/transcribe-bentham/category/events/>.

¹⁰⁸ Jenkins, Henry, Kate Clinton, Ravi Purushotma, Alice Robison, and Margaret Weigel. “Confronting the Challenges of Participatory Culture: Media Education for the 21st Century.” MacArthur Foundation, 2006.

“When children are deep at play they engage with fierce, intense attention that we'd like to see them apply to their schoolwork. Interestingly enough, no matter how intent and focused a child is at that play, maybe even grimly determined they may be at that game play, if you asked them afterwards, they will say that they were having fun. So, the fun of game play is not non-stop mirth but rather the fun of engaging attention that demands a lot of you and rewards that effort. I think most good teachers believe that in the best moments, classroom learning can be the same kind of fun. But a game is a moment when the kid gets to have that in spades, when the kid gets to be focused and intent and hardworking and having fun at the same time.”¹⁰⁹

By adapting the ideas of play and gamification, it is possible to shift the focus and emphasis from fun to engagement. Game play itself is often not actively fun. There are many moments that require effort and can feel like a grind. However as Jenkins et al. found, the key is that the activity is so deeply motivating as to continue to entice participation, making the individual willing to push through the grind or the monotonous moments in order to achieve a specific goal or purpose. For a process such as crowdsourcing, where volunteers are often presented with fairly menial tasks, gamification could help entice participation or encourage deeper participation. These questions and early discussions helped support the need to test how gamification could impact incentivization to participate but also how gamification could affect the act of participation itself.

When creating a gamified project for this research, it was important to consider many of the noted challenges discovered by projects like TiltFactor's Metadata Games Suite. The Metadata Games created by Dartmouth University's TiltFactor were, in essence, miniature crowdsourcing projects the community could participate in that helped libraries and museums in their metadata tagging processes.¹¹⁰ The Metadata Games were a diverse suite of games that featured variety in game play and game design, but have a common purpose, “to allow players to access media items from a number of cultural heritage institutions' collections and provide them with the opportunity to contribute new metadata within the context of an immersive, enjoyable game experience.”¹¹¹

¹⁰⁹ Jenkins, Henry, Kate Clinton, Ravi Purushotma, Alice Robison, and Margaret Weigel. “Confronting the Challenges of Participatory Culture: Media Education for the 21st Century.” MacArthur Foundation, 2006.

¹¹⁰ Information Space. “Crowdsourced Metadata Games: A Primer,” October 10, 2014. <https://ischool.syr.edu/infospace/2014/10/10/crowdsourced-metadata-games-a-primer/>.

¹¹¹ Bråthen, Jan-Erik. “An Analysis of Image Folksonomy Generation,” 2009, 180.

A key challenge within the gamification of crowdsourcing projects is the need to balance incentivization to participate with the need to still encourage accurate and high-quality contributions.¹¹² The Metadata Games project found that competition was a key element that incentivized participation;¹¹³ however, it's important to note that what may be incentivizing to some users – features like direct competition or leaderboards for high scores – may actually disincentivize others.¹¹⁴ With this in mind, the design considerations for my own gamified project looked to capture an experience that would be individually challenging but lack any direct competition amongst participants.

As the Zooniverse platform does not support gamification, I looked at alternatives for hosting my gamified case study. Wikidata was used previously by the “Tag, That’s It!” crowdsourcing game created in collaboration between the Metropolitan Museum of Art, Microsoft, and the Massachusetts Institute of Technology (MIT).¹¹⁵ The gamification element of this project presented an image from the Metropolitan Museum of Art’s collection along with AI-generated search terms, asking users to select any of the terms that they believed were accurate for the image shown. Though the source code for this platform was available, I made the decision not to utilize this specific example as the gamification aspect differed very little from my own Zooniverse case study “Verify AI Tags,” and though the built-in community of users at Wikidata was a draw, the platform itself did not seem adequately different enough to test the gamification I was looking for as part of my Action Research and Organizational Development Learning tradition use.

With preexisting platforms such as Zooniverse and Wikidata ruled out due to technical functionality, the choice to value interface and experience design over the existing communities built into these platforms was made.¹¹⁶ As I decided to build my own platform, I made the conscious decision to forfeit the community of crowdsourcing volunteers immediately available

¹¹² Flanagan, Mary, Sukdith Punjasthitkul, Max Seidman, Geoff Kaufman, and Peter Carini. “Citizen Archivists at Play: Game Design for Gathering Metadata for Cultural Heritage Institutions,” 2014, 13.

¹¹³ Gelli, Bianca. “Readers Save Legacy Content by Crowdsourcing Metadata Games.” Gamification Co (blog), May 12, 2014.

<https://www.gamification.co/2014/05/12/readers-save-legacy-content-by-crowdsourcing-metadata-games/>

¹¹⁴ Ridge, Mia, Samantha Blickhan, Meghan Ferriter, Austin Mast, Ben Brumfield, Brendon Wilkins, Daria Cybulska, et al. The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage - Community Review Version. PubPub, 2021.

<https://britishlibrary.pubpub.org/pub/introduction-and-colophon/release/2>.

¹¹⁵ “Wikidata: Tag, That’s It! · Met x Microsoft x MIT Hack.” *Met x Microsoft x MIT Hack*. Accessed January 4, 2023. <https://mmm.pubpub.org/wikidata>.

¹¹⁶ Ridge, Mia, Samantha Blickhan, Meghan Ferriter, Austin Mast, Ben Brumfield, Brendon Wilkins, Daria Cybulska, et al. The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage - Community Review Version. PubPub, 2021.

<https://britishlibrary.pubpub.org/pub/introduction-and-colophon/release/2>.

on these larger platforms in favor of really testing the gamification aspects of a custom-built crowdsourcing video game. When looking into the game design, I considered the open source code available by TiltFactor to adapt one of the workflows featured in the Metadata Games Suite; however, as the code was last adapted in 2017, it was considered a security risk by the Adler Planetarium Information Technology team, and a custom-built platform was instead decided upon.

As I prepared to design my own gamified platform, I looked at the work of Kusic and Tomka, presented as part of the 2018 European Year of Cultural Heritage.¹¹⁷ By looking at the work of psychology professor Mihaly Csikszentmihalyi, the report by Kusic and Tomka emphasized a concept known as the “state of flow.”¹¹⁸ This concept emphasized the importance of balancing the challenges and skills of the user: if the challenge of the game is too low and the user is skillful, they will likely be bored, whereas if the challenge of the game is too high for the skills of the user, they may become too anxious and worried to continue participating.¹¹⁹

With this in mind, I decided to favor a simple and familiar game play model, one grounded in the design of 8-bit video games popularized in the 1980s and 1990s – a game style recognizable to a variety of age ranges and with fairly intuitive gameplay. Similarly, in response to previously identified shortcomings of gamification, in particular those centered around scoring,¹²⁰ I decided to create a video game that focused on personal preference and taste over a quantifiable right or wrong. In much the same way that the Zooniverse-based case studies emphasized with users the departure from contributing the “right answer” to instead contributing a preference, so, too, was the video game designed. This reinforced the centrality of the Participatory Research traditions used in the methodological approaches of this thesis.

Originally, I planned to create this gamified project as a part of my work with the Adler Planetarium, preparing a funding proposal for a gamified platform that could be built by the Adler and Zooniverse teams, despite the proposed build being separate from the Zooniverse platform. The funding was not received to make this an official Adler Planetarium/Zooniverse project, and I pivoted to adapting the idea into a project I built and tested myself. I decided to base the gameplay off of a game type known as a “word catch,” which asks users to catch

¹¹⁷ Kusic, Visnja, and Goran Tomka. “Citizen Engagement & Education: Learning Kit for Heritage Civil Society Organisations.” 2018 European Year of Cultural Heritage. The Hague: Creative Europe Programme of the European Union, 2018.

¹¹⁸ Kusic and Tomka, “Citizen Engagement & Education,” pg. 35

¹¹⁹ Kusic and Tomka, “Citizen Engagement & Education,” pg. 35

¹²⁰ Hedges, Mark, and Stuart Dunn. *Academic Crowdsourcing in the Humanities: Crowds, Communities, and Co-Production*. Chandos Information Professional Series. Chandos Publishing, 2018.

falling descriptors and sort them as either matching the image shown or not matching the image shown.

Of the 1,090 images used in the Zooniverse hosted *Tag Along with Adler* project, a subset of 60 images (14 archival photographs, 35 works on paper, and 11 rare book illustrations) were selected to be a part of the gamified workflow. For these sixty images, every metadata tag created by the Adler Planetarium's cataloguers, tags created by both AI models (iMet and Google Cloud Vision API), and all tags created as part of the Zooniverse *Tag Along with Adler* project by volunteers were added. The gamified platform was designed to present 12 randomly selected tags from the list accumulated from these three taxonomies for users to sort. A term was dropped from the top every 10 seconds, with a full session for one image lasting 2 minutes.

The user experience started on a "Main Menu" page. This featured an "About the Game" hyperlink which featured two sections of information for users. The first section included a short description of the research project's purpose and aimed to mirror the language used in *Tag Along with Adler* to emphasize "there is no right or wrong answer here!"¹²¹ The second section of this "About the Game" page featured a survey similar to the volunteer demographic survey appended to the *Tag Along with Adler* Zooniverse header. Information for why the survey was included in the game was followed by a clickable "Survey" button, which linked out to a Google Survey link identical to that included on the Zooniverse project (**Appendix 12**).¹²² The "About the Game" section ended with a paragraph explaining this project as part of active research and a statement of data governance for volunteers.

Returning to the "Main Menu," the game was designed in a vertical orientation, to be optimized for mobile users and desktop users alike, fitting the preferred gaming style of a modern audience: mobile and casual.¹²³ Prominently displayed at the top of the "Main Menu" were the game's "Instructions". The "Instructions" stated:

"Control your character using w, a, s, d keys, arrow keys, or the buttons at the bottom of the screen. Catch the falling words when they reach your character (either using the up arrow, "w," or pickup buttons) and then drop them (using the down arrow, "s," or drop off buttons) on the far right if **you** think they match the image, or on the far left if they do not match the image."

¹²¹ <http://meta-tag-game.herokuapp.com/about>

¹²² **Appendix 12: Tag Along Metadata Game Survey** link: https://docs.google.com/forms/d/e/1FAIpQLSeIZkqRRGzGffmoLM_k4J201oBPWxnLGiiMg8kjXAkTI6CsAQ/viewform

¹²³ Hedges, Mark, and Stuart Dunn. *Academic Crowdsourcing in the Humanities: Crowds, Communities, and Co-Production*. Chandos Information Professional Series. Chandos Publishing, 2018.

Below these instructions, a thumbnail of each of the 60 images included in this project was displayed with the opportunity to click on any image to launch the gameplay of that image. When the image was selected, the gameplay screen opened with the image overlaid on top of a rectangle. The left sixth of the rectangle was highlighted red to designate where to drop terms that the image did not match, and the right sixth of the image was highlighted green to designate where to drop terms that did match the shown image. The users controlled a black outlined, unfilled, human icon and the terms that dropped did so with a white background behind the black text to help aid accessibility in viewing the terms overlaid on the image. This can be seen in **Figure 7**.

At the end of this session, a box was presented to allow users to add any terms of their own tags to the image, the prompt being: "Thank you for playing. Now add your voice! In the box, add words or phrases you would use to describe this image. Please add tags one at a time." From here, volunteers could return to the main menu to begin a new session with either the same image or a new image.

Due to lack of funding for an Adler-sanctioned game build and my own lack of video game and programming skills, I contracted a developer to build the application for me. The application was built by Ryan BrodeFrank¹²⁴ using a combination of React, JavaScript, HTML and CSS programming languages. A MySQL database was created on the backend to store the results of users' experiences, tracking both the interactions with individual terms and compiling any user-submitted terms. The video game was hosted on Heroku. The decision to use these languages and platforms was made by the expedient need to test a gamified version of the tagging experience online (due to continued building closures due to the COVID-19 pandemic) and within the expertise of the programmer selected.

Even accounting for the limitations and simplicity within the gamified workflows designs, the video game itself allowed for lingering questions around crowdsourcing to still be incorporated into this thesis. In particular, this gamified workflow allowed for user language preference between the three taxonomies present within this project as a whole (cultural heritage professionally cataloged taxonomies, AI generated taxonomies, and the user-generated taxonomy/folksonomy) to actually be compared in real time. It also provided the opportunity to test interactions on a site hosted on a non-citizen science platform, looking at the

¹²⁴ Ryan BrodeFrank is a web developer with 5 years experience in video game design and web development work whose resume can be seen here: https://www.linkedin.com/in/ryan-brodefrank-7933288b?original_referer=https%3A%2F%2Fwww.google.com%2F He is also my spouse and did this work pro bono.

effects using a self-hosted site can have on participation while also looking at whether gamification itself increases participation in crowdsourcing activities.¹²⁵

Zooniverse Onsite – Canceled Workflow

With the use of the Action Research and Organizational Development Learning tradition within this thesis methodology, the impetus was to be able to test individual variables in isolation to be able to determine which design decisions would affect participation in crowdsourcing projects. One aspect initially planned was to be able to test how having a crowdsourcing platform within a museum space would change the experience and outcomes from crowdsourcing projects done at home or in isolation. This would connect the research back to the reality it was designed to understand, bringing cataloguing of museum collections by the public back into a museum space, an activation of the Action Science tradition.

For this reason, the initial plan was made to run this project on the Zooniverse online platform, while also running the Zooniverse MuseumMode interactive onsite at the Adler Planetarium. This would have allowed me to further analyze whether tags and engagement differed between the Zooniverse and Adler audiences, while also being able to gauge the differences in how tagging experiences were responded to in isolation versus in a public space. As designed this would have been the Adler Planetarium's second time using the Zooniverse MuseumMode within an exhibition space. In November 2019, the Adler Planetarium and Zooniverse teams partnered to launch the first in-exhibit interactive using MuseumMode functionality of the Zooniverse platform, *Mapping Historic Skies*.

Having served as one of the project leads on *Mapping Historic Skies*, I saw a similarly designed onsite MuseumMode-powered interactive around *Tag Along with Adler* as an exciting possibility. The Field Museum in Chicago had launched a similar interactive kiosk designed by Zooniverse team members called *MicroPlants* in which they reported that “participant interaction with the kiosk is very different from their interaction with the online platform” despite having seen that the data produced by both online participants and kiosk visitors was comparable.¹²⁶ The *MicroPlants* team reported that the largest deviation in behavior between their onsite

¹²⁵ Hedges, Mark, and Stuart Dunn. *Academic Crowdsourcing in the Humanities: Crowds, Communities, and Co-Production*. Chandos Information Professional Series. Chandos Publishing, 2018.

¹²⁶ The Museum Scholar. “Crowdsourcing Knowledge for Representation: Interactive Learning and Engagement with Collections Using Zooniverse’s Mapping Historic Skies,” April 24, 2020. https://articles.themuseum scholar.org/2020/04/24/tp_vol3_brodefrank/.

participants and those participating online was potentially due to the realities of an in person experience, specifically being “limited by time, interest, and other waiting people.”¹²⁷

As part of the testing of the *Mapping Historic Skies* interactive, a three-month long action research based study was done on the floor of the Adler Planetarium. A group consisting of staff from the Adler’s Collections, Zooniverse, and Guest Experience departments began asking guests to use a beta prototype of the interactive, a single workflow on the Zooniverse platform displayed on an iPad.¹²⁸ This in person testing similarly relied on Action Research and Organizational Development Learning tradition, with iterations to the workflow made based on user responses. However with the testing being facilitated by museum staff an unexpected complication emerged, as staff members stood next to or were holding the iPads and observing guests, there was a wariness amongst guests. Staff often heard participants vocally express concerns about being “wrong” or questioning their own knowledge.¹²⁹ With this in mind, plans for future testing, including that planned for an onsite interactive of the *Tag Along with Adler* project, were designed to be iPads left on a table and observed by staff from afar, to more closely simulate the final gallery experience.

However due to the COVID-19 pandemic and the closure of the Adler Planetarium from March 2020-March 2022, the onsite MuseumMode interactive was abandoned. Despite the inability to implement this workflow due to the pandemic closure of the Adler Planetarium, it does provide an interesting path forward for future research.

Qualitative Data to Gauge Experience – Participant Surveys & Interviews with Industry Leaders

As part of the data collection of this thesis, it was also important to focus on the experience of the users. As a core part of this thesis looks at the activation of the public in the process of crowdsourcing descriptions, but specifically in taking the engagement expertise of cultural heritage institutions and applying it to this process, being able to account for how effective these case studies are in engaging the public was vital. To gauge not only the users’

¹²⁷ The Museum Scholar. “Crowdsourcing Knowledge for Representation: Interactive Learning and Engagement with Collections Using Zooniverse’s Mapping Historic Skies,” April 24, 2020. https://articles.themuseum scholar.org/2020/04/24/tp_vol3_brodefrank/.

¹²⁸ The Museum Scholar. “Crowdsourcing Knowledge for Representation: Interactive Learning and Engagement with Collections Using Zooniverse’s Mapping Historic Skies,” April 24, 2020. https://articles.themuseum scholar.org/2020/04/24/tp_vol3_brodefrank/.

¹²⁹ The Museum Scholar. “Crowdsourcing Knowledge for Representation: Interactive Learning and Engagement with Collections Using Zooniverse’s Mapping Historic Skies,” April 24, 2020. https://articles.themuseum scholar.org/2020/04/24/tp_vol3_brodefrank/.

experience with the act of tagging, but also their reactions to AI models and transparency within cultural heritage, having qualitative data from surveys remains key.

As will be discussed below as part of the *Participant Identification and Recruitment Practices* section, a survey to gauge user experience as well as user diversity, was included as part of this thesis.¹³⁰ When designing the survey it was important to include open ended questions as much as possible, and spaces where users could expand upon answers when needed.¹³¹ Eight questions were designed specifically to gauge the experience of users, with an additional four questions used to gauge issues of diversity and representation, though these four questions were optional.

The questions had a range of answers users could select from. For the question “Please tell us how much you agree with the following statements: The experience was 1. Fun, 2. Thought Provoking, 3. Engaging” users were able to select from “Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree” for each part of the question. For the few questions that were not designed to be open ended, such as “Did you enjoy your experience with the Tag Along with Adler Project?”, the responses always included an “Other” textbox where users could add their own responses, in order to encourage openness within an otherwise closed question.

In addition to the surveys, the Talkboards were a key component in collecting qualitative data on user experience. As mentioned above, these discussion boards are attached to all Zooniverse projects, and the Zooniverse team itself encourages researchers to view these as not only a spot for engaging volunteers but as additional research metrics.¹³² Throughout the course of the case study’s run on Zooniverse, comments added to the various Talkboards were copied into a spreadsheet to facilitate examination.¹³³

In order to process and understand the responses to both the survey and the Talkboards, I adopted a Grounded Theory method. Grounded Theory methods consist of “systematic, yet flexible guidelines for collecting and analyzing qualitative data to construct theories from the data themselves. Thus researchers construct a theory ‘grounded’ in their data.”¹³⁴ The adoption of this method was important from the inception of the thesis projects, as grounded theory strategies can help researchers start, stay involved, and finish their projects by

¹³⁰ **Appendix 15: Tag Along with Adler User Survey link:**

<https://docs.google.com/forms/d/e/1FAIpQLSfkmwYpPciVLBi0vGOkxH3daFw4mw6dkXpidxlpE4DPHjACg/viewform>

¹³¹ Charmaz, Kathy. *Constructing Grounded Theory*. Vol. 2. Sage Publications, 2014. P. 65.

¹³² <https://help.zooniverse.org/getting-started/>

¹³³ **Appendix 16: Talk Board Comments**

<https://docs.google.com/spreadsheets/d/1AYWVgTLGtCZ4w47DULbOgJtAneZ9l8ld30MiipgE4l8/edit?usp=sharing>

¹³⁴ Charmaz, Kathy. *Constructing Grounded Theory*. Vol. 2. Sage Publications, 2014. P. 1.

continuing to do analysis of responses as they come in.¹³⁵ This model of qualitative research analysis fit perfectly with the action research methodology described previously as it allowed for real time analysis and iteration of the projects based on responses.

In order to stay true to the Grounded Theory, I began this qualitative collecting with an open mind as to what was happening.¹³⁶ It was not until viewing the actual responses that work on constructing qualitative coding began. Qualitative coding in Grounded Theory is the process of separating and sorting responses, attaching labels to these segments of data which depict what is unique to each segment.¹³⁷ This coding gives an analytic handle for making comparisons with various segments of the data, but also provides further areas of the data to explore in subsequent data collection.¹³⁸ This constructivist approach paired well with the action research methodology, as both methods address researcher bias, which was essential for a thesis that focuses on the bias of practitioners. As action research focuses on critical subjectivity,¹³⁹ constructivist (Grounded Theory) approaches also focus on the need to shed notions of neutrality: “not only does that mean that researchers must examine rather than erase how their privileges and preconceptions may shape the analysis, but it also means that their values shape the very facts that they can identify.”¹⁴⁰

As responses to the survey and conversations on Talkboards began, it was important to begin construction of both **Appendix 15** and **Appendix 16**. In both cases, I designed the structure of the data to align with Grounded Theory construction, with emphasis on recording who did what, when it occurred, how it occurred, identifying conditions under which actions emerge, focusing on particular words and phrases to which participants seem to attribute particular meaning, and finding taken-for-granted or hidden assumptions.¹⁴¹ This is why dates, Zooniverse handles, subject set IDs in Zooniverse, Adler Collections types, Adler Collection object identifiers, link to comments, and full comments were all recorded. Only after this did I begin sorting by “Comment Type.”

However, it was not just the experience of users that it was important to judge in this thesis; as it is an action research and practice-based study, it was also imperative to gauge how the field of cultural heritage responded to the project and its results. Due to the depth of conversation envisioned, I decided to focus these conversations with experts within the cultural

¹³⁵ Charmaz, Kathy. *Constructing Grounded Theory*. Vol. 2. Sage Publications, 2014. P. 3.

¹³⁶ Charmaz, Kathy. *Constructing Grounded Theory*. Vol. 2. Sage Publications, 2014. P. 3.

¹³⁷ Charmaz, Kathy. *Constructing Grounded Theory*. Vol. 2. Sage Publications, 2014. P. 4.

¹³⁸ Charmaz, Kathy. *Constructing Grounded Theory*. Vol. 2. Sage Publications, 2014. P. 4.

¹³⁹ Herr, Kathryn, and Gary Anderson. *The Action Research Dissertation: A Guide for Students and Faculty*. 2nd ed. Canada: Sage Publications, 2015. P. 75.

¹⁴⁰ Charmaz, Kathy. *Constructing Grounded Theory*. Vol. 2. Sage Publications, 2014. P. 13.

¹⁴¹ Charmaz, Kathy. *Constructing Grounded Theory*. Vol. 2. Sage Publications, 2014. P. 35.

heritage field as interviews instead of as surveys or ethnographic observations.¹⁴² As this thesis became a project rooted in the COVID pandemic period, it was essential to be thoughtful about interviews, and as criteria for the interviewees was being developed I opted to focus on purposive sampling. With purposive sampling the guiding logic when deciding who to recruit is to identify the most relevant participants in terms of being rich in insights.¹⁴³ By focusing on purposive sampling it was also possible to focus on depth over breadth; and though limiting in representativeness, it allowed for richer insights from participants.

Initially, I intended for these interviews to occur throughout 2021-2022, when the various workflows had all been launched and publicly available. From a design standpoint, semi-structured interviews seemed to be the best fit as it allowed for organization of a topic guide with 3-5 broad topics, which when discussing a project with professional colleagues seemed the best way to gauge various questions surrounding the research. However, due to the continual closure of institutions and travel bans put into place due to the pandemic, all interviews for this thesis had to be redesigned to be done remotely.¹⁴⁴ Since it is key with interviews to select a place where both the participant and the research can feel relaxed and uninterrupted,¹⁴⁵ and with the knowledge that many professional colleagues were working from home with families around, I made the decision to conduct all the interviews via email instead of a video conferencing platform like Zoom.

In order to gauge how those within the cultural heritage field would react to my thesis projects and findings, I focused on reaching out to those in the field who had worked on crowdsourcing projects in the past or concurrently with my own project timeline. I identified teams at the British Library, The Massachusetts Institute of Technology, Cleveland Museum of Art, Metropolitan Museum of Art, Wolfsonian FIU, the Newberry, and the Getty. Participant Agreements were procured before moving any further, which laid out expectations of time needed for the interview process, reassurance that contribution was on a voluntary basis, reminder that consent could be withdrawn at any time, indication of how responses would be

¹⁴² Knott, Eleanor, Aliya Hamid Rao, Kate Summers, and Chana Teeger. "Interviews in the Social Sciences." *Nature Reviews Methods Primers* 2, no. 1 (September 15, 2022): 1–15. <https://doi.org/10.1038/s43586-022-00150-6>.

¹⁴³ Knott, Eleanor, Aliya Hamid Rao, Kate Summers, and Chana Teeger. "Interviews in the Social Sciences." *Nature Reviews Methods Primers* 2, no. 1 (September 15, 2022): 1–15. <https://doi.org/10.1038/s43586-022-00150-6>.

¹⁴⁴ Oct 2018. "Interview Data in Action Research." Accessed November 3, 2023. <https://www.hltmag.co.uk/oct18/interview-data>.

¹⁴⁵ Knott, Eleanor, Aliya Hamid Rao, Kate Summers, and Chana Teeger. "Interviews in the Social Sciences." *Nature Reviews Methods Primers* 2, no. 1 (September 15, 2022): 1–15. <https://doi.org/10.1038/s43586-022-00150-6>.

stored, as well as agreement to identification or anonymity with an agreed upon review of the transcript.¹⁴⁶

Ultimately, teams from the British Library, the Metropolitan Museum of Art, and the Getty responded that their bandwidth allowed for participation in the interview process, agreeing to answer seven questions via email. Answers were submitted from the British Library by Mia Ridge, from the Metropolitan Museum of Art by the Collection Information Team with Jeannie Choi taking the lead on correspondence, and from the Getty by Drawings and Paintings Team with Edina Adams and Casey Lee taking lead on correspondence. The questions posed were:

1. What was the major motivation behind the creation of your crowdsourcing projects at the (institution name)? Throughout the course of the projects did your motivations change, and if so, how?
2. Since beginning these kinds of projects, what has been the most important takeaway for you as a project lead? What has been the most difficult part?
3. Would you undergo another crowdsourcing project using your collections? And if so, what lessons would you apply from previous projects to the next one?
4. What advice would you give to someone in the cultural heritage field who wanted to create a collections based crowdsourcing project?
5. How have you designed or run your projects to ensure diversity in your users? Was diversity or inclusion a stated purpose of these projects? Have you noted if your project users are heterogeneous?
6. Did your project have any impact on your institution's policies and practices?
7. Do you see the need for more institutions to create these sorts of projects? Why or why not?

In order to analyze the interview materials I opted for a thematic analysis which worked well with the Grounded Theory constructivist approach taken to the other qualitative data analysis. With thematic analysis the interview material was also coded and interpreted by

¹⁴⁶ Knott, Eleanor, Aliya Hamid Rao, Kate Summers, and Chana Teeger. "Interviews in the Social Sciences." *Nature Reviews Methods Primers* 2, no. 1 (September 15, 2022): 1–15. <https://doi.org/10.1038/s43586-022-00150-6>.

Oct 2018. "Interview Data in Action Research." Accessed November 3, 2023. <https://www.hltmag.co.uk/oct18/interview-data>.

themes that emerged from the data¹⁴⁷ and it was also able to compare the coding segments from the surveys and Talkboards with those of the interviews.¹⁴⁸

Participant Identification and Recruitment Practices:

An additional question that has been raised when discussing the creation of the case study, the processing of results, and how to incorporate tags into the database centered around understanding who the audience for the *Tag Along with Adler* project actually is. As I discussed this project as a way to center the public's language into the Adler's database (and, in fact, the usefulness of crowdsourced projects for this task in other institutions), how does one know they are getting a representative cross section of the public participating in this project? Importantly for this thesis, it's crucial to determine who the Adler Planetarium considers the "public" to be, as the demographic breakdown of the world, the United States, the Chicagoland area, the guests who attend the Adler, the users of Zooniverse, and so on will all be distinctly different. For the purpose of this thesis and the *Tag Along with Adler* project, no specific demographic distribution is being targeted. However, data from Zooniverse and from the Adler Planetarium on their volunteer/visitor demographic distribution will be used as a baseline, with a survey that *Tag Along with Adler* volunteers can participate in being made available and appended to the project text.¹⁴⁹

The Zooniverse platform's volunteer demographic distributions are last available from 5 March 2015, which covers a survey distributed throughout the summer of 2014 as part of Victoria Homsy's Master's thesis.¹⁵⁰ Of the 3,000 people sent the survey, around 300 responded, and it was noted that "They were not a random sample of users, rather they were people who had logged-in to the Zooniverse at least once in the three months before we emailed them."¹⁵¹ From the survey, it was ascertained that the Zooniverse community has roughly a 60/40 split in gender, with male at 60% and female at 40%. Interestingly, the distribution across age groups was fairly stable, though with a slight tilt away from 60+. It was also reported that for user location, the breakdown between US/UK/the rest of the world is basically a three-way split.

¹⁴⁷ Knott, Eleanor, Aliya Hamid Rao, Kate Summers, and Chana Teeger. "Interviews in the Social Sciences." *Nature Reviews Methods Primers* 2, no. 1 (September 15, 2022): 1–15. <https://doi.org/10.1038/s43586-022-00150-6>.

¹⁴⁸ Somekh, Bridget, Allan Feldman, Herbert Altrichter, Peter Posch. *Teachers Investigate Their Work: An Introduction to Action Research across the Professions*. 3rd ed. London: Routledge, 2018. <https://doi.org/10.4324/9781315398822>.

¹⁴⁹ **Appendix 15: Tag Along with Adler User Survey** link: <https://docs.google.com/forms/d/e/1FAIpQLSfkmwYpPciVLBi0vGOkxH3daFw4mw6dkXpidxpE4DPHjACg/viewform>

¹⁵⁰ <https://blog.zooniverse.org/2015/03/05/who-are-the-zooniverse-community-we-asked-them/>

¹⁵¹ <https://blog.zooniverse.org/2015/03/05/who-are-the-zooniverse-community-we-asked-them/>

However, specific user demographic statistics for Zooniverse can also be found in the 2019 article by Spiers et al. “Everyone counts? Design considerations in online citizen science.”¹⁵² In particular, this article references demographics for age and gender across five Zooniverse projects, not the entire platform. These demographics do demonstrate that certain subject types reflect variations in users; for example, projects centered on astronomy saw a demographic split on average around 30% female to 70% male, whereas projects centered on ecology saw demographic splits on average around 60% female to 40% male. No information was recorded for race or education level, however, in either set of demographic research.

In a survey of citizen science projects run by the National Academies of Sciences, Engineering, and Medicine; Division of Behavioral and Social Sciences and Education; Board on Science Education; Committee on Designing Citizen Science to Support Science Learning in 2018, of the 125 projects where managers or directors responded to the survey, only a subset of 44%-69% were able to provide demographic data. This data however reflected that almost all project managers who reported demographics for race and ethnicity reported that “all” or “most” of the participants were White (88.6%), while only 6.1% indicated the same level of participation by Hispanics, 4.6% participation for Asians, and no project reported overwhelming participation among Black or Indigenous communities.¹⁵³ In fact, projects with a higher-than-average participation of one or more minority groups were either outside of the United States (e.g., Migrant Watch and Citizen Sparrow are two bird-focused citizen science projects in India, with a majority of Asian participants), or were geographically linked to a site with high cultural importance (e.g., the Camas Citizen Science Monitoring Program, centered on the Nez Perce National Historical Park's Weippe Prairie Site, is a project of the National Park Service in which high school students monitor camas flowering and incorporate aspects of the cultural and ecological values of this native prairie plant).¹⁵⁴

Similarly, a publication in 2020 published by “Theory and Practice: Citizen Science” reflected that in a survey of the RiverWatch citizen science project, data indicated that

¹⁵² Spiers, Helen, Alexandra Swanson, Lucy Fortson, Brooke Simmons, Laura Trouille, Samantha Blickhan, and Chris Lintott. “Everyone Counts? Design Considerations in Online Citizen Science.” *Journal of Science Communication* 18, no. 1 (January 17, 2019). <https://doi.org/10.22323/2.18010204>.

¹⁵³ National Academies of Sciences, Engineering, Division of Behavioral and Social Sciences and Education, Board on Science Education, Committee on Designing Citizen Science to Support Science Learning, Kenne Ann Dibner, and Rajul Pandya. *Demographic Analyses of Citizen Science. Learning Through Citizen Science: Enhancing Opportunities by Design*. National Academies Press (US), 2018. <https://www.ncbi.nlm.nih.gov/books/NBK535967/>.

¹⁵⁴ National Academies of Sciences, Engineering, Division of Behavioral and Social Sciences and Education, Board on Science Education, Committee on Designing Citizen Science to Support Science Learning, Kenne Ann Dibner, and Rajul Pandya. *Demographic Analyses of Citizen Science. Learning Through Citizen Science: Enhancing Opportunities by Design*. National Academies Press (US), 2018. <https://www.ncbi.nlm.nih.gov/books/NBK535967/>.

participants were “disproportionately white, highly educated, and affluent compared with the Illinois [site of RiverWatch] general population.”¹⁵⁵ These demographics from Zooniverse surveys and the more current literature continue to demonstrate limitations of citizen science projects, as I will touch upon further on (*pg. 148*).

In comparison to the results of the Zooniverse platform (and citizen science in general), the Adler Planetarium ran a Visitor Intercept Survey in 2018 for eight days, from 3 August to 6 August 2018, and from 13 September to 16 September 2018. During this time, over 2,500 participants voluntarily participated in a survey gauging their motivations for visiting as well as providing demographic information. During the same time an Online Visitor Survey was distributed to approximately 25,000 visitor email accounts that had been collected from online ticket purchasers from 2016-2018. A total of 1,377 recent visitors completed this survey from 19 September to 21 October 2018. For purposes here, I will focus on the demographic information, noting that there were 21 questions in total asked of survey participants that can be seen in **Appendix 4**.¹⁵⁶

Compared to the results of the Zooniverse platform survey, the Adler Planetarium reports found that 54.8% of visitors identified as female, and 45.2% identified as male; with the two genders being the only option of this survey which admittedly neglects to account for those who do not feel represented by the gender binary. Whereas the Zooniverse age range begins at 18, the Adler Planetarium does see children onsite, though the survey report showed roughly 60% of visitor groups did not include children. For groups that included children, roughly 70% were under the age of 12, with about 30% over the age of 12. For adults, the visitor age range skewed higher under 45, with 68.2% of visitors under 45.

Unlike the Zooniverse survey, the Intercept Survey also showed racial/ethnic background demographics, showing that 53.7% of survey participants identified as White/Caucasian, 18% as Asian, 15.6% as Hispanic or Latino, 3.2% as Black or African American, 3.4% as Mixed Race/Ethnic, with the remaining 6.1% being a mix of American Indian/Alaska Native, Native Hawaiian/Pacific Islander, or Other. This survey also asked about education. The Intercept Survey showed that roughly 32% of Adler visitors held an Undergraduate Degree, 22.6% held a Master’s Degree, 16% held a Professional/Doctoral Degree, with remaining quarter of surveyed

¹⁵⁵ Blake, Charlie, Allison Rhanor, and Cody Pajic. “The Demographics of Citizen Science Participation and Its Implications for Data Quality and Environmental Justice.” *Citizen Science: Theory and Practice* 5, no. 1 (October 7, 2020): 21. <https://doi.org/10.5334/cstp.320>.

¹⁵⁶ **Appendix 4: Adler Survey of Visitors and Supporters -- Graphical Key Finding Report - January 8 2019** : <https://drive.google.com/file/d/1LA60o7XDNx2DIeZCiBohGYuF5nJgBydE/view?usp=sharing>

guests distributed amongst the categories of Some High School, High School/GED, Community College/Trade School, and Some University/College.

This recognition that, though there is likely overlap in the demographics of the Zooniverse.org user base and that of the Adler Planetarium user base, there is also initial evidence of the Adler Planetarium having a more diverse audience; however, this may be from the lack of survey and data from the Zooniverse.org platform, but I can only use the information I have at my disposal. For this reason, the initial plan was made to run this project on the Zooniverse online platform, while also running the Zooniverse MuseumMode interactive onsite at the Adler Planetarium. This would have allowed me to further analyze whether tags and engagement differed between the Zooniverse and Adler audiences; however due to the COVID-19 pandemic and the closure of the Adler Planetarium from March 2020-March 2022, the onsite MuseumMode interactive was abandoned.

As the purpose of this project is to provide more representational access points to the Adler Planetarium's collections, it is helpful to note these demographics and these surveys come with margins of error and issues with sample sizes. However, they do provide a baseline knowledge of who the Zooniverse and Adler user bases are, as the project primarily targeted these two audience bases. As part of the project, a survey was designed to gauge not only demographics including gender, race/ethnicity, and educational background, but also to gauge interests and engagement with the collections, the platform, and the project. Much in the way the Zooniverse-created survey for beta testing provided a base of qualitative data during this beta test, my hope was that this demographic survey could provide a qualitative data basis for the project at large, with questions centering on experience and perceived trust, to complement the quantitative data that was processed from the project results and the demographic questions on this survey. It was my intention to use these qualitative responses to the survey to help gauge whether the "potential benefits to online citizen science based research include a reduction in data processing time and cost, and the engagement of a more diverse crowd that may include typically underrepresented skills or demographic features" as stipulated by Spiers et al.¹⁵⁷

Besides just demographic diversity, it is important to note the engagement of users and recruitment processes more widely as integral to project success. "The inclusion of a citizen science project on a successful citizen science platform website such as the Zooniverse does not guarantee high levels of engagement alone, as measured by number of classifications, and

¹⁵⁷ Spiers et al., "Everyone Counts?"

that some projects are far more successful at attracting classifications than others.”¹⁵⁸ As discussed previously, project design and iteration as well as engagement with users on “Talk” boards, were specific decisions made to maximize engagement. Moving beyond the Zooniverse platform, however, the *Tag Along with Adler* project was also actively marketed in order to appeal to and attract non-Zooniverse users and/or non-Adler audiences to participate.

This active marketing was crucial in particular for the gamified workflow, which was marketed to two distinct audiences: the first being the *Being Human Festival 2021* participants based in the United Kingdom, and the second being the Adler Planetarium’s email listserv and social media audiences. The *Being Human Festival* targeted a humanities-engaged audience, but one that is not specifically associated with citizen science, while the Adler Planetarium’s email listserv targets a museum-centric audience whilst COVID-19-induced building closures made interacting with guests onsite impossible, and the Adler Planetarium’s social media accounts targeted a predominately millennial social media audience.

The *Being Human Festival* audience differs each year, with audience metrics available for years 2014-2020.¹⁵⁹ For this specific thesis, the statistics for year 2020 are most prevalent, as both 2020 and 2021 were mainly hosted online or hybrid due to the continual COVID-19 pandemic. Though previous in-person years still lend some understanding to the *Being Human Festival* audience, there are differences in expectations and participation for an online or hybrid festival, so I will focus most specifically on the 2020 audience profile and statistics.

In 2020, the *Festival* accounted for almost 300 free events that took place during the month of November across the United Kingdom. An estimated 22,720 people watched an event live/in real time across 262 events nationwide, with an additional 12,904 people watching recordings of the events afterwards but still during the festival time period. Including those who accessed festival materials outside of the designated festival runtime, the 2020 *Being Human Festival* saw over 66,000 views on the recorded materials included in the festival itself. When looking at this audience’s demographics, a reported 2,047 people participated in an audience survey.¹⁶⁰ Survey respondents indicated that the audience profile for the *Being Human Festival 2020* audience was: 72% female, 10% Black/Asian/or minority ethnic background, 14%

¹⁵⁸ Spiers et al., “Everyone Counts?”

¹⁵⁹ Venn, Liberty. “Being Human Festival 2020: An Evaluation of Impact & Engagement,” May 2021. <https://www.beinghumanfestival.org/sites/default/files/file-uploads/2021-07/2020%20Being%20Human%20Festival%20Evaluation.pdf>.

¹⁶⁰ Venn, Liberty. “Being Human Festival 2020: An Evaluation of Impact & Engagement,” May 2021. <https://www.beinghumanfestival.org/sites/default/files/file-uploads/2021-07/2020%20Being%20Human%20Festival%20Evaluation.pdf>. pg. 3

disabled, 86% university educated (with 67% of these holding a degree in the humanities), and a median age of 45-54 years of age.

The Adler Planetarium's email listserv consisted of 25,054 subscribed individuals, of which 3,457 are Adler members. The Adler's social media reach for the COVID-19 shutdown period and subsequent testing period of this project (14 March 2020 to 15 March 2022) was 710,615 via Facebook (with 28,011 active engagements), 1,040,289 via Instagram (with 37,879 active engagements), and 1,283,295 via Twitter (with 35,911 active engagements).¹⁶¹ According to surveys conducted through May 2020, the Adler Planetarium's social media across Facebook, Twitter, and Instagram is used predominately by users between 25 and 44 years of age (accounting for 60.08% of users). Of these, 59.06% identify as female, and 40.14% identify as male (with majority female users on Facebook and Instagram, and majority male users on Twitter).

According to the previously cited Visitor Intercept Survey report on Adler Planetarium visitors and members, the demographic data from this report showed that the Adler's member audience was: 13.3% aged 25-44, 33.2% aged 35-44, and 20.7% aged 45-54 (46.5% are the same 25-44 age group as social media; but there is a significantly higher percentage of members in the 45-54 age bracket). In this case, including the Adler Planetarium's member listserv on top of their social media channels for distributing the gamified workflow meant that a more representational group was included, at least age-wise. As the Adler Planetarium does not track demographic information such as race or ethnicity for their social media audiences, the Visitor Intercept Survey can be used to provide a baseline of these demographics for the gamified workflow, but will not capture the full diversity. The demographic survey appended to the gamified workflow was intended to provide more specific information about the users, in much the way the same survey was being used on the Zooniverse platform.

Data Collection and Analysis:

When talking about data collection and analysis, it is important to first define certain terms that will permeate the remainder of this thesis. For the purpose of this thesis, a classification will be defined and referenced in regards to how a classification functions on the Zooniverse platform. "The term 'classification' is used to denote a single unit of analysis on a project by a volunteer, such as the tagging of an image or a video, whereas the term 'subject' refers to a single data object such as an image, video or graph."¹⁶² A *classification* is a single

¹⁶¹ This data was provided by Adler Planetarium's Marketing Department Manager, Colleen Cesaretti (ccesaretti@adlerplanetarium.org)

¹⁶² Spiers et al., "Everyone Counts?"

task sometimes containing multiple data points surrounding a single subject set; i.e. the AI tags selected for image P-140, or the tags added for image P-14. For this project, a single-subject set is an image: in “Verify AI Tags,” that image has text overlaid on top, and the tasks include a “point” tool that asks users to click on the text they wish to verify (one classification) before providing them with space to add their own tags too (one classification). In “Tag Images,” the image has no additional layers, and the tasks are to just provide their own tags within the space (one classification). Depending on the workflow, there can be multiple tags or verifications per classification, but it is a singular classification regardless of how many tags were added or how many words were verified.

As part of the export of data that comes from Zooniverse, a CSV file is downloaded that contains additional information on top of the classification data. Included in the CSV export are the 14 different data fields¹⁶³, and for my purposes, I am prioritizing the data in these fields (**Appendix 5**).¹⁶⁴ The process of extracting the data from the project export was a manual process I undertook. Upon receiving this data export, I added these specific fields into a separate Google Sheets for each workflow and subject set (**Appendices 6a-v**)¹⁶⁵, while saving

¹⁶³ <https://help.zooniverse.org/next-steps/data-exports/>

¹⁶⁴ **Appendix 5: Zooniverse Data Exports:**

https://docs.google.com/document/d/1SCpAzoFdqqWAKJ7QO_lhdbmNZgdQ8wacSPATacS2zB0/edit?usp=sharing

¹⁶⁵ **Appendix 6: Exports**

Subject Set 1:

Appendix 6a: Verify AI Tags:

https://docs.google.com/spreadsheets/d/19d7c-y9JchdbLNc_MDfheUTqIN3fsUoxq1aR8Rb23K0/edit?usp=sharing

Appendix 6b: Tag Images:

https://docs.google.com/spreadsheets/d/1dfkYSBoKTCetmEGSggrDswgl7ppUGit_RzdHjdmc4yc/edit?usp=sharing

Subject Set 2:

Appendix 6c: Verify AI Tags:

<https://docs.google.com/spreadsheets/d/1160eoFuThjPUrjPvSyt4PNfoL0DJqct0un9ibnm0M0/edit?usp=sharing>

Appendix 6d: Tag Images:

<https://docs.google.com/spreadsheets/d/1EzTPVc9JalvltEY15qGYPcwAhS4Ge4F7F2YPB4TIsU/edit?usp=sharing>

Subject Set 3:

Appendix 6e: Verify AI Tags:

https://docs.google.com/spreadsheets/d/1uGiJ1FDuB_0SFGwOQQ2PRSeKfmbM7GvwTQj1wYnNtfU/edit?usp=sharing

Appendix 6f: Tag Images:

<https://docs.google.com/spreadsheets/d/1apXLFH2M8hyAQ55h4fO-TL47GjRZJZnNWscuUDhReiA/edit?usp=sharing>

Subject Set 4:

Appendix 6g: Verify AI Tags:

<https://docs.google.com/spreadsheets/d/1d7voXDDauccg53XNq9RcWYwXFtr2J92v575DTrsZTq4/edit?usp=sharing>

the original CSV file. Operating within Google Sheets allows for an easier range of access and

Appendix 6h: *Tag Images:*

https://docs.google.com/spreadsheets/d/12J-slfKkWb50xh5stDVu8xec52117AIzGEPH_59WIM/edit?usp=sharing

Subject Set 5:

Appendix 6i: *Verify AI Tags:*

<https://docs.google.com/spreadsheets/d/1TQFVYY-3QU7Z65gigb0R993kXbO9cIBy7tcA-TOJQpU/edit?usp=sharing>

Appendix 6j: *Tag Images:*

<https://docs.google.com/spreadsheets/d/15MoeRNZFKcDJapLBAHr8FzfwMJ88WzRAvwzeXTsv268/edit?usp=sharing>

Subject Set 6:

Appendix 6k: *Verify AI Tags:*

<https://docs.google.com/spreadsheets/d/1UHA8Zh96AWmdjRPFWmeKqGYPUKt4xhc6StOnipqybps/edit?usp=sharing>

Appendix 6l: *Tag Images:*

<https://docs.google.com/spreadsheets/d/1BYa3PiUvL9vv41tJMvysZF8QV7ambiMyK6LCVEQgWNo/edit?usp=sharing>

Subject Set 7:

Appendix 6m: *Verify AI Tags:*

<https://docs.google.com/spreadsheets/d/1lmwRUw9iZIOuU-SVMsITNI6KFrOvN-JhdsShWHtucZM/edit?usp=sharing>

Appendix 6n: *Tag Images:*

https://docs.google.com/spreadsheets/d/1TuF6EkFkCVRIsF-jO_5pSAnn5pcybIFg3nJGDUBFJSg/edit?usp=sharing

Subject 8:

Appendix 6o: *Verify AI Tags:*

https://docs.google.com/spreadsheets/d/1ArfXnHhiUXtUfXKlq7HwXSDGMe_lmCAmb6rqGUVJo7o/edit?usp=sharing

Appendix 6p: *Tag Images:*

<https://docs.google.com/spreadsheets/d/1irkXNfu9If9yE2sAoTYiCifzMJ2KU1lqsEKWKYVHQyg/edit?usp=sharing>

Subject 9:

Appendix 6q: *Verify AI Tags:*

<https://docs.google.com/spreadsheets/d/18hQVrhC-hOj9V9leNVFHaCoh7QadYOhCpyHb6FSCuWE/edit?usp=sharing>

Appendix 6r: *Tag Images:*

<https://docs.google.com/spreadsheets/d/1XkSWSLAHJNrb70Tc-iuOABJB-qdiXeAnTMpc8Sf8sl/edit?usp=sharing>

Subject 10:

Appendix 6s: *Verify AI Tags:*

https://docs.google.com/spreadsheets/d/1D_IEwrsme5XIoT88nqUA9y80rylxd5Lm2SznXavpmhM/edit?usp=sharing

Appendix 6t: *Tag Images:*

https://docs.google.com/spreadsheets/d/1pfnOlnHQpRLPKJWFbzdQP0NG6lkmTt38UXVILX5Gb_k/edit?usp=sharing

Subject 11:

Appendix 6u: *Verify AI Tags:*

<https://docs.google.com/spreadsheets/d/1VTINhpdIJt4dx5L22w-nFX3rtErWQm7-O25tYyeWEnk/edit?usp=sharing>

Appendix 6v: *Tag Images:*

https://docs.google.com/spreadsheets/d/1dwoF2sg0bC9lfJBEpUrHI8DGOUCzclOTRHcd_Wu3Wno/edit?usp=sharing

sharing of the data. Once the data from the CSV file is populated in a Google Sheet, I made a secondary Google Sheet (**Appendix 7**)¹⁶⁶ that only houses the Adler accession number associated with each distinct image file, as well as all the terms created by users while tagging that specific image, tags generated by AI Tagging models for that specific image, and tags available in the Adler catalog for that specific image. Each term gets its own row, where it is associated with both the image file and the accession number, as this aids in later tasks such as determining prevalence of individual tags.

Once the tags are added and formatted in a way where each tag is in a separate row, it is possible to run the tabs through the Tableau software, which looks for prevalence and provides numerical data on the frequency of individual terms. These are exported as an additional tab in the Google Sheet labeled “TagImages_Counts” and “VerifyAITags_Counts” respectively. These show only two pieces of information: the user-generated tag, and the frequency with which it is represented within the selected tab.

This particular step helps to establish certain trends in tagging, and in particular within the processing of the beta test results, it helped to confirm early suspicions that this project would result in the Long Tail theory discussed in the **Chapter 3: Literature Review**. Running the tags through the Tableau software helped to not only confirm the individual tags that were added, but it also helped to visualize the frequency with which the user tags were added.

After the tags were formatted by Tableau, I took the spreadsheets I had created earlier in the project that recorded every term for each of the objects/images included in this project searchable on the Adler’s public online catalog, and I compared the user-generated terms against those created by the Adler’s cataloging teams. Again, this was a manual process, and it is important to note that human error is therefore expected in the results.

Within the spreadsheets, I formatted the user-generated tagging data to include bolded characters and two different highlighted colors. This was used to track the overlap of user generated tags with that of the Adler cataloging language (terms were bolded when they were also present in the Adler catalog), and the two different AI tagging models used in this project (terms were highlighted green if also present in the Metropolitan TensorFlow model tags, and highlighted red if also present in the Google Cloud Vision API model tags). This step made it possible to analyze how many of the user-generated tags for both workflows were completely new terms to the Adler vs. terms that were already present in the Adler’s catalog and searchable by the public, or readily defined by the AI tagging models.

¹⁶⁶ **Appendix 7: Data Management for All Generated Terms:**
<https://docs.google.com/spreadsheets/d/1z9j62wIRilcb4jivHcPJnPV6Uv7wzPX-cA4Tf7SG2L4/edit?usp=sharing>

For the “Verify AI Tags” workflow, an additional step is required. In order to gauge the verification task itself (the “point” task to select any AI tags that the user would use to describe the image), an aggregation tool stage was needed. The data export from the Zooniverse platform includes the image coordinates that are selected in each classification; however, with 50 classifications needed to retire a single image, it quickly becomes an onerous task to try to match over 50,000 coordinate points. In order to more accurately and quickly identify these coordinate points, I worked with the aggregation code the Zooniverse team had published previously for anyone to use.¹⁶⁷ I specifically wanted to use the open source code available to any researcher, so as to transparently show how this process would work for any other institution or researcher attempting to duplicate this study. I used a video walk-through of a workshop hosted by Zooniverse programmer Coleman Krawczyk¹⁶⁸ and a sample data set shared on GitHub.¹⁶⁹

As such, the data aggregation steps for processing this task began with downloading the Miniconda software, a free minimal installer for conda, with Python version 3.8. Though I followed the steps in the publicly available Zooniverse aggregation-caesar document,¹⁷⁰ I did also have assistance from Dr. L. Clifton Johnson, Zooniverse lead at the Adler Planetarium and Northwestern University. Dr. Johnson helped me run through the initial stages to ensure I had the processing down, as my knowledge of coding was minimal before this project launched. As previously mentioned, though the work of the thesis and this project were solely managed by myself, I did rely on the collaborative nature of digital humanities work to assist in areas my own knowledge lacked.

Using the same data exports I describe above for textual tag analysis, I followed the Zooniverse GitHub instructions for using the Graphical User Interface (GUI).¹⁷¹ For my limited coding capabilities, I found the GUI easier to utilize and understand, even though the output would have been the same had I chosen to follow the instructions for Python coding commands. The first stage is to configure the extractors and reducers. I followed instructions within the “config” tab to create “yaml” files for each individual workflow,¹⁷² uploading the CSV data export, the current “workflow_id,” “major,” and “minor_version” numbers featured in the CSV data export. This created four distinct “yaml” files:

¹⁶⁷ <https://aggregation-caesar.zooniverse.org/Scripts.html>

¹⁶⁸ <https://www.youtube.com/watch?v=o9SzgsZvOCg&t=3840s>

¹⁶⁹ https://github.com/ou-escape-eco/first-escape-cs-workshop/tree/main/aggregation_tutorial

¹⁷⁰ <https://help.zooniverse.org/next-steps/caesar-realtime-data-processing/>

¹⁷¹ <https://aggregation-caesar.zooniverse.org/GUI.html>

¹⁷² Any changes to the “Tag Images” or “Verify AI Tags” workflows resulted in a new workflow ID, so as the project iterated the “config” files had to be remade to match the current workflow ID.

- Extractor_config_workflow.yaml: The configuration for the extractor code
- Reducer_config_workflow_point_extractor_by_frame.yaml: The configuration for the reducer used for the “point” task
- Reducer_config_workflow_question_extractor.yaml: The configuration for the reducer used for the “question” task
- Task_labels_workflow_.yaml: A lookup table to translate the column names used in the extractor/reducer output files into the text originally used on the workflow.

Taking a look at the extractor configuration file (**Appendix 8**)¹⁷³ shows that the point_extractor_by-frame will pull for the T0 field, which is the Task 0, or the “point” task within the “Verify AI Tags” workflow. This extractor “yaml” can then be used within the “extract” GUI tab along with the classification CSV file to create a point_extractor_by_frame.csv file. This CSV file includes the X and Y coordinates for each of the AI tag boxes selected within classification. This CSV is then used in the “reduce” GUI tab along with the configuration file. This step creates a single CSV that reduces the points generated per image into one line, making it possible to gauge the frequency of AI tag selection per image, as well as the coordinates for each selection which can then be matched to the actual term.

This step of matching the coordinates to the term included the necessity for a piece of code created by Dr. Johnson as part of the Adler Planetarium and Zooniverse.org project “Mapping Historic Skies,” which overlays coordinates and frequency onto the actual image file shown in **Appendix 9**.¹⁷⁴ This made it possible to see the number of selections for each of the boxes, though it did necessitate visually processing all 1,090 images files in the “Verify AI Tags” workflow. Upon this step, though, the frequency of tag verifications was added to the AI tagging model tabs in the data tracking spreadsheet to be able to see which of the terms created by the iMet and Google Cloud Vision taggers were verified by users and at what frequency.

By processing the textual tags submitted in the various workflows, as well as the verified AI tag coordinate points, it was possible to track which tags were submitted under which conditions (workflow, workflow version), enabling the ability to analyze differences, similarities, and patterns critical to determining optimal conditions for tag production, accuracy, and diversity. It also enabled all tags created across the various workflows and projects to be seen in one

¹⁷³ **Appendix 8** is available here:

https://drive.google.com/file/d/1w4Ex_WlwGLzxlHz_W1slZgxWI72HlzWI/view?usp=sharing

¹⁷⁴ **Appendix 9**, available here:

<https://drive.google.com/file/d/1tjc0sLvvd7yDq4ACDAWfSwORwo9GO8ut/view?usp=sharing>

central location.¹⁷⁵ Having all tags created like this not only assisted my own research, but also enabled the tag usability for the Adler Planetarium. As this was a practice-based action research method, the data was being actively used as part of my position at the Adler Planetarium. In particular, this affected a quality assurance stage of this project, and within the data collection and analysis stage. After I processed all the tags created across the workflows and projects, the user generated tags were flagged in what is being called the “QA for Wrongness” process.

The “QA for Wrongness” process is thus called specifically to demarcate that this process is only to flag tags that are unequivocally wrong, so as not to add wrong information into the Adler’s catalog. In this process, Dr. Pedro Raposo, director of collections and curator at the Adler Planetarium, was given a Google Sheet for each specific workflow as seen in **Appendices 10¹⁷⁶ and 11.¹⁷⁷** He then added an “X” into the specified column for any wrong tags with a note for any that are not “wrong, but misleading.” This secondary note process was added after beta testing, when it was realized that some tags that are technically accurate may still affect searchability from a *curatorial* standpoint. I tracked both the tags marked unequivocally as wrong and those marked as misleading, as it is important to have discussions on how often wrong tags are created in each circumstance and workflow, but also to discuss trends in what a curator deems misleading or unnecessary, though, importantly, not wrong. Further discussion of this will be handled in future chapters, but now I raise it to flag that the conversation on institutional control over the project process was identified and planned for within the methodology and project design.

Limitations to Method and Project Design:

Language:

As shown above there were specific reasons and motivations for choosing to center this practice-based action research within the collections of the Adler Planetarium, using pre-existing third-party platform Zooniverse.org, and iteratively testing across various workflows and projects. However, each of these choices does come with its own limitations. In order to assert

¹⁷⁵ **Appendix 7: Data Management for All Generated Terms**, can be accessed here: <https://docs.google.com/spreadsheets/d/1z9j62wIRilcb4jivHcPJnPV6Uv7wzPX-cA4Tf7SG2L4/edit?usp=sharing>

¹⁷⁶ **Appendix 10: Verify AI Curator Verification Stage**, can be accessed here: <https://docs.google.com/spreadsheets/d/1FvKFIBN4rK9IBMmKr4HLenBz1G72VanImoGXdqIt0sY/edit?usp=sharing>

¹⁷⁷ **Appendix 11: Tag Images Curator Verification Stage**, can be accessed here: <https://docs.google.com/spreadsheets/d/1kSKytpMZ4gbNy2bAp1OOOkVU4O-4ciOE5ID6H917Z8/edit?usp=sharing>

the reach of this thesis outside of the Adler Planetarium and across the cultural heritage sector, these limitations must be transparently stated. In this section, I will highlight ways in which limitations are accounted for, but are still present.

An early recognized limitation to this case study across the various component projects is a reliance on English language, and truly the exclusion of all other languages. As discussed, this project was built in English on the Zooniverse.org platform, which has over two-thirds of its users identified as UK or USA residents, and the majority of the projects on the site only available in English.¹⁷⁸ The Adler Planetarium did not have demographic information on users' language capabilities; however, being based in the city of Chicago, it becomes important to note that 35.8% of Chicago citizens are speakers of a non-English language.¹⁷⁹ Though these kinds of metrics do not provide a clear idea of how many non-English speakers are precluded from the experiences as UK/USA residents may speak English and another language and a citizen who is a non-English language speaker may also speak English, they do serve as metrics that presenting projects in only one language is setting a project up to be exclusionary.

After the beta test that was run in February 2021 for the Zooniverse online project, it became a noted issue for the Adler Planetarium Collections team that the projects were limited to English, as tags were submitted in Russian and Chinese characters unsupported by Zooniverse functionality, as well as in French, Spanish, German, and more. Though the Collections team at the Adler Planetarium overwhelmingly agreed that including foreign language tags within the project would be enriching to foreign language search of the database, issues with the database prevented the team from wanting to add instructions to encourage this sort of search.

The Adler's collections database is not available to search in any language other than English, and due to this, the vast majority of the searchable terms in the database are in English with noted foreign language tags being present when titles of books or pieces, or inscription, are written in a foreign language. Though the database is not fully translated into any other languages, and though it cannot support any character-based languages such as Arabic or Chinese, it is possible to have terms in German or Spanish returned, but the limitation is based on what is added to the database in that language. Dr. Raposo, the curator and director of collections at the Adler Planetarium, made the argument that encouraging users to add tags in

¹⁷⁸<https://blog.zooniverse.org/2015/03/05/who-are-the-zooniverse-community-we-asked-them/>

¹⁷⁹

<https://embed.datausa.io/profile/geo/chicago-il/demographics/languages#:~:text=Non%2DEnglish%20Speakers&text=35.8%25%20of%20Chicago%2C%20IL%20citizens.IL%20are%20native%20Spanish%20speakers.>

non-English languages could limit search results in the database later, as it provides a false sense of confidence that foreign language searches will return in the database. For instance, a user to the project may have added “la rosa” as a term in the project, and may search the Adler’s database after the fact for “la rosa”. Though they may return the singular tag they submitted during the project, it would not return the countless other objects that feature the English tag “the rose.” These limitations of the existing cataloging systems when it comes to diversifying data and metadata will be further discussed and explored in **Chapter 6: Conclusion** but are important to note here.

These conversations also led to considering the ways in which adapting foreign language tags could diminish the value and intent of the semantic meaning of the tag. If one were to allow foreign language terms, one would need to run them through translation software to ensure that the tags received the same level of QA as other tags added to the project. The software for translation is notably tricky when it comes to semantics, especially for slang or conversational language, and the concern was that it may be adding English translations that deviate too far from the original meaning of the foreign language tag. With these conversations in mind, the decision made was that moving forward, the project would make no mention of foreign language tags, neither to encourage nor discourage this kind of tagging. Instead, a line was added to the FAQs encouraging the use of English based on the Adler Planetarium’s mono-language database, and if foreign language tags were added to the project, they would only be accepted if they were a transcription of text seen within the image, as data from the beta test showed that this was a somewhat frequent use of the free tagging fields. In fact, transcribing of these foreign languages, and of inscriptions in general, has use as an enrichment to the data, so it is seen as a positive submission by the Adler Collections staff. However, the anglophone dominance of the internet is a noted limitation of not only this project, but the digital humanities field at large and is therefore an important limitation to consider.¹⁸⁰

User diversity:

In the above sections, there were discussions on the limitation of user diversity from a demographic user standpoint, and this is a salient limitation that particularly affects the outcome of a project like this one. As shown above, the only demographic information I can use to discuss who the audience and users of this case study were was collected through voluntary, self-selected surveys. It is important that this demographic information was voluntarily provided

¹⁸⁰ Fiormonte, Domenico. “Toward a Cultural Critique of Digital Humanities.” In *Debates in the Digital Humanities 2016*, edited by Matthew K. Gold and Lauren F. Klein, 438–58. University of Minnesota Press, 2016. <https://doi.org/10.5749/j.ctt1cn6thb.38>.

and not a requirement of these projects, as it can be a barrier to entry for those who do not feel comfortable identifying various aspects of their identity, especially to institutions in which they may feel tokenized, othered, or excluded. It is unethical to require demographic information, but also to assign demographic markers to someone based on appearance, and as such, I believe the surveys used in this case study are the best practice for judging this information.¹⁸¹

With this in mind, it is still a limitation to the relevancy of this thesis that it is almost impossible to account for all users and build a truly representational model of who actually participated in these projects. Clearly, there is a need to understand who the audiences are on the Zooniverse.org platform and in the Adler Planetarium to even recognize who the audiences for these projects *could* be, but not everyone on and in these sites will participate, and it is possible participants learned of this project through other recruitment processes discussed in the “Participant and Recruitment” section above, such as the *Being Human Festival*, Adler Planetarium email listserv, Adler Planetarium social media, or even non-Adler sponsored blogs that picked up this project, including *The New York Times*,¹⁸² the Pod Academy¹⁸³ and Project Delve¹⁸⁴, in which case the optional surveys embedded in the projects (both on Zooniverse and in the gamified workflow) are still a vital component for gauging user diversity. Keeping this in mind, the projects, as discussed above, were specifically designed for non-expert users to participate so as to encourage Zooniverse users, Adler Planetarium guests, and the general public to participate.

One early limitation of crowdsourcing projects in museums that, in certain ways, did carry into these projects, was a requirement to create an account or log in. As early as the mid-2000s, and around the time of the *steve.museum* project, cultural heritage experts were speculating on the necessity of logins and accountability of users to prevent things like spam tagging.¹⁸⁵ The *steve.museum* project itself had prepared for this eventuality of having spam or obscene tags added, creating a “Blacklisted tags” list which included obscenities and racial

¹⁸¹ “Museum Metrics: Measuring the Tangible and Intangible to Gauge an Exhibition’s Success - Association of Art Museum Curators.” Accessed May 14, 2021.
<https://www.artcurators.org/page/metricswebinar>.

¹⁸² “Lesson of the Day: ‘After 110 Years, an Overdue Book Is Returned to a Library in Idaho,’” *The New York Times*. January 10, 2022.
<https://www.nytimes.com/2022/01/10/learning/lesson-plans/lesson-of-the-day-after-110-years-an-overdue-book-is-returned-to-a-library-in-idaho.html>

¹⁸³ Zara Karschay, host, “Beyond the Virtual Exhibition.” Pod Academy (podcast). April 6, 2021. Featuring: Jessica BrodeFrank, Professor Maria Economou, and Professor Meike Hopp.
<http://podacademy.org/podcasts/the-virtual-museum/>

¹⁸⁴ <https://projectdelve.com/humanities/tag-with-adler/>

¹⁸⁵ “Speaking Technically.” *American Libraries* 39, no. 7 (August 2008): 54–57.4.

slurs.¹⁸⁶ Of the 36,981 total terms created during the course of *steve.museum*, only 20 were identified as being a part of this blacklist.¹⁸⁷ This very low instance of obscenity and spam tagging may have been due to the inability to see tags added by others, but was also seen as further proof that obscenity and spam tagging were an unsubstantiated fear, seeing as the Library of Congress study of tagging reported a similarly low level of inappropriate tagging.¹⁸⁸ Though as shown here, it was feared early on that projects requiring a login to discourage users from spamming projects, though providing a level of accountability, created a barrier to entry when requiring these steps, and within the two decades of crowdsourcing/citizen science, the need for logins was an unsubstantiated issue, therefore not requiring the mitigation tactic of a login.

As such, the *Zooniverse.org* online project was available for use by anyone and did not require a login. Though these choices were made to open up the project and attempt to circumvent an earlier limitation of such projects, it did lead to some limitations in processing the data as unregistered users on *Zooniverse.org* are assigned a randomized identification number upon data export, but that randomized ID is session-specific. Though it is possible to track the number of experiences a registered user has across the time period of the project, this is not possible for an unregistered user, so it did complicate tracking how many people actually accessed the project.

Superusers:

This recognition of limitations around *Zooniverse.org* platform users extends beyond tracking how many individuals are actually participating based on registration and into a noted limitation of using crowdsourcing as a project and engagement tool: the superuser. The superuser is a known entity in crowdsourcing projects – a small number of users contributing a large percentage of the activity in contrast to the larger number of users who make fewer contributions in total.¹⁸⁹ In the article by Rohden et al. that investigated virtual citizen science projects through a case study of the *Zooniverse* project “Shakespeare’s World,” the team found that 37% of total forum content (Talkboards) were created by a group of 11 superusers, out of the 363 users active in the forum across the project’s lifecycle.¹⁹⁰

¹⁸⁶ Trant, Jennifer. “Tagging, Folksonomy, and Art Museums: Results of *Steve.Museum*’s Research.” University of Arizona University Libraries, 2009. <http://hdl.handle.net/10150/105627>

¹⁸⁷ Trant, “Tagging, Folksonomy, and Art Museums: Results.”

¹⁸⁸ Trant, “Tagging, Folksonomy, and Art Museums: Results.”

¹⁸⁹ Rohden, Frauke, Christopher Kullenberg, Niclas Hagen, and Dick Kasperowski. “Tagging, Pinging and Linking – User Roles in Virtual Citizen Science Forums.” *Citizen Science: Theory and Practice* 4, no. 1 (June 7, 2019): 19. <https://doi.org/10.5334/cstp.181>.

¹⁹⁰ Rohden et al., “Tagging, Pinging, and Linking,” pg. 4

In a large-scale review of more than 60 online citizen science projects, Spier et al. elaborated on this known limitation.¹⁹¹ Similar to my own assertions, the project team stated the “potential benefits to online citizen science based research include a reduction in data processing time and cost, and the engagement of a more diverse crowd that may include typically underrepresented skills or demographic features.”¹⁹² And though a major benefit of online crowdsourcing/citizen science projects is the engagement of a more diverse crowd, the authors noted that “a large fraction of classifications are provided by a relatively small number of volunteers across all projects.”¹⁹³ So if it is a promised benefit of these projects that they can elicit greater diversity and engagement across underrepresented skills or demographic communities, how is the limitation of superusers dealt with? In many ways, this is still under debate and as such, a large piece within my own project design, iteration, and testing. The noted advantage to fostering a community of dedicated and experienced volunteers who consistently return to the project is that it enables quicker and more accurate data processing.¹⁹⁴ However, I believe a project such as mine, which is specifically not looking for a consensus or accurate answer, needs to be designed to foster diversity of users, not a dedicated base of users.

Spiers et al. state, “Beyond research objectives, lack of group diversity may also curtail the potential of a citizen science project to achieve other aims” and for this thesis and case study, this is the major concern of the superuser.¹⁹⁵ As shown above, specific design decisions were made in an effort to curtail superusers. Raising the retirement rate to 50, incremental release of small amounts of data¹⁹⁶ (11 sets of 100 images), as well as testing the projects various places online, were all informed choices that were done to try to discourage superusers from blowing through the project data quickly but with a limited diversity of voice. Even with these design choices made, it is a limitation that permeates the citizen science and crowdsourcing field, and as such is important to note.¹⁹⁷

¹⁹¹ Spiers, Helen, Alexandra Swanson, Lucy Fortson, Brooke Simmons, Laura Trouille, Samantha Blickhan, and Chris Lintott. “Everyone Counts? Design Considerations in Online Citizen Science.” *Journal of Science Communication* 18, no. 1 (January 17, 2019). <https://doi.org/10.22323/2.18010204>.

¹⁹² Spiers et. al, “Everyone Counts?”

¹⁹³ Spiers et. al, “Everyone Counts?”

¹⁹⁴ Spiers et. al, “Everyone Counts?”

¹⁹⁵ Spiers et. al, “Everyone Counts?”

¹⁹⁶ Spiers et. al, “Everyone Counts?”

¹⁹⁷ Fuger, Simon, Robert Schimpf, Johann Füller, and Katja Hutter. “User Roles and Team Structures in a Crowdsourcing Community for International Development – a Social Network Perspective.” *Information Technology for Development* 23, no. 3 (July 3, 2017): 438–62. <https://doi.org/10.1080/02681102.2017.1353947>.

AI Tag Models:

As previously discussed in the design of the Zooniverse online project, there is a limitation to AI tagging models in general, but specifically in the ones selected for this project. It is a known limitation with AI that there will always be a human bias trained into the machine¹⁹⁸: “humans categorized what they saw in terms of race, gender, age, emotion, and sometimes personal character. In doing so, they injected their own conscious and unconscious opinions and biases into the tissue of the algorithm.”¹⁹⁹ In 2019, the Online Computer Library Center (OCLC) published a research position paper that stated it was an expressed concern of contributors that an increased adoption of AI and algorithmic methods could lead to the amplification of bias.²⁰⁰ Importantly this report stated:

“Historic and contemporary biases in collection development activity manifest as corpora that overrepresent dominant communities and underrepresent marginalized communities. Where marginalized communities are represented, that representation tends to be within the context of narratives that dominant cultures sanction. A critical historical perspective and resources are required to create corpora that remediate underrepresentation.”²⁰¹

It is a known limitation of AI tagging models that they are imbued with bias and the innate ability to perpetuate dominant narratives, which for projects looking to diversify narratives and increase representation is a real limitation to consider.²⁰² However, I did make the decision to include an AI capability and workflow within this case study specifically because as digital collections and their associated data continue to grow, cultural heritage institutions are faced

Ponciano, Lesandro, and Francisco Brasileiro. “Finding Volunteers’ Engagement Profiles in Human Computation for Citizen Science Projects.” *Human Computation* 1, no. 2 (December 20, 2014). <https://doi.org/10.15346/hc.v1i2.12>.

Super-Transcribers: “Events | UCL Transcribe Bentham.” Accessed February 14, 2020. <https://blogs.ucl.ac.uk/transcribe-bentham/category/events/>.

¹⁹⁸ Villaespesa, Elena, and Oonagh Murphy. “This Is Not an Apple! Benefits and Challenges of Applying Computer Vision to Museum Collections.” *Museum Management and Curatorship*, January 27, 2021, 1–22. <https://doi.org/10.1080/09647775.2021.1873827>. - pg. 4

¹⁹⁹ artnet News. “How ImageNet Roulette, a Viral Art Project That Exposed Facial Recognition’s Biases, Is Changing Minds About AI,” September 23, 2019. <https://news.artnet.com/art-world/imagenet-roulette-trevor-paglen-kate-crawford-1658305>.

²⁰⁰ Padilla, Thomas. “Responsible Operations: Data Science, Machine Learning, and AI in Libraries.” OCLC Research Position Paper, 2019. <https://doi.org/10.25333/xk7z-9g97>.

²⁰¹ Thomas, “Responsible Operations”

²⁰² Villaespesa and Murphy, “This is Not an Apple!”, pg 4

with the interconnected challenges of supporting discovery of the collection and assessing the impact on the community.²⁰³ Though there are many noted issues with AI, there are also noted examples and research surrounding the ability of AI to enrich collections through semantic metadata, captioning, speech-to-text transcription, or other methods. It would be a limitation to this thesis not to include AI in some method.

The inclusion of the selected AI tagging models, as discussed in the design description above, were chosen due to limitations in the Adler Planetarium's own collections and ability to train an AI model. In total, the Adler Planetarium holds less than 2,000 images of visual arts pieces, and this is nowhere near the amount needed for an accurate training model. Villaespesa and Murphy note that a major concern around museum collections as a valid training dataset for AI centers on the representativeness of data, in particular not having enough training data.²⁰⁴ For this project, this was a particular limitation for the Adler Planetarium. Due to this, I made the decision to utilize two different training models: one that was trained on fine art collections that would be similar to the visual arts pieces of the Adler Planetarium (the iMet Collection 2019), and one that was trained with millions of images and would be most similar to the algorithms encountered by users in their daily lives (Google Cloud Vision API).

The iMet Collection 2019 dataset included over 155,531 samples, among which 109,274 were used for training, 7,443 for validation, and 38,814 for testing.²⁰⁵ The Metropolitan team used this dataset to train a model for fine-grained attributes as well as research-grade museum attribute labels, and both of these came with appeals and limitations. The appeal of using this model with the Adler Planetarium's collection was that it showed how a museum, and a curatorial team, would create a tagging model (in opposition to a more general model like the Google Cloud Vision); however, a noted limitation in this project is that the Adler Planetarium's collection of visual arts works has some commonalities with the Metropolitan's collection, but there are noted differences in the scientific themes of the Adler's works which were not trained in to the Metropolitan's model. Another limitation is that the Metropolitan collection, like many major art museums, relies on a collection with an inherent bias, as each collection has different origins, donation history, and acquisition policies creating gaps in the collection and what is represented for the training of the model. This raises a lot of questions about whether museum collections are valid training datasets due to the representativeness of the data.²⁰⁶ In opposition,

²⁰³ Thomas, "Responsible Operations"

²⁰⁴ Villaespesa and Murphy, "This is Not an Apple!", pg 2

²⁰⁵ Zhang, Chenyang, Christine Kaeser-Chen, Grace Vesom, Jennie Choi, Maria Kessler, and Serge Belongie. "The iMet Collection 2019 Challenge Dataset." ArXiv:1906.00901 [Cs], June 3, 2019. <http://arxiv.org/abs/1906.00901>.

²⁰⁶ Villaespesa and Murphy, "This is Not an Apple!", pg 17

the Google Cloud Vision API provided a more generalized and extensive training model set, but lacked the curatorial focus and museum-specific tags, both providing a limitation in accuracy of the tags but also a look at a non-curatorial indexing that could possibly better serve users on an image-based search such as Google Image Search.

Again, it is important to note that these limitations were understood prior to project design, and decisions were made in a best effort to mitigate certain aspects of these limitations. However, the limitations on AI and algorithmic bias, training model size, and language are all important to note when evaluating this case study and when looking to apply similar projects in any institution. If a project is created with these limitations in mind, it can still harness the promise of AI and machine vision. As Villaespesa and Murphy state, “the opportunities are not only to create metadata for these records but also to diversify the information that currently exists on the database. Computer vision can find other ways of describing collections that go beyond what [humans] can do. These computer-generated features and data can have a significant impact on providing access and creating more open and friendly paths to navigate through the collection for users with no expert knowledge in the subject.”²⁰⁷

Curatorial Control, the QA Process:

Within the project design sections above, a curatorial review process we called a “QA for Wrongness” was introduced as a stage within this case study. Though the goal is not to use this stage to censor or control what tags are added based on the opinions of the Adler Planetarium staff, the process was done in recognition of the need to at least filter out inaccurate tags. For example tags were added to describe an image as being from the “1700s” when it was in fact from 1843. As a team, we agreed that adding these wrong tags into the database would not increase searchability – in fact, it would bog down the ability to find information. However, even if a tag is unequivocally wrong, if that is how multiple users described the image, would it be helpful to include it in the database? Though our team decided no, it is something to consider as a possible limitation and will be discussed further in **Chapter 6: Conclusion**. As the Metropolitan Museum of Art stated, “a museum needs to make sure that there is a system in place to ensure civil and productive discourse among the users. As museums are responsible for the interpretation of the objects, their staff must decide whether the knowledge implicit in tags is acceptable or not, and how that knowledge affects their own system of interpretation.”²⁰⁸

²⁰⁷ Villaespesa and Murphy, “This is Not an Apple!, pg 11

²⁰⁸ “Tagging in Museums: The Metropolitan Museum of Art’s One Met. Many Worlds. | Semantic Scholar.” Accessed November 25, 2019.

With this said, it does still create limitations for the project, especially for one questioning the authority of the museum and the power structure of voice and decision making. Incorporating user tags is in fact a form of radical trust,²⁰⁹ as voice and choice carry the power to perpetuate the top-down approach that continually favors white male voices, this stage needs to actively work against the perpetuation of inequity,²¹⁰ and this must be considered when discussing limitations as well.

Further, in a project where 50 individuals are tagging a single image, even if on average they are adding 3.4 tags each,²¹¹ and we account that it is possible (though unlikely) that if each tag is unique and not repeated, there is a risk of adding 170 new search terms to every single database record. In what ways does this create a new layer of limitation to search? One decision made by the Adler Planetarium was to not add any user-generated tags to the “keywords” field that are already reflected in the Adler Planetarium’s catalog in another searchable field. As Olivia Vane noted, “since tagging is not meant to replicate existing cataloguing information, relevant tags may be omitted if objects already have the term somewhere else in their record.”²¹² Though this helps to cut down on the number of tags added to the database, which can prove a limitation on its own, it could also limit the represented breadth of user-generated language for those looking at tags added by users and not seeing pre-existing terms populated in this field as well. For this case study, this is mitigated by publishing the full data sets that reflect this cross section of user-generated and professionally added metadata tags, but it is a limitation to raise for future and similar projects that may not be publishing full data sets.

Looking at the mass of possible terms, and upon discussions with the Adler Planetarium’s database company, Axiell, it was learned that there is no actual limit to terms added to the database, but at a certain point, it could slow down the system, extending the time it takes to render a search. It is also possible that it could complicate searches; for example if someone queries the Adler Planetarium’s database looking for “telescopes,” they could be presented not only with the three-dimensional telescopes in the collection but also every

<https://www.semanticscholar.org/paper/Tagging-in-Museums%3A-The-Metropolitan-Museum-of-One-Li/4ad9d6b0667190492b087fc6988e238304bd3410>.

²⁰⁹ Semantic Scholar, “Tagging in Museums.”

²¹⁰ Ferry, Scott. “Decolonizing Diversity, Equity, and Inclusion Work: Centering Equity Through Equity-Centered Design.” The Inclusion Solution (blog), April 16, 2020.

<http://www.theinclusionsolution.me/decolonizing-diversity-equity-and-inclusion-work-centering-equity-through-equity-centered-design/>.

²¹¹ As seen in the February 2021 beta test.

²¹² Vane, Olivia. “Timeline Design for Visualising Cultural Heritage Data.” Royal College of Art Postgraduate Art and Design, September 5, 2019.

illustration of a telescope in rare books or fine art pieces, as well as telescopes in archival photographs. This could expand the accessibility to the collection for some, but for others it could present them with an exhaustive list of options that is its own barrier to search. As will be discussed in **Chapter 6: Conclusion**, this is a limitation considered within the data analysis stage of the project as well as the research outputs, but it is a limitation that should be considered for all tagging projects as a difficulty in changing established online catalogs to include new terms and new functionality within third-party systems built for professional cataloging.

Conclusion:

As shown above, the designs of the various projects that make up the case study of this thesis were specifically done in order to answer lingering questions of crowdsourcing in cultural heritage, but also to address my own research questions looking at a pivot in attitude of institutions themselves to see these crowdsourcing projects as integral engagement work instead of data outsourcing. By testing various workflows across audiences and with various technologies, the case study is designed to situate within the recognized limitations of such projects while also appealing outside the Adler Planetarium, creating results replicable by any institution.

By grounding this work within the practice-based action research approach, this work is not only a research topic situated within literature reviews, but also a very real case study evolving through the actual work done as part of my role at the Adler Planetarium. In this way, the results of this project should be grounded in research and emerging best practices, but also in both qualitative and quantitative data that provide a framework to move this work into the cultural heritage sector at large.

Chapter 5: Data & Results

Introduction:

Using the adapted practice-based action research methodology discussed in the previous chapter, this chapter looks at the case study projects I devised and led at Chicago's Adler Planetarium, including the Zooniverse-hosted *Tag Along with Adler*. In this chapter, I will document and evaluate the results of the various components of each case study (including design choices, platform selection, tasks, and targeted audience) to demonstrate the benefits of crowdsourcing projects (and metadata tagging projects in particular) within museums, not as mere outsourcing of labor but rather as participatory, even transformational, experiences for an engaged public that also enhance and expand cataloging.¹ This chapter includes a presentation of data collected throughout the case study period and across workflows, with examples and highlights of data that is presented in full within the appendices. I will share results from each case study and workflow, as well as qualitative responses to surveys, Talk Boards, and interviews from experts in the field.

This chapter also explores the successes and shortcomings of this case study project and research, and what these results suggest for the cultural heritage field at large with respect to language and metadata production. In particular, this chapter will demonstrate that there exists a semantic gap in the language and descriptive styles of museum professionals and the public, and that crowdsourcing demonstrates promise to help bridge this gap while also providing an opportunity for the public to engage with museums directly. The results will include quantitative and qualitative analysis of the metadata produced during the course of these case studies, but will also highlight public opinion that illuminates the stated need for these transparent collaborative experiences.

Evaluating the "Tag Along with Adler" Project:

In this section, I intend to show the ways in which this data supports the use of citizen science/crowdsourcing of metadata tags to not only demonstrate the semantic gap between the language of the professional cataloguer, AI algorithms, and the public user, but also the early promise the process demonstrates in bridging this gap as part of a participatory, mission-centric experience. The *Tag Along with Adler* project ran on the Zooniverse platform from 23 March

¹ Laura Carletti et al., "Digital Humanities and Crowdsourcing: An Exploration," *Museums and the Web 2013*, April 17 –20, 2013, <https://mw2013.museumsandtheweb.com/paper/digital-humanities-and-crowdsourcing-an-exploration-4/>.

2021 until 12 March 2022. As each of the 11 subject sets was retired, the textual data and verification task data was processed, allowing evaluations of the 1,090 images.

As each subject set was retired, all the user generated terms were recorded. This was done in an individual spreadsheet per subject set and by workflow, “Tag Images” and “Verify AI Tags.” These spreadsheets were titled with the date the subject set was retired as well as what workflow the data set came from, and they make up the 22 subparts within Appendix 6 as follows:

1. Verify AI Tags Subject Set 1 – Retired 03/24/2021² – this subject set consisted of 98 archival photographs, and 2 rare book illustrations. 17,508 individual terms were added to this subject set.³
2. Tag Images Subject Set 1 – Retired 03/24/2021⁴ – this subject set consisted of 98 archival photographs, and 2 rare book illustrations. 18,526 individual terms were added to this subject set.
3. Verify AI Tags Subject Set 2 – Retired 03/31/2021⁵ – this subject set consisted of 8 archival photographs, 2 rare book illustrations, and 90 works on paper (40 of these were drawings of instruments, 10 were celestial cartography, 8 were portraits). 16,059 individual terms were added to this subject set.
4. Tag Images Subject Set 2 – Retired 03/31/2021⁶ – this subject set consisted of 99 works on paper (44 of these were drawings of instruments, 13 were celestial cartography), and 1 rare book illustration. 22,118 individual terms were added to this subject set.
5. Verify AI Tags Subject Set 3 – Retired 04/16/2021⁷ – this subject set consisted of 100 works on paper (26 of these were drawings of instruments, 14 were volvelles, 11 were

² **Appendix 6a_03242021_VerifyAITags_Export** -

<https://docs.google.com/spreadsheets/d/1PqsGQZBjF9eyynleoZaO99Mn1eGFhzzvluHhPfcFPdl/edit?usp=sharing>

³ Terms added account for every individual term added by users during the course of this subject sets public life cycle. It does not account for data management and clean up documented in this thesis that included accounting for tag frequency, homophily, spelling mistakes, etc.

⁴ **Appendix 6b_03242021_TagImages_Export** -

<https://docs.google.com/spreadsheets/d/1ObWDWmZmowgZpweJF1clxTWvOOzdMVe1ykjzoR4MTo/edit?usp=sharing>

⁵ **Appendix 6c_03312021_VerifyAITags_Export** -

https://docs.google.com/spreadsheets/d/1TXRSj-d1cHBUqCn21_MrqTS2z4REHh38il_eVFbimAk/edit?usp=sharing

⁶ **Appendix 6d_03312021_TagImages_Export** -

<https://docs.google.com/spreadsheets/d/114bYS2LAQjng3idL22n3M-lcYoaEqdHeJYGmpmwO40/edit?usp=sharing>

⁷ **Appendix 6e_20210416_VerifyAITags_Export** -

<https://docs.google.com/spreadsheets/d/18Inf0g5nll0xZT9DeosmSaeBhe5inuby-L0Jppish0/edit?usp=sharing>

portraits, 10 were celestial cartography). 15,313 individual terms were added to this subject set.

6. Tag Images Subject Set 3 – Retired 04/16/2021⁸ – this subject set consisted of 100 works on paper (25 of these were drawings of instruments, 17 were celestial cartography, 10 were portraits, 15 were volvelles). 19,171 individual terms were added to this subject set.
7. Verify AI Tags Subject Set 4 – Retired 05/01/2021⁹ – this subject set consisted of 100 works on paper (27 of these were drawings of instruments, 15 were portraits, 8 were celestial cartography). 14,158 individual terms were added to this subject set.
8. Tag Images Subject Set 4 – Retired 05/01/2021¹⁰ – this subject set consisted of 100 works on paper (9 of these were drawings of instruments, 17 were portraits, 12 were celestial cartography, and 9 were volvelles). 19,129 individual terms were added to this subject set.
9. Verify AI Tags Subject Set 5 – Retired 05/27/2021¹¹ – this subject set consisted of 7 works on paper, 83 rare book illustrations (10 of these were portraits, 18 were drawings of instruments), and 10 archival photographs (all 10 of these were from the 1933 Columbian Exhibition). 16,001 individual terms were added to this subject set.
10. Tag Images Subject Set 5 – Retired 05/27/2021¹² – this subject set consisted of 7 works on paper, 86 rare book illustrations (11 of these were drawings of instruments, 18 were portraits), and 7 archival photographs. 21,355 individual terms were added to this subject set.

⁸ **Appendix 6f_20210416_TagImages_Export -**

https://docs.google.com/spreadsheets/d/1Jn4mvggqSmpn_b01_Yskhq02XA7cE0OHc1VwzWd61T_k/edit?usp=sharing

⁹ **Appendix 6g_20210501_VerifyAITags_Export -**

https://docs.google.com/spreadsheets/d/1hckp0TqtBljzzaHk3103fTCFs_CtY5H50gigg6wSQXk/edit?usp=sharing

¹⁰ **Appendix 6h_20210501_TagImages_Export -**

https://docs.google.com/spreadsheets/d/1qzwEVQEsLaE5n_-2X-hk6PYTFywal_AntB9_P1EdbxA/edit?usp=sharing

¹¹ **Appendix 6i_20210527_VerifyAITags_Export -**

https://docs.google.com/spreadsheets/d/1q2giVRKkSjh36kTrfYcLcbG7Sfm6okBj2C_y3c3hLRI/edit?usp=sharing

¹² **Appendix 6j_20210527_TagImages_Export -**

https://docs.google.com/spreadsheets/d/1nEFJKJmkxGwkc3MIHWglf3-vnobqorzgZ_vGpBg7ljg/edit?usp=sharing

11. Verify AI Tags Subject Set 6 – Retired 06/25/2021¹³ – this subject set consisted of 96 archival photographs (38 of these were from the 1933 Columbian Exhibition), and 4 rare book illustrations. 17,524 individual terms were added to this subject set.
12. Tag Images Subject Set 6 – Retired 06/25/2021¹⁴ – this subject set consisted of 97 archival photographs (42 of these were from the 1933 Columbian Exhibition), and 3 rare book illustrations. 20,308 individual terms were added to this subject set.
13. Verify AI Tags Subject Set 7 – Retired 07/30/2021¹⁵ – this subject set consisted of 8 archival photographs, 1 rare book illustration, and 91 works on paper (48 of these were drawings of instruments, 15 were celestial cartography). 16,375 individual terms were added to this subject set.
14. Tag Images Subject Set 7 – Retired 07/30/2021¹⁶ – this subject set consisted of 43 archival photographs, 3 rare book illustrations, and 54 works on paper (7 of these were celestial cartography, 32 were drawings of instruments). 19,563 individual terms were added to this subject set.
15. Verify AI Tags Subject Set 8 – Retired 09/23/2021¹⁷ – this subject set consisted of 8 archival photographs, 1 rare book illustration, and 91 works on paper (14 of these were celestial cartography, 47 were drawings of instruments). 16,542 individual terms were added to this subject set.
16. Tag Images Subject Set 8 – Retired 09/23/2021¹⁸ – this subject set consisted of 100 works on paper (11 of these were celestial cartography, 51 were drawings of instruments). 20,775 individual terms were added to this subject set.

¹³ **Appendix 6k_20210625_VerifyAITags_Export -**

https://docs.google.com/spreadsheets/d/1XDNKINKdFKoVIQr5C40uwgTNki0NPg_b2lhAvv67b3c/edit?usp=sharing

¹⁴ **Appendix 6l_20210625_TagImages_Export -**

<https://docs.google.com/spreadsheets/d/1LUW-Hpy4hk-5ACQrcz9qY8K-CJ1zF7ecmF0bOwZpK-o/edit?usp=sharing>

¹⁵ **Appendix 6m_20210730_VerifyAITags_Export -**

<https://docs.google.com/spreadsheets/d/1N972oAERsnFu5aRiJn1BJv4bGzoJzNQZjOYRxc5O-x0/edit?usp=sharing>

¹⁶ **Appendix 6n_20210730_TagImages_Export -**

<https://docs.google.com/spreadsheets/d/12CzAd7BrVG64w1ljqE4DUrMRhNSuKEiiTvOy88JNYac/edit?usp=sharing>

¹⁷ **Appendix 6o_20210923_VerifyAITags_Export -**

<https://docs.google.com/spreadsheets/d/1sv8Ykaqr4-b6tCgL9yFL8O8XxUw303k33Lz0YVlloX0/edit?usp=sharing>

¹⁸ **Appendix 6p_20210923_TagImages_Export -**

<https://docs.google.com/spreadsheets/d/1ECUFztTq59oB8KWx5olv9JXcndajdyiMUcadxepCgaQ/edit?usp=sharing>

17. Verify AI Tags Subject Set 9 – Retired 10/22/2021¹⁹ – this subject set consisted of 23 archival photographs (15 of these were from the 1933 Columbian Exposition), 48 works on paper (31 of these were drawings of instruments), and 29 rare book illustrations. 15,564 individual terms were added to this subject set.
18. Verify AI Tags Subject Set 10 – Retired 11/18/2021²⁰ – this subject set consisted of 16 archival photographs (12 of these were from the 1933 Columbian Exposition), 25 rare book illustrations (6 of these were drawings of instruments), and 49 works on paper (8 of these were portraits, 17 were drawings of instruments). 7,298 individual terms were added to this subject set.
19. Tag Images Subject Set 9 – Retired 12/06/2021²¹ – this subject set consisted of 100 works on paper (15 of these were volvelles, 18 were portraits, 9 were celestial cartography). 19,306 individual terms were added to this subject set.
20. Verify AI Tags Subject Set 11 – Retired 01/07/2022²² – this subject set consisted of 26 archival photographs (22 of these were from the 1933 Columbian Exposition), 30 were rare book illustrations, and 34 were works on paper (14 of these were drawings of instruments). 12,457 individual terms were added to this subject set.
21. Tag Images Subject Set 10 – Retired 03/15/2022²³ – this subject set consisted of 52 works on paper (20 of these were drawings of instruments, 4 were celestial cartography, 6 were portraits), and 48 rare book illustrations (9 were instruments, 7 were portraits). 18,536 individual terms were added to this subject set.
22. Tag Images Subject Set 11 – Retired 03/15/2022²⁴ – this subject set consisted of 49 archival photographs (all 49 were from the 1933 Columbian Exposition), and 51 rare

¹⁹ **Appendix 6q_20211022_VerifyAITags_Export -**

<https://docs.google.com/spreadsheets/d/133RMAeuovF4zrruTGFAqSJcfp9Fyv24kTRQjCVAq1W0/edit?usp=sharing>

²⁰ **Appendix 6s_20211118_VerifyAITags_Export -**

https://docs.google.com/spreadsheets/d/1x_3HY68qsMbT6aBslp7gRCPXxvaHBRYo_JuqE7fw5Fk/edit?usp=sharing

²¹ **Appendix 6r_20211206_TagImages_Export -**

https://docs.google.com/spreadsheets/d/1TWOi1qDXNZs01CKWcmwHsYfzttmk0j8ikS.JwA_anuOM/edit?usp=sharing

²² **Appendix 6u_20220107_VerifyAITags_Export -**

https://docs.google.com/spreadsheets/d/19Tj3KTrCvf992zliir_zSgCBVN4PW_n35_XwfSD7uftQ/edit?usp=sharing

²³ **Appendix 6t_20220315_TagImages10_Export -**

https://docs.google.com/spreadsheets/d/1feo_j5Tn86TqORuiGekUSRihcSsKKul2eSQzgXUpIzY/edit?usp=sharing

²⁴ **Appendix 6v_20220315_TagImages11_Export -**

<https://docs.google.com/spreadsheets/d/1TSYqPNLe7AkN43ZdHubDHYXxeuUJ6mxWG54z89UyA38/edit?usp=sharing>

book illustrations (15 of these were instruments, 4 were portraits). 17,478 individual terms were added to this subject set.

Each appendix features the data exported from the Zooniverse platform including the volunteer's username (user_name), the workflow ID used to track iterative design of both the "Tag Images" and "Verify AI Tags" workflows (workflow_id), the date and time the classification was made (created_at), the unique identifier for each collection item in the project (subject_id), the filename associated with this unique identifier (Filename), as well as the exact text added by the volunteers (data.text) as shown in **Figure 41**. Along with this extracted text from the Zooniverse platform, a "OneTagPerLine" sheet is included in each Appendix which takes the terms added in the data.text field and breaks them apart into individual tags; using a visual basic script to separate tags out by commas to create one tag per row as shown in **Figure 42**.

Formatting the data in this way allowed sorting of tags by any of the individual columns, including by Filename, unique identifier, username, and tag text. When viewing the data sets by username it was possible to analyze individual participants as shown in **Figure 44**. Within **Appendix 7: Data Management for All Generated Terms**,²⁵ this data is featured in the Sheets "UsersBySet" and "Users." Within the "UsersBySet" Sheet data is sorted by Subject Set and Workflow, similarly to how data is sorted in the Appendices 6a-6v, with each row representing a single subject set within a single workflow, with columns for the number of classifications made by each volunteer, the number of tags added by each volunteer, and the overall average of tags added per classification for these volunteers. The "Users" Sheet by comparison organizes data by the individual volunteer, identifying volunteers by Zooniverse handle and demonstrating how many classifications each individual volunteer worked on, how many tags the volunteer created, the number of subject sets they participated in, and which workflows they worked on.

Over the year the *Tag Along with Adler* project ran, the project had 3,557 registered volunteers, with 6,976 individual participants.²⁶ Of these participants, a subset has emerged: the superuser. Superusers are a known entity in crowdsourcing projects - a small number of users

²⁵ **Appendix 7: Data Management for All Generated Terms -**
<https://docs.google.com/spreadsheets/d/1z9j62wlRilcb4jivHcPJnPV6Uv7wzPX-ca4Tf7SG2L4/edit?usp=sharing>

²⁶ Zooniverse projects do not require participants to be registered to participate, but any unregistered user who participates in the Zooniverse projects is assigned a single use random ID number for each session, making it difficult to ascertain whether they participate more than once. There is a hashed user IP field that can be used to ID repeat classifications from non-logged-in users, but this accounts for an IP address only, and discounts the possibility of multiple users utilizing a single IP address. See **Page 130**.

contributing a large percentage of the activity in contrast to the larger number of users who make fewer contributions in total.²⁷

In a large-scale review of more than 60 online citizen science projects, Spiers et al. elaborated on this known entity.²⁸ Though a possible benefit of online crowdsourcing/citizen science projects is the engagement of a more diverse crowd, the authors noted that “a large fraction of classifications are provided by a relatively small number of volunteers across all projects: indicating a need to design for diversification.”²⁹ So if it is a possible benefit of these projects that they can elicit greater diversity and engagement across underrepresented skills or demographic communities, how is the superuser considered? This is a central question of *Tag Along with Adler’s* project design, iteration, and testing. The noted advantage to fostering a community of dedicated and experienced volunteers who consistently return to the project is that it enables quicker and more accurate data processing.³⁰ However, a metadata project that is specifically not looking for a consensus or single accurate answer needs to be designed to foster diversity of users – a larger base of diverse users, as well as a dedicated base of superusers – who are often a more homogenous user group as discussed in **Chapter 4: Methodology & Project Design (pgs. 152-156)**.

Specific design decisions were made on *Tag Along with Adler* in an effort to encourage both a diversity of users and the superusers. Requiring 50 people to classify an image before it was retired from the project, incremental release of small amounts of data³¹ (11 sets of 100 images), and planning to test the projects both online and onsite³² were all informed choices that were done to try to prevent superusers from blowing through the project data quickly but with a limited diversity of voice.³³ Even with these design choices made, superusers remain an aspect that permeates the citizen science and crowdsourcing field, and as such it is important to plan for.³⁴

²⁷ Rohden, Frauke, Christopher Kullenberg, Niclas Hagen, and Dick Kasperowski. “Tagging, Pinging and Linking – User Roles in Virtual Citizen Science Forums.” *Citizen Science: Theory and Practice* 4, no. 1 (June 7, 2019): 19. <https://doi.org/10.5334/cstp.181>.

²⁸ Spiers, Helen, Alexandra Swanson, Lucy Fortson, Brooke Simmons, Laura Trouille, Samantha Blickhan, and Chris Lintott. “Everyone Counts? Design Considerations in Online Citizen Science.” *Journal of Science Communication* 18, no. 1 (January 17, 2019). <https://doi.org/10.22323/2.18010204>.

²⁹ Spiers et. al, “Everyone Counts?”

³⁰ Spiers et. al, “Everyone Counts?”

³¹ Spiers et. al, “Everyone Counts?”

³² Due to COVID-19 pandemic, this research was relegated to being fully online and the onsite component was not included in the scope of this thesis.

³³ The Museum Scholar. “Crowdsourcing Knowledge for Representation: Interactive Learning and Engagement with Collections Using Zooniverse’s Mapping Historic Skies,” April 24, 2020. https://articles.themuseumscholar.org/2020/04/24/tp_vol3_brodefrank/.

³⁴ Fuger, Simon, Robert Schimpf, Johann Füller, and Katja Hutter. “User Roles and Team Structures in a Crowdsourcing Community for International Development – a Social Network Perspective.” *Information*

The presence of superusers was noted; however, it appears that the design choices were effective in encouraging both superusers and a large group of users. Of the 3,557 registered volunteers who participated in *Tag Along with Adler*, only 807 users participated in more than one subject set (returned to the project for additional sets of data). Across the 11 subject sets, these 3,557 registered volunteers created 322,993 individual metadata tags. Those who participated in only one subject set (did not return to the project over time) submitted 163,342 of these tags (50.6%) averaging 59 tags per user. In comparison, those who worked on multiple subject sets (returning to the project throughout the 12 months) submitted 159,651 of the tags (49.4%) averaging 197.8 tags per user over the course of their project participation.

These results reflect previous analysis of superusers, including a study published by Rohden et al. in 2019 that looked at the virtual crowdsourcing project “Shakespeare’s World” on Zooniverse, finding that 37% of total forum content was created by 3% of the project participants.³⁵ *Tag Along with Adler* results show that roughly 22% of the project participants are responsible for the creation of 49.4% of the project's data. It is important to note that the bulk of the tags created were still generated by a larger subsection of users, and that of those who participated in multiple subject sets, the data shows overall that with each additional subject set, the returning users drop, but the engagement with the content and task increases. Below, you will see a chart (**Figure 8**) with two lines, demonstrating the number of users returning for each subject set and the tags they created (the average number of tags created per user/per subject set). The inverse relationship demonstrates that though the rate of returning users mainly falls off with each set, the tags created by each user go up the more they return to the project (demonstrating a higher level of engagement with the project), showing a dedicated base of engaged superusers but also a large group of users generating the bulk of the tags. This

Technology for Development 23, no. 3 (July 3, 2017): 438–62.
<https://doi.org/10.1080/02681102.2017.1353947>.

Ponciano, Lesandro, and Francisco Brasileiro. “Finding Volunteers’ Engagement Profiles in Human Computation for Citizen Science Projects.” *Human Computation* 1, no. 2 (December 20, 2014).
<https://doi.org/10.15346/hc.v1i2.12>.

Super-Transcribers: “Events | UCL Transcribe Bentham.” Accessed February 14, 2020.
<https://blogs.ucl.ac.uk/transcribe-bentham/category/events/>.

³⁵ Rohden, Frauke, Christopher Kullenberg, Niclas Hagen, and Dick Kasperowski. “Tagging, Pinging and Linking – User Roles in Virtual Citizen Science Forums.” *Citizen Science: Theory and Practice* 4, no. 1 (June 7, 2019): 19. <https://doi.org/10.5334/cstp.181>. Note the “37% of forum content” discussed here is content within the platform’s forums, not classification data, and forum participants as a whole are already a smaller subset – or a superuser community – in and of themselves.

demonstrates the design of the *Tag Along with Adler* project fostered both a large group of users as well as dedicated superusers.

When discussing limitations of crowdsourcing projects, it is also important to raise the known issue of user diversity. As shown above, there were specific reasons and motivations for choosing to center this practice-based action research within the collections of the Adler Planetarium, using pre-existing third-party platform Zooniverse, and iteratively testing across various workflows and projects. However, each of these choices does come with its own limitations. In order to assert the reach of this study outside of the Adler Planetarium and across the cultural heritage sector, these limitations must be transparently stated.

An early recognized limitation to this case study across the various component projects is a reliance on English language, and truly the exclusion of all other languages. As discussed, this project was built in English on the Zooniverse platform, which has over two-thirds of its users identified as UK or USA residents, and the majority of the public projects on the site only available in English.³⁶ The Adler Planetarium does not have demographic information on our guests' language capabilities; however, being based in the city of Chicago, it's important to note that 35.8% of Chicago citizens are speakers of a non-English language.³⁷ Though these kinds of metrics do not provide a clear idea of how many non-English speakers are precluded from the experiences, as UK/USA residents may speak English and another language and citizens who are non-English language speakers may also speak English, they do serve as metrics that presenting projects in only one language is setting a project up to be exclusionary.

Conversations are still ongoing at the Adler Planetarium about the possibilities of cataloging and metadata tags of non-English languages; but, it is still a critical discussion to mention in regards to ethics. As a voluntary activity, it is integral that the ethical considerations of the task being asked of the volunteers and the use to the institution is transparent from the start. If an institution sees a true benefit to non-English language data, then asking users to add tags in other languages is within the ethical norms of the project to encourage. As the *Creative Wisdom* team stated, "making sure your project includes informed consent and clear conditions of participation"³⁸ is critical to creating an ethical project, and as such, the *Tag Along with Adler*

³⁶<https://blog.zooniverse.org/2015/03/05/who-are-the-zooniverse-community-we-asked-them/> /

³⁷

<https://embed.datausa.io/profile/geo/chicago-il/demographics/languages#:~:text=Non%2DEnglish%20Speakers&text=35.8%25%20of%20Chicago%2C%20IL%20citizens,IL%20are%20native%20Spanish%20speakers.>

³⁸ Ridge, Mia, Samantha Blickhan, Meghan Ferriter, Austin Mast, Ben Brumfield, Brendon Wilkins, Daria Cybulska, et al. *The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage - Community Review Version*. PubPub, 2021.

<https://britishlibrary.pubpub.org/pub/introduction-and-colophon/release/2>.

project hosted on Zooniverse did accept non-English language tags, but did transparently state to users that the Adler Planetarium database was not available completely in non-English languages.

Because a noted purpose of the Adler team's crowdsourcing metadata projects was to enhance and expand the accessibility and representation of the cataloging data, ensuring that a representative public is a part of the project is vital. The only demographic information about the audience and users of this case study was collected through voluntary, self-selected surveys. This demographic information was voluntarily provided and not a requirement of these projects, as it can be a barrier to entry for those who do not feel comfortable identifying various aspects of their identity, especially to institutions in which they may feel tokenized, othered, or excluded. It is unethical to require demographic information, but also to assign demographic markers to someone based on appearance, and as such, the surveys used in this case study are the best practice for judging this information.³⁹

With this in mind, it is still a limitation to the relevancy of this study that it is almost impossible to account for all users and build a truly representational model of who actually participated in these projects. The case study, as discussed above, was specifically designed for non-expert users to participate so as to encourage Zooniverse users, Adler Planetarium guests, and the general public to take part. An optional survey was attached to the project header to encourage users to self identify.

The survey attached to the project can be accessed in **Appendix 15**.⁴⁰ Of the 3,557 registered users who have participated in the project, 197 participated in this survey (roughly 5.5%). This survey included demographic questions as well as qualitative questions (to be shared later). Below you will see charts with the demographic information requested and self-submitted by volunteers. Questions centered around education level (**Figure 9**), ethnicity (**Figure 10**), gender (**Figure 11**), and age (**Figure 12**).

Additional user demographic statistics for Zooniverse can also be found in the 2019 article by Spiers et al. "Everyone counts? Design considerations in online citizen science."⁴¹ This article references demographics for age and gender across five Zooniverse projects, not the

³⁹ "Museum Metrics: Measuring the Tangible and Intangible to Gauge an Exhibition's Success - Association of Art Museum Curators." Accessed May 14, 2021. <https://www.artcurators.org/page/metricswebinar>.

⁴⁰ **Appendix 15: Tag Along with Adler User Survey** link: <https://docs.google.com/forms/d/e/1FAIpQLSfkmwYpPciVLBi0vGOkxH3daFw4mw6dkXpidxlpE4DPHjACg/viewform>

⁴¹ Spiers, Helen, Alexandra Swanson, Lucy Fortson, Brooke Simmons, Laura Trouille, Samantha Blickhan, and Chris Lintott. "Everyone Counts? Design Considerations in Online Citizen Science." *Journal of Science Communication* 18, no. 1 (January 17, 2019). <https://doi.org/10.22323/2.18010204>.

entire platform. However, these demographics demonstrate that certain subject types reflect variations in users; for example, projects centered on astronomy saw a demographic split on average around 30% female to 70% male; whereas projects centered on ecology saw demographic splits on average around 60% female to 40% male. No information was recorded for race or education level, however, in either set of demographic research.

Similarly, a publication in 2020 published by “Theory and Practice: Citizen Science” reflected that in a survey of the *RiverWatch* citizen science project, data indicated that participants were “disproportionately white, highly educated, and affluent compared with the Illinois [site of RiverWatch] general population.”⁴²

The results of the voluntary demographic survey linked on the *Tag Along with Adler* project strongly align with the results of various surveys on traditional crowdsourcing platforms. Most notably, the majority of respondents to *Tag Along with Adler* self-identified as White/Caucasian, with ethnic diversity being the least distributed of the four demographics gauged. As shown in the **Chapter 4: Methodology & Project Design**, many previous projects did not provide data for demographic information, but demographic data published by the National Academies of Sciences, Engineering, and Medicine; Division of Behavioral and Social Sciences and Education; Board on Science Education; Committee on Designing Citizen Science to Support Science Learning in 2018 did report “that “all” or “most” of their participants were white (88.6%), while only 6.1 percent indicated this same level of participation for Hispanics, with slightly lower levels (4.6%) for Asians, including Asian Americans. No projects reported overwhelming participation among Black or African peoples, Indigenous peoples including Native Americans, or Hawaiian/Pacific Islanders.”⁴³

It’s important to reiterate this statistic, as my own findings did demonstrate more ethnic diversity than this 2018 report, and though the majority of project participants who participated in the demographic survey identified as White/Caucasian (60.6%), this is still almost 20% fewer than the National Academies of Sciences observed. Similarly, though the ethnic diversity was less distributed than some of the other demographics to follow, amongst the project participants in the Zooniverse case study, there was a breakdown more similar to that reported by the Adler Planetarium’s 2018 Intercept Survey than that of the Zooniverse platform, demonstrating the

⁴² Blake, Charlie, Allison Rhanor, and Cody Pajic. “The Demographics of Citizen Science Participation and Its Implications for Data Quality and Environmental Justice.” *Citizen Science: Theory and Practice* 5, no. 1 (October 7, 2020): 21. <https://doi.org/10.5334/cstp.320>.

⁴³ National Academies of Sciences, Engineering, Division of Behavioral and Social Sciences and Education, Board on Science Education, Committee on Designing Citizen Science to Support Science Learning, Kenne Ann Dibner, and Rajul Pandya. *Demographic Analyses of Citizen Science. Learning Through Citizen Science: Enhancing Opportunities by Design*. National Academies Press (US), 2018. <https://www.ncbi.nlm.nih.gov/books/NBK535967/>.

draw these type of cultural heritage crowdsourcing project can have in bringing more diverse audiences to citizen science platforms.⁴⁴

The *Tag Along with Adler* survey for ethnic demographics (as shown in **Figure 10**) showed participants were 60.6% White/Caucasian, 15% Asian, 4.1% Black, 2.6% Hispanic/Latinx, with additional responses added or self identified. In comparison the Adler Planetarium's Intercept Survey from 2018 showed the average Adler visitor audience was 53.7% White/Caucasian, 18% Asian, 15.6% Hispanic/Latino, and 3.2% Black/African. The demographics of this case study actually align quite closely with those reported by the Adler for White/Caucasian, Black/African, and Asian participants; however, it is notably lower for Hispanic/Latinx users which may be a result of the project's noted limitation of being published as an English-language-only project.

Education levels were more distributive, due to a large number of active high school students participating. The percentages of educational levels still closely align to the general American public. The US Census reports that between 2015-2019, the percentage of Americans with bachelor's degrees reached 32.1%, close to the 28.7% who reported on this survey.⁴⁵ Similarly, a good array of ages was represented throughout the survey, with the largest proportion coming from school-aged students 18 or under, but still solid distributions between the remaining age groups.

This data comes with limitations, clearly, as only 5% of users opted in to participating in the survey, but it does help to provide a baseline for the effectiveness of claiming this project data as a more representational voice than professional museum staff alone. In a 2018 study published by the Mellon Foundation, a survey of over 30,000 US-based museum employees looked to establish ethnic demographics for the field.⁴⁶ Findings showed that 72% of art museum staff identified as White/Caucasian with 28% identifying as People of Color, which reflected a 4% increase in People of Color in art museum positions since the 2015 survey. The US Census for the same time period reflected that the US general population was 62% White/Caucasian, and 38% People of Color.⁴⁷ This demonstrates that crowdsourcing projects

⁴⁴ Reference the "Participant Identification and Recruitment Practices" section of the **Chapter 4: Methodology & Project Design (pgs 137-142)** for additional information on how the various case studies were marketed, and the differences in targeted audience sectors.

⁴⁵ Nietzel, Michael T. "New From U.S. Census Bureau: Number of Americans With A Bachelor's Degree Continues To Grow." *Forbes*. February 22, 2021. <https://www.forbes.com/sites/michaelnietzel/2021/02/22/new-from-us-census-bureau-number-of-americans-with-a-bachelors-degree-continues-to-grow/?sh=106c61957bbc>

⁴⁶ Westermann, Mariët, Liam Sweeney, and Roger Schonfeld. "Art Museum Staff Demographic Survey 2018." Ithaka S+R, January 28, 2019. <https://doi.org/10.18665/sr.310935>.

⁴⁷ Kenney, Nancy. "Exclusive survey: what progress have US museums made on diversity, after a year of racial reckoning?" *The Art Newspaper*. May 25, 2021.

like the *Tag Along with Adler* project, which featured 60.6% White/Caucasian users versus a museum staff which on average has 72% White/Caucasian-identified staff, have the ability to bring a group more representative of to the US general population into the cataloging process than museum staff are currently reflecting.

However, it is still important to note these demographics and these surveys come with margins of error and issues with sample sizes as noted above. Despite these limitations, they do provide a baseline knowledge of who the Zooniverse and Adler user bases are as well as those participating in this particular case study project.

The optional survey that was shared with participants to gauge demographic information was also used to provide qualitative baselines on engagement, not just engagement of users with the project itself but also with the learning objectives of the project. The quantitative data shared above on user statistics, including tags generated and user returnal to the project, is helpful in discussions of user engagement, but the qualitative data collected from things like the “Talk” board threads and the user survey are also essential when discussing crowdsourcing projects as a mission-centric participatory experience. One set of questions asked in the survey was particularly helpful in gauging audience perspectives on things like trust and representation. As this project was designed with these issues in mind, it was helpful to gauge what were noted concerns of the users.

The following questions were asked with responses for each individual question allowing selection of Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree:

1. I trust museums reflect multiple perspectives (**Figure 13**)
2. Stories like mine are in museum collections (**Figure 14**)
3. Stories like mine are in museum exhibitions (**Figure 15**)
4. I see people like me in science today (**Figure 16**)
5. Museums are essential to communities (**Figure 17**)
6. Communities are essential to museums (**Figure 18**)
7. I trust what I find online (**Figure 19**)
8. I can find things online easily (**Figure 20**)

The responses to these questions again only account for about 5.5% of project participants, but when looking at standard survey responses, it is not atypical for email surveys

<https://www.theartnewspaper.com/2021/05/25/exclusive-survey-what-progress-have-us-museums-made-on-diversity-after-a-year-of-racial-reckoning>

to receive approximately 6% response rate, with online embedded surveys (like the one for this project) averaging around 8% response rate.⁴⁸ Approximately 23.9% of survey respondents did not agree that they felt stories like theirs were included in museum collections, 69% did not agree that they felt stories like theirs were included in museum exhibitions, and 39.6% did not agree that they felt like they could see people like themselves in science today. Combined with the extremely high markers that participants felt museums were essential to communities (94.4%) and communities were essential to museums (94.9%), there is a marked opportunity for museums to leverage their place within the community to begin participatory experiences that would bring the public into the process of description, helping to increase the representation that is notably lacking. There is also an opportunity for museums as a place with marked standing in the community to help foster discussions on searchability and discovery on the internet. This survey showed that only 18.7% of participants agreed they could trust what they find online, but conversely, 76.1% of them agreed they could find things online easily. The level of transparency that this study, and crowdsourcing projects in general, can afford could have an effect on the trust of online search, especially in regards to museum search.

Diversifying Data, Expanding Who is in the Crowd:

Importantly, when looking at the survey results shown above, a breakdown of responses by race demonstrates differences that are useful in identifying the need for cultural heritage institutions to engage in transparent participatory experiences such as these crowdsourcing projects. As **Figure 13** shows, about two thirds of survey respondents indicated that they trusted that museums reflect multiple perspectives with about 7% disagreeing or strongly disagreeing with this statement. However, when looking at the breakdown of survey responses by race of the users, the results change. For respondents who did not wish to identify their race (**Figure 13e**), the agreement rate was actually 80% – however, this group had no neutral responses and had the second-highest disagreement rate at 20%. Those who identified as Multiple Races (**Figure 13d**) indicated the same 80% agreement rate, however, their disagreement was at 7% with a 13% neutrality. Respondents who identified as Asian (**Figure 13a**) agreed with this statement at 73%, followed by those who self-added their race (**Figure 13f**) at 70% (with this category having 0% of respondents disagreeing), White/Caucasians (**Figure 13g**) agreed at 65%, Black/African respondents (**Figure 13b**) had an agreement rate at 62.5%, but the highest disagreement rate at 25%, and Hispanic/Latinx individuals (**Figure 13c**) had a 40% agreement

⁴⁸ Delighted. “What Is a Good Survey Response Rate for Customer Surveys in 2022?,” February 17, 2022. <https://delighted.com/blog/average-survey-response-rate>.

rate (though this was completely indicated as “Strongly Agree”) with the remaining 60% indicating a neutral stance.

Of particular note are the disagreement rates on this question: “I trust museums reflect multiple perspectives.” Where **Figure 13** shows a small minority selecting “Disagree” or “Strongly Disagree” with between 7%-8%, when breaking down by race, it is clear that those who do not prefer to indicate their race disagreed at a markedly higher 20%, and those who were Black/African disagreed at 25%. Similarly, the Hispanic/Latinx users did not have any disagreement, but with a 60% majority of Hispanic/Latinx users selecting a neutral stance, their agreement rate of only 40% is the furthest from the group average response of 68%. This indicates a difference in museum experience and trust for minority groups, particularly those from Black/African and Hispanic/Latinx backgrounds.

Similarly, in **Figure 14** and **Figure 15**, the agreement rates for the questions “Stories like mine are in museum collections” and “Stories like mine are in museum exhibitions” were 34.5% and 31% respectively, with neutral response rates being the highest for both questions, 41.6% and 42.1% respectively, and disagreements to the questions at 23.9% and 26.7% respectively. This indicated that though almost a third of volunteers felt they could see stories like theirs within museum collections and exhibition spaces, about a quarter did not. However, this can once again be broken down further by race to show how underrepresented marginalized communities feel in the museum spaces.

Among Asian respondents, 37% did not believe their stories were in museum collections (**Figure 14a**), and 42% did not believe their stories were present in museum exhibitions (**Figure 15a**), a marked increase from the average users by 14%-15%. Black/African respondents noted that 25% strongly disagreed that their stories were present in either museum collections or exhibitions (with none simply disagreeing) (**Figure 14b, Figure 15b**), coming close to the average of disagreement by the whole group; however, “Strongly Disagree” was only indicated at 5.6% for representation in collections, and 6.1% for representation in exhibitions by the entire group, indicating a much stronger response by Black/African respondents at almost 4-5x the average rate. Hispanic/Latinx respondents indicated a 40% disagreement to representation in collections and exhibitions (**Figure 14c, Figure 15c**), and though there were no “Strongly Disagree” responses in this group, this is still about 15% higher than the group average for disagreement. Those who identified as Multiple Races had a much higher neutral response rate to representation within collections at 53% vs. the group average of 41.6% (**Figure 14d**), though responses to representation within exhibition spaces was much closer to the average of the group (**Figure 15d**). Those who preferred not to disclose their race agreed that their stories

were represented in collections at a much higher rate of 50% (**Figure 14e**) and that their stories were represented in exhibitions at a rate of 43% (**Figure 15e**), indicating agreement rates 16% and 12% higher than the group respectively. Respondents who self-added their own race to the survey indicated the highest levels of neutrality with 56% marking neutral for representation in collections (**Figure 14f**), and 67% indicating neutrality to representation in exhibitions (**Figure 15f**) (15% and 25% higher than the average group response of neutrality).

Once again, the White/Caucasian responses align closest to the “average group” responses indicated in **Figures 8** and **9**, again indicating the value of breaking down these responses by race. By breaking down the following qualitative responses by demographics, it again shows that Black/African, Hispanic/Latinx, and (in this case) Asian respondents do not feel collections and exhibitions represent their stories in the same way White/Caucasian audiences do, indicating a lack of representative stories in collections and exhibitions. This important piece is not only demonstrated in the case study results reported here, but also confirmed in the 2022 report by the Association of Science and Technology Centers which showed African American and Hispanic guests reported increased barriers to entry in science centers, with 40% of African American participants and 33% of Hispanic participants noting that the exhibits being too White-centric was a noted barrier.⁴⁹

The Semantic Gap:

The data thus far has been useful in discussing user behavior and limitations to any crowdsourcing project, from superusers to demographic metrics of the public; however, it is also possible to use this data to demonstrate that the semantic gap does in fact exist, and that such projects can begin to bridge it. As discussed earlier in this thesis, a full survey of the Adler cataloging data was conducted as part of the project build.⁵⁰ This was done in part to create a baseline understanding of what kind of language the Adler used and what terms permeated the cataloging data. By including this data in **Appendix 7: Data Management for All Generated Terms**, it was possible to visualize the variety of terms created for each included collection’s object. The first three sheets within this Appendix sorted collections objects by the collection they belong within: WOP for Works on Paper, AHP for the Archival Images, and RareBooks for

⁴⁹ Volpe, Christopher, Eve Klein, and Michelle Race. “Americans Motivations for and Barriers to Engaging with Science.” Executive Report. ASTC, May 12, 2022. <https://sciencecounts.org/wp-content/uploads/2022/06/Americans-Motivations-for-and-Barriers-to-Engaging-with-Science.pdf>.

⁵⁰ **Appendix 7: Data Management for All Generated Terms** - <https://docs.google.com/spreadsheets/d/1z9j62wIRilcb4jivHcPJnPV6Uv7wzPX-cA4Tf7SG2L4/edit?usp=sharing>

the Rare Book Images. For all three collections' categories the data is formatted by individual image files, the Adler accession number for the object within this image, the tag for this object as well as where this tag was created (Adler Catalogue, MET Terms or Google Cloud Vision API). Additionally, a final column was included for "Prevalence" which was used to denote the verification rate from the "Verify AI Tags" workflow (shown in **Figure 45**).

The next set of sheets within this appendix focused solely on the "Verify AI Tags" verification task, breaking down the subjects by their collection type instead of by subject set. These sheets (WOPVerificationTask, AHPVerificationTask, and RBVerificationTask) include the image file name, the associated accession number from the Adler's Collection, the tag generated, which model (Google Cloud Vision API, iMET Tagger) created the tag, and how often the tag was approved by volunteers (**Figure 46**).

Additionally, **Appendix 10**⁵¹ and **Appendix 11**⁵² were used to separate tag submissions from volunteers by workflow, with **Appendix 10** holding sheets for each individual subject set within the "Verify AI Tags" workflow, and **Appendix 11** holding sheets for each individual subject within the "Tag Images" workflow. Each of these Appendices includes individual sheets by subject sets, accounting for the 11 individual subject sets run in both workflows. Within these individual sheets the accession number and filename for each image are recorded, as well as the user generated tag added, as well as the frequency with which volunteers added that tag for the specific image. Formatting within these Sheets remained consistent, with bold text denoting that the user generated term was already available in the Adler Planetarium's cataloguing data, with green highlighted text denoting that the user generated term was also created by the iMET tagger, and the red highlighted text denoting that the user generated term was also created by the Google Cloud Vision API tagger (as shown in **Figure 47** for "Verify AI Tags", and **Figure 48** for "Tag Images").

At the top of each individual Sheet, statistics are also included for these bolded and highlighted data points, allowing the number of tags and percentage of the tags added for each subject set within each individual workflow to show those already in the Adler catalogue and those created by each of the two AI tagging models. This information was then also added to a Sheet labeled "Stats" which brings together all 11 subject sets with the total tags created by volunteers, the number of these tags reflected in Adler's Catalogue, the number of these tags

⁵¹ **Appendix 10: Verify AI Curator Verification Stage -**

https://docs.google.com/spreadsheets/d/1WXaPlc17_c8QPRsUaIRZ-QgzcrkHutItXpB-dz-6GnE/edit?usp=sharing

⁵² **Appendix 11: Tag Images Curator Verification Stage -**

<https://docs.google.com/spreadsheets/d/1Y3kNosFa8AFOnoSUZHtCkfXgBKTAGrN9PnOrEU1Lt1Y/edit?usp=sharing>

reflected in the AI Tags created, as well as a breakdown of these AI tags by Google Cloud Vision API and iMET Tagger (as shown in **Figure 49**).

As shown in **Figure 21**, the most frequently cataloged terms in the Adler's publicly accessible records were locations of objects (where objects were created, where books were published), item types, years of creation, and significant makers (object makers, authors, etc.). The thirty most used terms in the cataloguing data of the data set (and the number of times the term appears) are seen here: Chicago (254), London (179), England (173), Adler Planetarium (155), celestial (105), cartography (103), 1933 (98), Century of Progress International Exposition (96), James Weber Linn (96), Kaufmann & Fabry Co. (96), Pictorial works (96), Reuben H. Donnelley Corporation (96), The official pictures of a Century of Progress Exposition, Chicago, 1933 (96), France (88), Paris (82), diagrams (80), internal perspective (71), Germany (70), instruments (68), northern (61), southern (59), Portrait (56), hemispheres (55), Netherlands (47), Astronomy (42), Issac Taylor (39), Ephraim Chambers (39), Cyclopedia or an Universal Dictionary of Arts and Sciences (39), Amsterdam (38), 1780 (38). Though this data is clearly important for the provenance and understanding of the objects within the Adler's collection, it does not represent much of the *context* of the objects in the collection. In fact many of these terms, specifically the 6 that appear 96 times, are terms added to archival collections regardless of the archival photographs' depictions, as cataloguing terms for archival collections are added at a collection level not an individual item collection.

In comparison (**Figure 22**), the frequency of terms created by users in the first six subject sets of *Tag Along with Adler* can be seen. The thirty most frequently added terms by participants of the *Tag Along with Adler* project across both the "Verify AI Tags" and "Tag Images" workflows (and the number of times the term was added) are seen here: illustration (1442), drawing (1424), astronomy (1365), black and white (1034), science (1008), diagram (982), space (790), people (765), Art (741), old (740), globe (707), history (687), Circle (678), map (667), men (660), earth (656), stars (651), sky (595), sun (589), planets (587), astrology (584), moon (567), photograph (548), man (547), chart (532), planet (529), sphere (511), building (507), engraving (478), telescope (470). These terms lack the *is-ness* details of makers, location, and dates, demonstrating a language geared towards describing what is represented in an object (though, importantly, still including terms to describe object type, particularly terms like "drawing," "diagram," and "photograph").

Evaluating even the thirty most frequent terms from the Adler catalog and the thirty most frequent tags from the *Tag Along with Adler* project demonstrates a gap in the way museums catalog collections vs. the way the public describes and looks to use collections. Results like

those visualized above help to show that crowdsourcing does have the desired effect of enhancing collections records to better suit the language of the user, as well as to serve user search and browse capabilities.

Another way to visualize the importance of user language added to the catalog for discoverability is shown in the following image set. Each image shows a photograph from the Adler's archival collection that was included in the *Tag Along* project, with **Figure 23a** including the terms already included in the Adler catalog and **Figure 23b** including the tags added by users of the *Tag Along with Adler* project. Not only do these images help to demonstrate a difference in how museum catalogers describe images (in this case demonstrating the archival standard of cataloging at a collection level vs. actual image content) but also in the amount of access points added by the crowdsourcing project, again increasing discoverability for the public and staff.

Additionally, when processing the data for the *Tag Along with Adler* projects, a comparison was made to denote how many tags added by users were already in the Adler catalog or were created by AI models vs. how many of the tags were completely new.

For this first half of the project, the average for tags added that were already in the Adler catalog was 13% for the "Tag Images" workflow (**Figure 23**), and 13.9% for the "Verify AI Tags" workflow (**Figure 24**), and the average for tags added that were also created by the AI models was 8.4% for the "Tag Images" workflow and 5.7% for the "Verify AI Tags" workflow. Taking a deeper look at the frequency with which volunteer-provided terms matched each model, there is a distinction within the frequency AI-generated tags were matched between the terms created by the Google Cloud Vision API and the iMet Metropolitan Museum of Art tagger. For the "Tag Images" workflow, the volunteer-generated tags matched the Google Cloud Vision API at an average of 6%, whereas they matched the iMet tagger at an average of 2.5%. Similarly, as part of the "Verify AI Tags" workflow, volunteer-generated tags matched the Google Cloud Vision API at an average of 3.9%, whereas they matched the iMet tagger at an average of 1.8%.

This was an exciting early assurance of the importance of using crowdsourcing for metadata creation, showing that though AI has some promises for metadata and tag creation, its success is still extremely dependent on the dataset used to train the AI model and still drastically short of the work of human participants. It was also noteworthy to see that the "Verify AI Tags" workflow that actually displayed the AI tags as part of the task had a lower percentage of tags added by participants that matched the AI-generated tags, as the expectation was that being primed with the language and terms would lead to more occurrences of the language in volunteer tagging.

Farooq et al. found that in most tagging systems, tags provided by users that were visible to other users were used more often, demonstrating a restriction of diversity of thought amongst users where the user would tend to select the terms that others have used to tag a resource.⁵³ With this in mind, the expectation was that the “Verify AI Tags” workflow would have a higher propensity for language matching, as the AI tags were actually visible and project text did not specifically state whether users should avoid adding duplicate tags; however, from the data shown below, it appears that Zooniverse users were influenced by the terms shown in the image in a different way. Instead of adding these terms in their free-text responses, the presence in the “Verify AI Tags” workflow of the terms actually resulted in fewer occurrences of the language in the users tags.

However, it should be noted that the inclusion of AI tags did entice user engagement. The “Verify AI Tags” workflow consistently saw 2-3x the engagement of the “Tag Images” workflow, demonstrating the draw AI, automation, and algorithms can have on users. As part of the “Verify AI Tags” workflow, the volunteers were asked to perform not only a tagging task, but also a verification task.

Figure 25 demonstrates how the verifications were broken down by collection type (Archival Images, Rare Book Images, and Works on Paper) as well as by the AI tagging models (Google Cloud Vision API, and the iMet tagger). Between the Google Cloud Vision API and the iMet tagger created by the Metropolitan Museum of Art, 7,606 AI-generated metadata tags were created across the collections of 1,090 Adler Planetarium objects. Roughly two thirds of these terms were validated by the volunteers, with one third being unvalidated.

The inclusion of these two tagging models was done to represent an AI that was trained specifically for visual museum collections (the iMet tagger) and one that would be similar to the daily AI-underpinned searches volunteers encounter on the web (the Google Cloud Vision API). About 58% of the AI-generated tags, or 4,420 tags, were generated by the Google Cloud Vision API tagger, with the iMet tagger having generated 3,183. Despite accounting for approximately 58% of the total tags generated, the Google Cloud Vision API tags accounted for 86% of the tags verified by the volunteers, demonstrating a strong preference of the volunteers for the visually descriptive language of the Google Cloud Vision API to the more museum-cataloger language prevalent in the iMet tagger. In fact, volunteers verified just shy of 50% of the terms created by the iMet tagger vs. verifying 80% of the tags generated by the Google Cloud Vision API.

⁵³ Cho, Chung-Wen, Ting-Kuang Yeh, Shu-Wen Cheng, and Chun-Yen Chang. “The Searching Effectiveness of Social Tagging in Museum Websites.” *Journal of Educational Technology & Society* 15, no. 4 (October 2012): 126–36.

Additionally, 34% of terms generated for images from the Rare Book Collections were not verified, while 26% of terms generated for images from the Archival Collections were not verified, and 24% of terms generated for images from the Works on Paper Collections were not verified. The AI taggers appear to have had an easier and more accurate time identifying aspects of the Photographic Collections as well as the Figural Works Collections, with the rare book illustrations continuously having the lowest verification rates by percentage.

In a 2021 published report from the Library of Congress that explored the range of projects the Digital Strategy Directorate and its Digital Innovation Lab (LC Labs) have undertaken, including those in crowdsourcing, a similar approach to combining machine learning technology and crowdsourcing was conducted.⁵⁴ A main research question for the Library of Congress was how machine learning and crowdsourcing could be used in tandem to create engaging, ethical, and useful data enrichment activities for cultural heritage institutions.⁵⁵ Through testing using the U.S. Telephone Directory Collection, the Library of Congress team found that 75% of participants offered overall positive responses, indicating that they found it worthwhile for the Library to combine machine learning with volunteer contributions, and that they would in fact be willing to volunteer for further initiatives.⁵⁶

Similar to the appeal that the “Verify AI Tags” workflow appeared to have for Zooniverse users of the *Tag Along with Adler* project, the Library of Congress team noted that 50% of their users stated that knowing the Library was incorporating a combined approach to integrate machine learning and human knowledge had a positive impact on their motivations to volunteer.⁵⁷ Furthermore, even the volunteers who explicitly noted a distrust for machine learning and AI indicated that knowing such technology was being incorporated into human-centered crowdsourcing would not deter them from volunteering in projects as long as the tasks and content remained engaging.⁵⁸

Breakdown of Tagging Behavior by Collections:

A deeper analysis of tagging behavior by collections can, and should, be discussed as part of this thesis. As the above section analyzed the verification rate of AI tags generated for each tagging model, it is possible to go further looking at the collection type. This is an important component of this thesis as it goes to the applicability of this kind of project outside of traditional

⁵⁴ Averkamp, Shawn, Kerri Willette, Amy Rudersdorf, and Meghan Ferriter. “Humans-in-the-Loop: Recommendations Report,” November 29, 2021. <https://labs.loc.gov/work/experiments/humans-loop/>.

⁵⁵ Averkamp et al. “Humans-in-the-Loop,” pg. 9

⁵⁶ Averkamp et al. “Humans-in-the-Loop,” pg. 48

⁵⁷ Averkamp et al. “Humans-in-the-Loop,” pg. 48

⁵⁸ Averkamp et al. “Humans-in-the-Loop,” pg. 48

art museums. Throughout the early 2000s and into the 2010s, the majority of projects that looked at metadata tagging were hosted at art museums. These studies found that volunteers responded best to two-dimensional works in the collections, finding that three-dimensional objects were often too difficult for tagging. As I look to show this kind of project is valuable to all museums, it is therefore important to discuss the tagging behaviors related to collection types that may be most common in non-art specific cultural heritage institutions.

With this in mind, I selected 1,090 objects within the Adler Planetarium's collections that were specifically two dimensional and visual based. This broke down across collections to include 613 Works on Paper, 195 Archival Rare Photographs, and 282 Rare Book Illustrations. When looking at the language created by volunteers, there is a distinct difference shown between the three collections. As can be seen in **Figure 26**, the Archival Photographs Collection consistently saw the highest number of tags added by users that were a match for tags already in the Adler Planetarium catalog, with on average about 17% of user tags already accounted for in the museum cataloging language. Closely behind at 15% of user tags accounted for in the museum cataloging language was the Works on Paper Collection. Most notably, the Rare Book Illustrations Collection saw a significantly lower number of user language matching the cataloger language, with an average of 5.5%.

This is especially interesting to note as the cataloging standards of the Works on Paper Collection at the Adler Planetarium follow a typical museum cataloging standard, while the Archival Photograph Collection is cataloged using the ISAD(G) standards of an archive, and the Rare Book Illustrations Collection is cataloged using the MARC standards of a library. These results provide an initial indication that all three cultural heritage institutions (museum, archive, and library) can benefit immensely from bringing the public into the description process, as 85% or more of the tags generated were new to the catalog on average. Library collections and archival collections may actually see the most value in bringing the public into the description of their collections images, as, unlike museums where cataloging is done on the individual object, libraries do not catalog per image but by work, and archives often catalog at the collection level over the individual item level. This may account for the statistics in **Figure 20**, which demonstrate that the highest number of new terms that were previously not in the catalog records were added for rare book (library) images.

However, it is important to look not only at the ways in which user language differed from cataloguer language by collection, but also on whether the collection type itself encouraged, or

conversely discouraged, volunteer participation habits. **Appendix 13**⁵⁹ features Sheets for each individual collection type (WOP, ArchivalPhotos, and RareBookIllustrations) as well the AI tagging models (MET_Terms, and GoogleAPIDetectLabels). In these 5 Sheets the individual image files and accession numbers for each object are included as well as each individual term within the Adler Planetarium's Catalogue that returns in a search for that image. The final column in all 5 Sheets denotes whether the term was added by the volunteers as part of the project; with the AI tagging models Sheets two columns are present, to denote if the term was added in the "Verify AI Tags" and/or "Tag Images" workflows. This data is then presented in the initial two Sheets of the Appendix, "%AddedbyTaggers" demonstrates the percentage of terms added by volunteers that were also in the Adler Catalogue or AI models, and the "AddedByTaggers" demonstrates a breakdown of terms added by volunteers that were also in the Adler Catalogue based on collection type.

As shown in **Figure 27**, the breakdown of tags added by collection differed largely. However, this does not take into account that there was a large discrepancy in the number of images represented within the project from each of the collections. **Figure 28** looks at the average number of tags added per image for each collection type and shows that, remarkably, the collection type seems to have very little impact on the tagging behaviors of the volunteers, demonstrating that cultural heritage institutions like museums, archives, and libraries can all benefit from crowdsourcing projects.

As expected, the Archival Photographs did have the highest number of tags added on average of the three collections, with 373.07 tags per image. As indicated by previous projects, photographs appear to have the lowest barrier to entry for volunteers, so it is unsurprising that they would elicit the largest number of tags per object. Perhaps more surprisingly, the Rare Book Illustrations had the second-highest number of tags added on average, with 361.27 tags per image. However, the Works on Paper were closely behind at 359.6 tags added per image. Overall, this shows that volunteers responded quite similarly across the three collection types, indicating that the impetus to tag and the ability to tag various collections housed in cultural heritage institutions is there and is promising.

Appendix 14⁶⁰ is helpful in visualizing this cross collection tagging data. This appendix features a sampling of 10% of the project data, including a breakdown to feature a

⁵⁹ **Appendix 13: Metadata Project Data Set -**

<https://docs.google.com/spreadsheets/d/1TMqkRlvDnjDuCXe7NDhGv23N94bWj18cL-yx7B9cNZU/edit?usp=sharing>

⁶⁰ **Appendix 14: Examples of the Dataset**

https://docs.google.com/presentation/d/1dob9fIVF_Ft9ygRw5GVFGNZuVw-OP9Ggln6ehJk-j3Q/edit?usp=sharing

representative sampling by collection type – 62 Works on Paper, 28 Rare Book Illustrations, and 20 Archival Photographs. Looking at even one example of each collection type it is possible to see evidence for the previous section on the semantic gap as well as evidence for the applicability of crowdsourcing across collections types.

As part of the project a large number of the Adler Planetarium's Works on Paper were included. These are two dimensional in nature as they all appear on paper, though within this collection there are pieces that are scientific instrument drawings, cartographic maps, as well as artistic renderings. Looking at the Adler Collections piece P-150i⁶¹ the cataloguing data that exists currently for this piece on the Adler's publicly accessible catalogue includes only the following terms (in quotes is the category designation for each piece of metadata): De la Sphere (title), Alain Mallet (creator), Thierry (maker), 1683 (date), Paris (place of production), France (place of production), Ursa Major (description), Minor (description), Cetus (description). When this image was run through the iMet Tagger the following terms were generated: culture: austrian, maps. When the image was run through the Google Cloud Vision API the following terms were generated: illustration, art, painting, textile, and visual arts. Between the Adler Catalogue and the two AI training models, a total of 16 terms could be used to find this collection piece. During the process of *Tag Along with Adler*, even when duplicate tags are removed, the list of terms added by volunteers was 148, including: 4 legged, Africa, ancient, animal, circular, animals, **art**, artistic, Artwork, astronomy, bear, long tail, bears, boar, Boat, boats, bodies of water, body of water, building, buildings, by S. Dunn, canoe, **cetus**, church, spire, circle, circles, coast, Color, colored, colour, common animals in a small town, constellation, constellations, Cow, creature, creatures, crowd, decorative frames, diagram, dog, Draco, dragon, drawing, evolution, fantasy, farm, farmer, farming, figure 37, figures, fish, fishers, fishing, great bear, green fish, Habitat, historical, history, horse, sheep, horses, house, blue roof surrounded by red roofs, houses, **illustration**, imaginary animals, ink, lake, lamprey, landscape, leash, Little Bear, London, men, monsters, moon, myth, mythical creatures, mythology, nature, night sky, ocean, Old story, **painting**, pastoral, people, pisces, portrait, possum, religion, research of an areas wildlife, ribbon, river, river side, riverside, row, rowboat, rural, sea, seaside, Serpens, serpents, sketch, sky, space, spectators, stars, still, sun, symbols, three, gold rings, rings, town, towns, tree, trees, Trinity, Twelve circles, **Ursa**, **ursa major**, **Ursa Minor**, village, water, whale, wildlife, wolverine, Zodiac constellations depicted in European night sky. In the

⁶¹ **Appendix 14: Examples of the Dataset**

https://docs.google.com/presentation/d/1dob9fIVF_Ft9ygRw5GVFGNZuVw-OP9Ggln6ehJk-j3Q/edit?usp=sharing (slide 14)

above list, those in bold were included in either the Adler Catalogue or the AI tagging models; with 122 of these tags appearing for the first and only time in the user generated data.

Looking at the Rare Book Illustrations shows a similar case for not only the additional entry points created by user generated metadata, but also for the suitability of rare book illustrations in such projects. Looking at the Adler Collections piece QB821 .B87 1900⁶² the cataloguing data that exists currently for this piece on Adler's publicly accessible catalogue includes only the following terms (in quotes is the category designation for each piece of metadata): S.W. Burnham (author), 1900 (publishing), catalogue (Title), 1290 double stars (Title), stars (subjects), 1871 (Title), 1899 (Title), Chicago (publishing), University of Chicago Press (publishing). When this image was run through the iMet Tagger the following terms were generated: tools and equipment, men, bridges. When the image was run through the Google Cloud Vision API the following terms were generated: paper product. Between the Adler Catalogue and the two AI training models, a total of 14 terms could be used to find this collection piece. During the process of *Tag Along with Adler*, even when duplicate tags are removed, the list of terms added by volunteers was 92, including: 40 inch telescope, 40-inch, 40-inch telescope, architecture, artillery, astrology, Astronomer, astronomy, balcony, big, black and white, brick, building, Canon, Chair, chairs, Clark, construction, cylinder, device, Different Era, dome, Door, doors, English, Enormous, Equipment, forty inch telescope, high ceiling, history, inside, interior, ladder, large, room, lens, machine, machinery, machines, moon, mounted by warner a Swasey, mounting, observatory, observing platform, old, optical telescope, photo, photograph, picture, planetarium, planets, print, real, refractor, rig, ring, Satellite, scaffolding, science, scientific instrument, Space, spiral stair case, spiral staircase, spiral stairs, staircase, stairs, star, stargazer, Stargazing, **stars**, steps, Structure, Supports, Swasey, tall, technology, telescope, text below, tool, tools, tower, vintage, war, Warner, Warner A Swarey, Warner Swarey, weapons, wide room, Window, windows, Yerkes, Yerkes Observatory. In the above list, only the term in bold was included in either the Adler Catalogue or the AI tagging models. The fact that only one of these user-generated tags appears within the professionally generated and AI generated metadata helps to show that library collections can in fact benefit from the individual-level attention that a metadata tagging project brings to collections otherwise catalogued at a volume (book) level instead of individual image level.

Finally, looking at Archival Photographs shows very similar results and impetus for inclusion within these projects as the Rare Book Illustrations. Looking at the Adler Collections

⁶² **Appendix 14: Examples of the Dataset**

https://docs.google.com/presentation/d/1dob9fIVF_Ft9ygRw5GVFGNZuVw-OP9Ggln6ehJk-j3Q/edit?usp=sharing (slide 76)

piece APHP.S7.B.F3.3⁶³ the cataloguing data that exists currently for this piece on Adler's publicly accessible catalogue includes only the following terms (in quotes is the category designation for each piece of metadata): children (title), telescope (title), outdoor (title), viewing event (title), telescopes (scope and content), Adler Planetarium (creator), Chicago (geographic access point). When this image was run through the iMet Tagger the following terms were generated: women, men, working. When the image was run through the Google Cloud Vision API the following terms were generated: photograph, history, stock photography, crew, photography. Between the Adler Catalogue and the two AI training models, a total of 15 terms could be used to find this collection piece. During the process of *Tag Along with Adler* even when duplicate tags are removed the list of terms added by volunteers was 90, including: 1900s, 1950s, 1960s, adult, adults, apparatus, astronomy, b&W photograph, black and white, boy scouts, boys, **Children**, class, class assignment, club, clothing, Compass, curious, demo, demonstrating, demonstration, discussion, education, experiment, Experimental, field trip, fifties, gathering, girls, grey, grinding, group, white mid 20th century boys and girls outside at night around a card table, group of people, Group project, High school students examining astronomical instruments, **history**, hypothesis, inspected, inspection, invention, investigate, kids, late forties, learning, lens, lens grinding, lenses, lesson, listening, looking, man, **men**, middle schoolers, monochrome, night, objects, observation, observing experiment equipment, old, **outdoors**, outside, people, Photo, **photograph**, project, pupils, reflecting telescope, retro school project, School science, Science Experiment, scientific instruments, show and tell, students, table, teacher, Teachers, teaching, team, Technology, teen, **telescope**, testing, trip, **viewing**, vintage, **women**, young people, youth. In the above list, the terms in bold were included in either the Adler Catalogue or the AI tagging models, with 8 of these tags appearing within the professionally generated and AI generated metadata. This again helps to show that archival collections can in fact benefit from the individual-level attention a metadata tagging project brings to collections otherwise catalogued at a collection level, irrespective of the type of image or object.

Gamification and Platform Selection:

One of the central questions of this thesis was how to optimize the chances at diversity of volunteers to the metadata tagging program to ensure that the tags created and the folksonomy generated during the process were in fact more diverse than the metadata created

⁶³ **Appendix 14: Examples of the Dataset**

https://docs.google.com/presentation/d/1dob9fIVF_Ft9ygRw5GVFGNZuVw-OP9Ggln6ehJk-j3Q/edit?usp=sharing (slide 115)

by museum cataloguers. At the end of the 2000s and into the 2010s, one of the theories to emerge for incentivization of tag generation that would in turn produce a more diverse audience was that of gamification. Researchers such as Jan-Erik Bråthen,⁶⁴ Mary Flanagan,⁶⁵ Henry Jenkins,⁶⁶ and Peter Carini⁶⁷ all explored the challenges of participatory culture in the twenty-first century and the role that play can have for engagement.

In a 2009 report funded by the MacArthur Foundation, Jenkins et al. emphasized the potential for engagement that comes with play, stating “when individuals play games, a fair amount of what they end up doing is not especially fun at the moment. It can be a grind, not unlike homework. The effort allows people to master skills, collect materials, or put things in their proper place in anticipation of a payoff down the line. The key is that this activity is deeply motivated. The individual is willing to go through the grind because there is a goal or purpose that matters to the person.”⁶⁸

Looking to the example of the Metadata Games platform, I endeavored to test gamification as part of this thesis looking at its impact on incentivizing participation, its ability to attract a more diverse audience, and whether it would yield different results in tagging language than a citizen science platform/audience like Zooniverse. The gamified case study evolved to also include testing of the general public’s preference for metadata language: did they prefer the language created by cataloguers, the language created by AI models, or that of the volunteers produced via the Zooniverse workflows?

Within **Chapter 4: Methodology & Project Design**, I have written more extensively on the design and execution of the gamified case study, but to refresh, the gamified case study was built using a combination of React, JavaScript, HTML, and CSS coding languages with a MySQL backend database to store results of user interactions, and was hosted on a custom-built website hosted on Heroku. The gamified case study had two “pushes”, one as part of the 2021 *Being Human Festival* in the the United Kingdom in November 2021, and one as part of the 2022 Adler Planetarium digital programming push to their member listserv and social media audiences from January to March 2022.

⁶⁴ Bråthen, Jan-Erik. “An Analysis of Image Folksonomy Generation,” 2009, 180.

⁶⁵ “Games and Learning: Seven Questions For Mary Flanagan | Interviews | Communications of the ACM.” Accessed November 14, 2019.

<https://cacm.acm.org/opinion/interviews/112340-games-and-learning-seven-questions-for-mary-flanagan/fulltext>.

⁶⁶ Jenkins, Henry, Kate Clinton, Ravi Purushotma, Alice Robison, and Margaret Weigel. “Confronting the Challenges of Participatory Culture: Media Education for the 21st Century.” MacArthur Foundation, 2009.

⁶⁷ Flanagan, Mary, Sukdith Punjasthitkul, Max Seidman, Geoff Kaufman, and Peter Carini. “Citizen Archivists at Play: Game Design for Gathering Metadata for Cultural Heritage Institutions,” 2014, 13.

⁶⁸ Jenkins, Henry, Kate Clinton, Ravi Purushotma, Alice Robison, and Margaret Weigel. “Confronting the Challenges of Participatory Culture: Media Education for the 21st Century.” MacArthur Foundation, 2009.

During the time of this case study, 512 unique users accessed the game portal. As shown in **Figure 29**, users came from 11 different countries; however, 90% of users came from the United States, and 5% came from the United Kingdom. As the game was marketed as part of a UK-based festival and by a US-based institution, and was created in English only, these results are not necessarily surprising, but they do show the continuation of limitations surrounding Anglophone dominance of projects as noted previously.

Another important statistic to note from this case study goes towards engagement. The 512 individual users recorded 935 page visits during the course of the case study, launching the game itself 567 times. However, as can be seen from the “Average engagement time” column in **Figure 29**, the users’ engagement with the game was markedly lower with an average of 21 seconds per user. It is difficult to fully understand why engagement was low with the game itself. The fact that 512 individual users recorded 935 unique page visits over the course of the four month case study is markedly lower than the number of users who participated in the Zooniverse case studies, where 1,000 unique volunteers participated within the first week alone.

The lower rate of engagement with the video game case study may be attributed to the choice of platform; hosting on a custom built site versus a third party site like Zooniverse. Steve.museum, perhaps the most noted example of metadata crowdsourcing in museums, was hosted on a custom-built site specifically to provide a safe “third space” that was not identified by any of the specific museum partners so as not to be directly impacted by existing institutional approaches or technical services.⁶⁹ Assembling a test set of 1,784 works of art from the various contributing members, testing was held in two phases, between 26 March 2007 and 14 October 2007; and from 15 October 2007 to 13 March 2008.⁷⁰ My own case studies and the steve.museum were similar in the almost year-long period of testing, though divergent on our choices of hosting. On their self-hosted project, the steve.museum team identified 2,017 users between 2007 and 2008– 608 were registered users and the remaining were unregistered/anonymous users.⁷¹

As stated above, my own Zooniverse-hosted case study also ran for almost a year, though from March 2021 to March 2022, and saw 3,557 registered volunteers, with 6,976 individual participants. Though the nearly six-fold increase in registered volunteers and 3.4-fold increase in total volunteers likely has many reasons outside the scope of this thesis, it does seem pertinent to note that this could be reflected in the decision to host this case study on the

⁶⁹ Trant, Jennifer. “Tagging, Folksonomy and Art Museums: Early Experiments and Ongoing Research.” *J. Digit. Inf.* 10 (2009). Pg. 7

⁷⁰ Trant, “Tagging, Folksonomy, and Art Museums,” pg. 12

⁷¹ Trant, “Tagging, Folksonomy, and Art Museums,” pg. 16

Zooniverse platform. Much like my own gamified case study that was self-hosted on Heroku, the *steve.museum* relied on email listservs to members and the public to encourage volunteers to their project, compared to the built-in community of over two million volunteers on the Zooniverse site. Demonstrating that the use of a self-hosted site compared to a preexisting platform appears to have an effect on participation, indicative of the difference in using the Zooniverse platform vs. a self hosted platform, such as the *steve.museum* and my own gamified case study.

Though the lower number of volunteers can, and should, be partially attributed to the platform selection, it is also important to note game design for the case study, titled *Meta Tag Game*, may also have had an impact on the seemingly low engagement with the site in regards to the average time spent per user, as well as the actual classifications conducted by the individual users. When volunteers accessed the site, <http://meta-tag-game.herokuapp.com/>, they were presented with 60 different images from the *Tag Along with Adler* Zooniverse-hosted project.

As shown in **Figure 30** and **Figure 31**, of these 60 different images, the *Being Human Festival* participants (**Figure 30**) only interacted with 10 images (8 archival photographs and 2 works on paper), whereas the Adler Planetarium listserv and social media audience participants (**Figure 31**) interacted with 7 images (3 archival photographs, and 4 works on paper). As shown in **Figures 30 and 31**, one of the most interesting metrics for the gamification case study was the preference the volunteers had for the different ontologies used and created as part of these thesis case studies. As shown in the images and discussed in the **Chapter 4: Methodology & Project Design**, video game participants were shown terms and then asked to sort them either as terms they *approved* or terms they *rejected*. The terms that were presented for each image came from the Adler Planetarium's public-facing catalog records, from the iMet and Google Cloud Vision API AI taggers, and from the Zooniverse-hosted *Tag Along with Adler* workflows "Tag Images" and "Verify AI Tags".

This data can be seen in Appendix 17.⁷² Here the "Data" Sheet includes all the image files that were added to the video game platform option list, as well as all the terms added to the game play for each image, including a column for "tag created by" which helps account for which taxonomy the terms came from (Adler Catalogue, MET Terms, User Generated, and Google Cloud Vision API). This Sheet also includes Approvals and Rejection numbers by the different audiences tested, the Adler Planetarium Marketing targeted participants, and the Being

⁷² **Appendix 17: VideoGame Approvals - Being Human Fest & Adler Marketing** - <https://docs.google.com/spreadsheets/d/1wcASXt9ad8FeI17JSRhvHPSE54JCkMQJKm-YkKu5BRI/edit?usp=sharing>

Human Festival 2021 audience. Additional Sheets breakdown the language preference of each of these audiences. “BHFLanguagePreference” shows the ten images engaged with by the Being Human Festival audience, tracking the total responses, and then documenting approval and rejections per image by the taxonomies: Adler Planetarium Catalogue, AI - MET, AI - Google, AI - Total, and User Generated. These are counted across images and then also analyzed to show a percentage of the tags being approved from each taxonomy. This is also shown in the “AdlerLanguagePreference” Sheet for the 7 images engaged by this audience. Additional Sheets in this appendix include “UserGeneratedTagsBHF” and “UserGeneratedTagsAdler” which identifies the image_id assigned in the game as well as the filename for this image_id, along with the terms added by the participants at the end of their experience.

Figure 30 and **Figure 31** include negative values on the x-axis to account for *rejected* terms. This helps to demonstrate the preference users had in both volunteer groups for the various ontologies available. As **Figure 30** demonstrates, the *Being Human Festival* participants generated a total of 305 interactions. Of these interactions, the breakdown was as follows:

- 28 Approvals for Adler Planetarium Catalog Terms, 0 Rejections for Adler Planetarium Catalog Terms
- 1 Approval for iMet AI Tags, 7 Rejections for iMet AI Tags
- 10 Approvals for Google Cloud Vision API AI Tags, 2 Rejections for for Google Cloud Vision API AI Tags
- 11 Approvals for AI Tags, 9 Rejections for AI Tags
- 117 Approvals for User-Generated Tags, 0 Rejections for User-Generated Tags

As **Figure 31** demonstrates, the Adler Planetarium listserv and social media audience participants generated 288 interactions with the gamified platform. Of these interactions, the breakdown was as follows:

- 7 Approvals for Adler Planetarium Catalog Terms, 4 Rejections for Adler Planetarium Catalog Terms
- 8 Approvals for iMet AI Tags, 4 Rejections for iMet AI Tags
- 4 Approvals for Google Cloud Vision API AI Tags, 7 Rejections for for Google Cloud Vision API AI Tags
- 12 Approvals for AI Tags, 11 Rejections for AI Tags
- 104 Approvals for User-Generated Tags, 0 Rejections for User-Generated Tags

The preference for ontologies can be seen in **Figure 32**. Here I have modeled the approvals and rejections by percentage for each ontological source, demonstrating the percentage of terms approved versus the number of terms that were available for each of the tests. For the cases where the rejection of terms outweighed the approval of terms, a negative numeral was generated for that ontological source and is reflected as 0% on the graph (shown by the AI-Met, and AI-Google values).

As **Figure 32** shows, there was discrepancy in ontology preference between the *Being Human Festival* volunteers and the Adler Planetarium listserv and social media audience volunteers. This is perhaps shown most strongly in the approval and rejection of the AI tagging model terms, with the *Being Human Festival* participants overall rejecting terms generated by the iMet tagging model, but the Adler Planetarium participants overall rejecting terms generated by the Google Cloud Vision API tagging model. Overall, though, both sets of volunteers approved AI tags at 3.33% (*Being Human Festival*), and 1.88% (Adler Planetarium) respectively, showing the least preference for AI tags out of the three ontological sources.

Similarly, there is a reversal in preference for the Adler Planetarium Catalog and the User-Generated Tags from the two volunteer groups. There was a 32% approval of the Adler Planetarium Catalog ontology by the *Being Human Festival* participants, while the same ontology had a 4.65% approval rating by the Adler Planetarium audience participants. The terms generated by users of the Zooniverse case study showed a 24.4% approval rate by the *Being Human Festival* participants, but a 43.51% approval rate by the Adler Planetarium audience participants. Though this could indicate a difference between a UK (*Being Human Festival*) and a US (Adler Planetarium audience) based audience (see **Chapter 4: Methodology & Project Design pg. 114-119** for this breakdown), overall the approval rates of this gamified workflow show a stronger alignment with the User-Generated ontology (folksonomy), demonstrating a value in incorporating the public in metadata creation.

Additionally, work continues at the Adler on the quality control for accuracy of these user-generated tags (looking at spelling, accuracy, polysemy, and plurality), but as this is ongoing work, it will not be expanded too widely in this thesis except to address this is a necessary step to either be designed into the project for users to assist with or as part of the workload staff prepare for. One unexpected outcome of the gamified workflow case study was the potential for gamification to aid in this quality control step. Of the 935 page starts to the gamified workflow, 593 resulted in an approval task, only 69 of these resulted in volunteers actually adding their own tags to the images.

It should be made clear that much like the Zooniverse-hosted “Verify AI Tags” workflow, the tagging task was secondary in the gamified workflow and was only presented to volunteers after they had completed the approval task. However, even as a secondary task, only 25 volunteers actually input their own terms in the gamified task, while in the “Verify AI Tags” workflow on Zooniverse, every single volunteer input terms of their own.

One possibility is that the gameplay itself did not lend well to the action of adding user tags. The approval task itself was run on a two-minute interval, randomly presenting 12 terms per image from the list composed of Adler Planetarium cataloging terms, AI-generated terms, and user-generated terms from the Zooniverse case studies. A term was dropped every 10 seconds, and after 12 terms, or 2 minutes, the text box was brought up to enter the user’s own language. It is possible that having been presented 12 terms, the users did not feel the need to add any additional tags, though this kind of influence on tagging was not seen in the “Verify AI Tags” Zooniverse workflow. It is also possible that volunteers became disinterested with the game before the 2 minutes of approval task ended and left the experience before the tagging task was introduced. It is difficult to judge in this case, as the appended survey that was added to the video game platform received zero responses.

Unlike the Zooniverse platform where the survey was appended to the *Tag Along with Adler* homepage as a banner link, for the gamified case study, the survey was added in the “About” section of the game,⁷³ though it was a nearly identical Google Form-based survey.⁷⁴ It could be that volunteers went directly to the game itself instead of clicking through the “About” section of text and just never discovered the survey, or that the difference in volunteers from those of a citizen science platform like Zooniverse to those of a gamified case study enticed by a festival or mailing list/social media post just resulted in a group less inclined to take a survey. Though it is only possible to speculate on why this survey was not responded to with the same rate as that of the Zooniverse case studies, it does make it more difficult to judge the qualitative experience of the gamified platform for the users in the same way I am able to do below for the Zooniverse case studies.

Crowdsourcing as Engagement – Qualitative Analysis of TalkBoards:

A noted assertion in this thesis has been the ability to use crowdsourcing projects as a way to not only enrich collections information and increase entry points to collections, but also

⁷³ <http://meta-tag-game.herokuapp.com/about>

⁷⁴ **Appendix 12: Tag Along Metadata Game Survey** link: https://docs.google.com/forms/d/e/1FAIpQLSeIZkqRRGzGffmoLM_k4J201oBPWxnLGliMg8kjXAkTI6CsAQ/viewform

as a way to engage and build relationships with the public and the audiences of the institutions. With this in mind, it is important to analyze the qualitative data provided in the case studies through TalkBoard comments and survey responses. Breaking these down, it is possible to see major themes within the communications expressed as well as to see specific examples of engagement taking place throughout the course of the projects.

To reiterate, the survey was accessed by 195 volunteers, resulting in 70 specific free-text comments in response to the prompt: “Anything else you want to share about what you enjoyed or didn't enjoy? Just like the scientific process, we want to learn from you!”⁷⁵ Additionally, the Zooniverse platform is equipped with TalkBoard functionality. The *Tag Along with Adler* project utilized this TalkBoard space, creating multiple “boards” for volunteers to communicate, including:

- Notes - General comment threads about individual subjects
- Introduce Yourself - A place to share a bit about who you are and how you came to be involved in the project
- Troubleshooting - A place to ask for help and/or report technical problems with the project

Within the Zooniverse TalkBoard, the majority of the comments made by volunteers took place in the “Notes” board, which was to be expected as this is where all comments made on the specific subjects (individual collection items within the project) are recorded. As **Figure 33** demonstrates, approximately 88% of all comments made on the *Tag Along with Adler* Zooniverse TalkBoards were made within the “Notes” board; also accounting for 100% of participants within the boards. Throughout the project’s run, 110 Zooniverse users submitted comments, with each of them participating at least once on the “Notes” board, as well as on the other two boards.

Breaking down the comments and engagement within the Zooniverse TalkBoards, themes emerged that can be used to group comments together as discussed in the **Chapter 4: Methodology & Project Design**. This grouping of comments into categories was done in line with Grounded Theory (constructivist), with categories created after review of comments was complete. Just over half of all comments made on this project were actually participants adding tags (**Figure 34**). Despite the *Tag Along with Adler* project being specifically designed to encourage tags to be added during the actual project task, many Zooniverse participants

⁷⁵ **Appendix 12: Tag Along Metadata Game Survey** link: https://docs.google.com/forms/d/e/1FAIpQLSeIzKqRRGzGffmoLM_k4J201oBPWxnLGliMg8kjXAkTI6CsAQ/viewform

continued to add these tags to the TalkBoard comments. This behavior of Zooniverse users adding comments with metadata tags, either with the hashtag symbol or without, has actually been noted in previous projects, including the Adler's 2018-2020 project *Mapping Historic Skies*.⁷⁶

The fact that this behavior was noted in *Tag Along with Adler* may reflect the practices of Zooniverse users and demonstrate a community norm. A total of 81% of survey participants indicated that they had previously participated in a Zooniverse project prior to *Tag Along with Adler*, and this specific comment type may be a byproduct of these previous experiences

(Figure 35). Comments supporting this assumption of community norms include:

- Subject 58031719, @WRSunset: "Taurus, Cancer, Leo, Capricorn, Scorpius, Aquarius, Ariete, [the Sun also passes through Ophiuchus]."
- Subject 58059417, @Holly_Pence: The caption in this drawing refers to the total solar eclipse over England "May 11, 1724." This was prior to the change to the Gregorian calendar in 1752. This event is now dated as "May 22, 1724."
- Subject 58059301, @Nomad_Purple: "Star Constellations with comets in the top half. Long snake = Hydra, Dog = Canis Minor, ship = Argo Navis (now obsolete), Rooster = Gallus (now obsolete), Cup = Crater. I learnt this from the last Adler project 😊"
- Subject 58031484, @thesugarpixie: "Adidas logo (trefoil) 1971-early 90s. It wasn't until 1971, when the trefoil logo was unveiled, that Adidas had a logo design that would become legendary.

<https://www.creativebloq.com/logo-design/how-adidas-logo-earned-its-stripes-11135390>

Looks like 1980s...if we were picking a decade, but low confidence."

These comments help to demonstrate that even within the *Tagging* category of comments, there is variety, with many of these comments including justification or citations to support the terms being added by the volunteers. These citations can be seen in the next group of comments:

- Subject 58031539, @thesugarpixie: "Fox, Miller, Dugan, Brown, Schalen, Cannon, Stewart." Got most of them right - was curious about Schalen. Google result from - fox miller dugan photograph - If anyone is curious:

⁷⁶ BrodeFrank, Jessica, Samantha Blickhan, L. Clifton Johnson, and Becky Rother. The Museum Scholar. "Crowdsourcing Knowledge for Representation: Interactive Learning and Engagement with Collections Using Zooniverse's Mapping Historic Skies," April 24, 2020. https://articles.themuseum scholar.org/2020/04/24/tp_vol3_brodefrank/.

https://artsandculture.google.com/asset/philip-fox-and-american-astronomical-society-meeting-attendees-with-coelostat/IAF_Ak8gzTvl_gg

- Subject 58031682, @ClaudiaGS: "Benjamin Martin (baptized 1705; died 1782) was a lexicographer who compiled one of the early English dictionaries, the *Lingua Britannica Reformata* (1749). He also was a lecturer on science and maker of scientific instruments. [https://en.m.wikipedia.org/wiki/Benjamin_Martin_\(lexicographer\)](https://en.m.wikipedia.org/wiki/Benjamin_Martin_(lexicographer))"
- Subject 58059573, @earthlike: Interesting but a little sparse Constellation Map with Dutch and Latin text. This archive link seems to fit very well and dates it 1586 (before Galileo's telescope!): <http://www5.kb.dk/maps/kortsa/2012/jul/kortatlas/object79482/en/>

The continued propagation of citations in the TalkBoard threads supports the need to incorporate language throughout the project differentiating the metadata tagging projects as seeking diversity of answers and individuals' descriptions, over that of a single correct answer to be arrived at via consensus. This was a large discussion through the **Chapter 4: Methodology & Project Design** chapter, but these results support not only my emphasis on this from the inception of my project design, but also the importance for future projects to take this into account.

The "Asking for Help" category of comments within the TalkBoards was the most instrumental in aiding iterative design of the project. As is argued in the *Collective Wisdom Handbook*, iterative design is an integral aspect of crowdsourcing projects, as it empowers the volunteers and demonstrates the institution's commitment to an equitable and transformative space and experience.⁷⁷ In the case of the *Tag Along with Adler* TalkBoards, the majority of the "Asking for Help" comments demonstrated volunteers hesitancy or perceived barrier to entry with the open description process, which is a departure from other projects on the Zooniverse platform.

Though this was a noted concern during beta testing and throughout the project and was a design consideration when creating the "Help Text" and instruction fields, it continued to permeate the comments on the TalkBoards. Examples of this perceived barrier can be seen in the following comments:

⁷⁷

Ridge, Mia, Samantha Blickhan, Meghan Ferriter, Austin Mast, Ben Brumfield, Brendon Wilkins, Daria Cybulska, et al. *The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage - Community Review Version*. PubPub, 2021. <https://britishlibrary.pubpub.org/pub/introduction-and-colophon/release/2>.

- "I as an individual would not want to commit to any of the labels here but instead be free without harming any of you." - made on 23 March 2021 by @beyondcommunication
- "Here is my second example to classify. It has left me in a quandary as to what to enter. The main subject of the photograph is people viewing an electronic consul of some type. However there are numerous items that could be tagged such as men, woman, table lamp, chair, spectacles, leather coat etc that are not really necessary to the main subject of the photo. Are you really wanting all these items tagged or should we be sticking to the main subject which is people viewing a consul shown on a black and white photograph? Also should there not always be a date where known or always a tag such as circa and the year? For example where people are shown they will most likely be wearing clothes of a date likely to be related to the year photo was taken. The tag could then be clothes circa and the date. Too many tags will bog down the system just as too little and make it difficult to find anything. To my way of thinking the tag for this entry should simply be, black and white, photograph, people viewing electronic consul, date or circa, clothes circa date, electronic consul, consul, table lamp, More help needed." - made on 23 March 2021 by @Davidddt48
- "This is only a guess." - 6 April 2021 by @LindenVW

Within the free-text response on the qualitative survey appended to the project, 18.8% of the 70 comments referenced difficulty with the project functionality. Here the comments were less about a perceived barrier to entry that comes with tagging and more about limitations inherent in using the Zooniverse platform. Note that these comments were anonymous but can still be demonstrated with a subset shown below:

- "Although I found the tagging relatively easy, sometimes I am just stumped for how to describe what I am looking at."
- "I kept seeing the same pictures over and over again."
- "I understand not wanting to bias the words we choose, but a little more background information on some of the images would be helpful. I have definitely used tags that I thought were accurate, only to find out later (by looking in the chat) that they were completely wrong."
- "Would be great to see an example and mention the purpose of the tags so that we can be more or less detailed to make sure it captures what you need."
- "The AI tag verifying is not optimized for tablets."

This emphasized the need to iterate certain design principles where possible, but to report limitations to both volunteers and the Zooniverse platform where improvements were not possible. For example, the small image size allowed in Zooniverse projects was done by the Zooniverse platform in order to optimize speed and usability of the platform in areas where broadband internet access may be limited; however, for a project reliant on the ability to view a detailed collections image, this restriction becomes a limitation. This was something as a researcher I could not change on the platform, but I was able to add it to the Frequently Asked Questions section of the project text. Similarly, it was essential to not only specify within project text the departure of this type of crowdsourcing project from those that users may be more familiar with, the ones where there is a specific and correct answer being sought, but also the need to have project staff available to respond to comments with encouragement and reassurance of the projects aims.

Additionally, within this category of comments there was a subsection of users asking for help or clarity around the AI programs used in the “Verify AI Tags” workflow. Comments often questioned the effectiveness of the models to tag collections and served as effective conversation starters for Adler staff to engage with volunteers. Examples of comments made about the AI models on TalkBoards can be see here:

- “I'm sorry, but I finding that no one seems to have programmed the AI to understand the difference between photography and astronomy so in all the pictures I have seen so far there is a basic need to tell it that people are not using cameras for photography but telescopes or other instruments for star gazing; eclipse watching etc. This is laborious now. IS there a possibility of reprogramming the AI to recognise astronomy or should we give it up ?” - made on 24 March 2021 by @Geographer2
- “Interesting to note that ALL the AI-generated tags are (erroneously) about military machinery.” - made on 24 March 2021 by @ruthfish
- “I don't know if this is the right place to ask this, but here goes: I started by working on confirming (or not) the AI-suggested tags. They seemed to me to be completely missing the point of almost every single image. The images had readily-visible titles, but these titles weren't listed as tags. The images had dates, but these dates weren't listed as tags. Weird things like ""culture: American"" were listed as tags when the images clearly had nothing to do with the US. I don't get it. Did AI really suggest all these tags that I saw? Monica” - made on 28 March 2021 by @mdevens

Additionally within the qualitative survey appended to the project also saw comments on the AI models, shown here:

- “A real eye-opener to see how far apart AI and human perceptions are!”
- “Intriguing process to consider descriptions. AI-generated were often not useful.”

These comments demonstrated the interest that volunteers had in AI technology but also the importance of addressing AI technology’s limitations with guests. As it was a noted reason for including AI tags within the case studies of this thesis, these comments helped to demonstrate the need for institutions to really communicate about these emerging technologies with their audiences as there is clearly a disconnect between the promises made for these technologies and the actual execution and limitations they currently have. As shown previously by the report of the Library of Congress, incorporating AI technologies into crowdsourcing projects, as done here, has the promise to introduce this technology’s potential benefits and limitations, providing both an enticement to the project and a learning opportunity.

As shown in **Figure 34**, approximately 20% of the comments made on the TalkBoards were those made “Responding to Other User,” and this accounts for both Adler project staff responding to comments including the “Asking for Help” category of comments, but also to Zooniverse users who encouraged and responded to each other. In particular, superusers – volunteers who participated in more than one release of data – were very active on the TalkBoards and particularly adept at responding to the comments of each other.

Additionally, within the conversations between users, a common concern of critics of crowdsourcing projects was demonstrated. In **Chapter 3: Literature Review**, a demonstrated critique of crowdsourcing projects identified was the possibility of profane or inappropriate tags or behavior. Within the TalkBoards of the Zooniverse case study, only one user of the 3,557 registered users made any derogatory or inappropriate comments, and this user was quickly flagged by other volunteers and the Zooniverse administrators were able to determine a history of “cyberbullying” on other projects, resulting in this user’s account being deactivated and removed permanently from the platform. Similarly, of the 322,993 individual metadata tags created during the course of the Zooniverse-hosted case study, there were zero noted cases of profane tags added, and in fact the only tags deemed inappropriate by the project team were a series of tags submitted by one user who reverse image searched eight different subject sets and added an entire Wikipedia page within the text field. The project team noted otherwise that descriptors added by volunteers could be flagged as unnecessary but not necessarily profane or inappropriate, and this was something to be discussed in the QA stage. For example, in an

archival photograph of a man at a chalkboard gesturing to a woman next to him, a volunteer added the tag “mansplaining.” We found similar instances of adjectives like “ugly,” “fat,” and “obese” used only sparingly that needed to be a considered possibility and added to any kind of quality assurance of the project tags when asking for individuals to apply their own descriptions. Overall, this case study did not represent a valid concern for profane language and inappropriate tags, and though they may exist, they do not appear to be widespread enough to deter cultural heritage institutions from participating in these projects.

Returning to the “Responding to Others” category of comments, this was also where Adler’s Director of Collections and Curator Pedro Raposo (Zooniverse user @praposo) was able to directly answer questions posed by users. Over the course of the project, he engaged in 23 direct conversations with users who requested additional information, being able to engage directly with volunteers in a way that is not often available during onsite visits to the museum itself. This was also a space that empowered Adler’s staff to share additional information about specific collections images and connect volunteers with other digital collections initiatives, including virtual exhibitions.

These comments helped highlight the potential and promise that crowdsourcing projects can have to be an engaging and enriching space for the cultural heritage institution but also the volunteer. They also helped highlight some noted limitations to the project, including foreign language tags. As shown, about 2% of comments made referenced foreign language, with two major comment subtypes emerging. The first was a reference and question about how to tag images that featured foreign languages, but the second was a question on adding tags in the volunteers primary language if it was non-Americanized English. Comments included:

- “Thank you!!! I have a questions... The new tags, must they be written in my own language, Spanish? or always in english?” - made on 24 March 2021 by @ClaudiaGS
- “I did have one other question: is there interest in developing tags in languages other than English? Thank you!” - made on 25 March 2021 by @AnneDiss
- “I used "colour" for this one, well you did say use my language :p” - made on 31 March 2021 by @Nomad_Purple

As part of this project, the volunteers were encouraged to use their own language to describe the collections, but no official decision was reached by the Adler on incorporating foreign language terms or non-Americanized English spellings into the catalog. Though no decision was reached, it is still important to highlight in this thesis, as it is a conversation that should be had in regards to metadata tagging projects and cataloging in general, especially for

cultural heritage institutions that assert a global audience but continue to utilize an English-only search and discovery portal.

When further examining the qualitative survey results, it's exciting to note that over 50% of the comments were made by volunteers who were expressing positive experience with the project. Additionally, 7% of comments that were not necessarily praise for the project still referenced the project-specific goals. Seeing that over 60% of the survey respondents reacted positively to the project and its goals helps to reaffirm the ability of crowdsourcing projects to engage with audiences in a meaningful way. Comments included the following subset:

- "I enjoyed being able to look at an image and form my own thoughts on how I would label/describe the picture to someone else. I also liked how the instructions for the project said there were no wrong answers, as this assured me that I didn't need to know too much about, say the various languages that were in the pictures. I didn't need extensive knowledge about what I was looking at. Also it was fun to do, and I could put as many or as little labels as I could think of, while being able to move on if I couldn't think of anything else. It was quick, easy, and overall a good experience. Also the instructions were clear, so I could understand what I was doing without having to read too much."
- "I enjoyed this project. Others I have participated did not allow me have as much narrative input."
- "I had fun to be honest, I at first just wanted to get community service hours, but I can see myself doing this just for fun."⁷⁸
- "This is a wonderful and very clearly explained project! I've been interested in citizen science (I think that's the term I've heard this sort of initiative called) but wasn't sure how to take part until a science teacher colleague shared this Zooniverse site. Are you interested in tagging items in languages other than English?"
- "It's reality, but it still irritates me to see how historical documentation of almost any field is male oriented and centered. Bah!"
- "Thought provoking and made me reflect on my own inherent biases too. Good project and hope to see more like this. I think an interesting exhibit exploring AI and machine learning could use this."

⁷⁸ In this case "service hours" refers to voluntary service hour requirements often required for graduation or scholarships by schools or programs. The "Tag Along with Adler" project did not sign individuals' "certificates of completion" for service/volunteer hours, but the Zooniverse platform itself describes for users how to document their hours to present to the requiring institution: <https://blog.zooniverse.org/2020/03/26/fulfilling-service-hour-requirements-through-zooniverse/>.

These comments both on the TalkBoards and the qualitative user survey help demonstrate the effectiveness of crowdsourcing as an enriching and engaging experience for both the cultural heritage institution and the audience members. Over 97% of survey respondents stated that they would participate in another Zooniverse project centered on the Adler's collections in the future (**Figure 36**) which helps to support the interest in these projects and validate the time and resources needed to be devoted to make them successful. Additionally, qualitative survey questions on experience helped to show that volunteers overwhelmingly found the case studies to be engaging (**Figure 37**), thought provoking (**Figure 38**), and fun (**Figure 39**). When taking these qualitative statements and statistics in tandem with the quantitative statistics that demonstrate the ability of these projects to enrich collections and cross the semantic gap between catalogers and the public, these projects prove to be a valuable and integral piece of digital engagement programming for the future.

Interview Responses from Email Interviews with Industry Leaders

Additionally, it is important to also share and discuss the responses that were received from a call to industry leaders across the cultural heritage sector. This series of interviews was conceived as a way to gauge how the field of cultural heritage responded to the project design, and as this study was designed as an action research and practice-based study, getting the response of practitioners was key.

As stated in **Chapter 4: Methodology & Project Design** I initially intended for these interviews to occur throughout 2021-2022, as semi-structured interviews with institutions who had run similar projects, or who were in the process of running similar projects. However, due to the continuing closure of institutions and travel bans put into place due to the pandemic, all interviews for this thesis were done remotely via email to accommodate for the change in capacity after an unexpected two year pivot within the field towards virtual programming.

In order to gauge how those within the cultural heritage field would react to my thesis projects and findings, I focused on reaching out to those in the field who had worked on crowdsourcing projects in the past or concurrently to my own project timeline. I sent interview requests to teams at the British Library, The Massachusetts Institute of Technology, Cleveland Museum of Art, Metropolitan Museum of Art, Wolfsonian FIU, the Newberry and the Getty. Ultimately, teams from the British Library, the Metropolitan Museum of Art, and the Getty responded that their bandwidth allowed for participation in the interview process, agreeing to

answer seven questions via email, and agreeing to have their institution & individual names shared within this thesis. The questions and responses are shown in **Appendix 18**⁷⁹ with an analysis of these responses below.

The first question asked of all projects teams was around the individual institutional motivations behind the creation of their crowdsourcing projects, with a follow up around whether motivations for the project changed at all during the project time period. As the *Collective Wisdom Handbook* stated in Chapter 4,⁸⁰ the motivations for a project, and in particular the establishment of values at a project's start empowers project teams to consistently make decisions in a transparent way as they work to support those values. The Getty demonstrated this in their response. The "Drawing Knowledge" program was created by the Getty when the Getty Center was forced to close its doors to the public in March of 2020 in response to the global COVID-19 pandemic. When the institution began looking for alternative ways to engage their audiences, outside of the physical in-gallery experience, the idea of crowdsourcing was supported as a way to create dialogue between museum staff and an online community.

The values established by the Getty for their crowdsourcing project reflected their motivations, to provide an engaging experience online. These values also contributed to Getty choosing the Zooniverse platform for their project, as they were able to be in direct contact with participants through chat and message board features. Additionally, a secondary value of enhancing metadata and better understanding the knowledge of the audience led to the team prioritizing the "flipping" of the roles, focusing on collecting user input over staff knowledge while designing the project in such a way that additional metadata access points could be used to enhance search results.

The Metropolitan Museum of Art team similarly approached the design of their project with the motivation to increase user engagement with the collections while also improving access to search and discovery of the collections to the widest possible audience. This motivation brought forth an emphasis on subject keywords and tagging experiences when the Metropolitan joined the *steve.museum* project, but the experience also evolved the motivations, introducing the project team to the idea of artificial intelligence models. The training of an AI model (iMet Tagger) evolved from this.

⁷⁹ **Appendix 18: Interview Responses –**

<https://docs.google.com/document/d/1Z8YB0avIrLUioCr67bXbQ3NNk-2JJIZcoBzemIDadS4/edit?usp=sharing>

⁸⁰ "Collective Wisdom - the State of the Art in Crowdsourcing in Cultural Heritage." Accessed March 10, 2021. <https://collectivewisdomproject.org.uk/>.

The multiplicity of motivations is important to note, as is evolution. The British Library noted that from the offset they had multiple motivations including: an interest in rebooting crowdsourcing efforts at the Library when new staff joined, staff's personal experience with crowdsourcing as an engaging experience, and the chance to contribute to research and practice within the cultural heritage field. For the British Library the combination of personal experience with the awareness of the field wide problem of poorly described materials led to the motivation to revive crowdsourcing projects with new staff and new audiences.

As demonstrated above, as well as in the *Collective Wisdom Handbook*, "crowdsourcing projects often change through their course, requiring adjustments while the project is already underway."⁸¹ For Getty, this was the first foray into crowdsourcing projects and the project leads were unable to forecast what challenges or changes might arise. For the Getty, using Zooniverse meant there was a considerable interest in the project that the Getty hadn't expected. Over 1100 people engaged with the project in the week of its launch, completing 235 of the 1017 images in that initial week. Getty project leads quickly worked to address this by changing the retirement limit from 10 individuals completing each image to 25 individuals. Additionally, as this was the first project of its kind at Getty, the analysis of the raw data exported from Zooniverse was a process the team was not prepared for. As a team that consisted mainly of curators of art historical material, the raw data required programming knowledge the team did not possess at the offset, making the post-processing period longer and more time-consuming than initially planned for.

The British Library similarly encountered staffing issues and lack of resources to be the most difficult part of the process, despite having worked on similar projects in the past this still remained true. Departure of key project team members made maintaining the website difficult, and with staff time a limited commodity it was difficult for the team to devote the resources for community engagement at the level they wanted.

For the Metropolitan Museum of Art team, they knew they did not have the staffing or infrastructure in place internally to host the platform themselves, and they added an outside vendor to do the tagging. A team of 70 people worked around the clock on the project, completing it in 3 months. Though this meant the Metropolitan team did not have the same staffing issues the Getty encountered, the Metropolitan team still ran into training issues as they realized the team was based outside the United States and were often unaware of the western conventions that arose in the tagging process. The Metropolitan team found that many subjects

⁸¹ "Collective Wisdom - the State of the Art in Crowdsourcing in Cultural Heritage." Accessed March 10, 2021. <https://collectivewisdomproject.org.uk/>.

were missed by the vendor as nuances and subject expertise differed, but also found a discrepancy in the tagging process with some images overtagged with every visual element, and others missing very obvious subjects. The lack of consistency was difficult to overcome as there is no right answer for tagging art and the extremely subjective process will differ person to person regardless of what cues you tell someone to focus on.

Despite these difficulties all three project teams stated they would be open to conducting other crowdsourcing projects in the future. Lessons learned from these difficulties already have inspired project teams to consider changes for the future. The Getty team considered the issue of extracting data and the post-processing of project data to be the biggest lesson they would take into their next project. The Metropolitan team in comparison would want to utilize a platform like Zooniverse with a large active user base. The British Library in particular would want to focus on what the infrastructure and technical landscape changes mean for crowdsourcing data; as cataloguing systems change what kinds of metadata would be most useful in a project.

When looking to the future, the project teams also indicated their own experiences did impart advice for the cultural heritage field at large. The Getty emphasized the need for institutional support, either in the form of funding or staffing for computational experts. This focus on computational expertise extends, with the British Library emphasizing the need to understand the platforms selected. For the Metropolitan team, the emphasis they see is the need to remember bias is everywhere and in everyone. Though the Metropolitan team was able to provide term lists and instructions to the 70 individuals who did the tagging for them, they still found it nearly impossible to escape personal biases when it came to describing art with different individuals favoring specific interests throughout the project lifecycle. For all three project teams, a major takeaway was that there is always something that will come up, perhaps best encapsulated by the British Library's advice to not let decision paralysis set in; these projects are best when viewed iteratively with the knowledge things will come forward that will require changes, so do not let the fear of those surprises stop you from starting the projects.

In the case of all three project teams, the diversity of users was not a part of the stated purpose or values of their individual projects. However, the projects did impact institutional policies and practices still. The Getty established policies and procedures with their Legal Department to allow students and organizations to use their project for volunteer hours. The British Library team saw colleagues across their institution use crowdsourcing platforms, and Zooniverse in particular, for projects. Though the Metropolitan team did not see any direct change they could directly attribute to their project, all three teams still stated they would create crowdsourcing projects again.

The Getty noted that the ability of crowdsourcing projects to create an engaging online experience that doesn't try to recreate the in-person gallery experience was the most valuable need for these projects. The Metropolitan team noted that as an institution with such an immense collection crowdsourcing is a good way to address the institutional want and need for creating access points to the collections. Similarly, the British Library noted that the hard-to-find and under-used collections benefit from projects of this sort and the hope is that these projects can help integrate access points into collections systems to make search and access easier.

The responses to these interviews helped to cover a range of practitioners in the field, as the British Library has hosted crowdsourcing projects for years and continues to do so, the Metropolitan Museum of Art is not currently conducting a crowdsourcing project but had previously done so with the creation of the iMET AI Tagger used within this thesis, and the Getty was conducting their first major crowdsourcing project at the same time as this case study; allowing a range within responses and experiences. Importantly, all three interviewees expressed that engagement with their publics was a key impetus for starting such projects, demonstrating this decade's focus not just on increasing access but also tying to the engagement work of these institutions.

An important takeaway for future project leads was the importance to know how much engagement these projects can receive, while also accounting for the time consuming analytical work of processing the data created in the project. All three project teams pointed to the data processing as the most difficult part of the project, with particular emphasis given to the quality assurance tasks as tagging is a subjective process. As cultural heritage institutions continue to confront staffing limitations and institutional burnout, these concerns should remain as highly important to consider.

Even with these acknowledged difficulties, all three project teams were emphatic about their interest in conducting additional crowdsourcing projects. Comments were made around making the most out of the process whether that be by working with technical experts to ease the data processing steps, or using third-party hosted platforms like Zooniverse to increase user base. Teams pointed to an institutional knowledge of crowdsourcing now that was missing in previous years, with interest expanding throughout institutions; but also indicated that the understanding of computational tools and project workloads may not be equal to the interest levels, and the need to warn of such things was important for the success of any future projects.

This was reflected as well in the advice the project teams would give to other practitioners. An emphasis on having in-house support for programming, for example for the Python scripts needed to run Zooniverse data exports. Additionally, project teams pointed to the

need to continue awareness towards bias, not only within professionally created metadata or AI generated metadata, but amongst individual volunteers as well; assume all descriptions have bias.

As bias was pointed to in these interviews it was interesting to see that for the majority of project leads, diversity within users was not a conscious part of their project designs. Though it was not a noted design limitation that was planned around, interviewees did acknowledge that demographic questions were important to include in surveys, and that choices for where to market projects were also decided based on known user demographics of platforms.

In the end all of the interviewees indicated they see a need for more cultural heritage institutions to undertake crowdsourcing projects, noting these projects provide new ways of seeing collections, as well as opportunities to engage online audiences. Interviewees shared that bringing change to the practices of cataloguing are difficult and often not a part of these projects' life cycles. However, interviewees did believe that these projects helped increase the visibility of the work of cataloguing. Though limited in scope, these interviews proved helpful in understanding where crowdsourcing of metadata projects currently stands within the practice and zeitgeist of the profession.

Conclusion:

Crowdsourcing offers the opportunity to leverage a tool to build new relationships with the public and the audiences of cultural heritage institutions, disrupting the relationship between the institution and the user by inviting the audience to act as researchers, curators, and experts – enriching the experience for the user, and enriching the data and access points of the institution.⁸² As this thesis has laid out, crowdsourcing allows for a change in the language of the museum's voice, expanding who can access these collections by including language and a style of description the public is searching for whilst allowing mission-driven experiences for the public to engage with the institution, further increasing the access points the institution has to its own collections as well.

In today's world where the public is contending with misinformation, inherent biases in search, and AI underpinning their discovery methods, the truth for museums is that this is not the time to uphold a status quo that damages the very missions and purposes of these institutions by obfuscating the ability of the public to discover cultural heritage collections. As stated in the *Collective Wisdom Handbook*, "doing nothing is also a decision. Doing nothing in

⁸² Ridge et. al, *Collective Wisdom Handbook*.

this context, by choosing not to engage with values, is likely to support the status quo, including existing power structures, instead of taking the opportunity for challenge and consciously course-setting.”⁸³ It is time to examine and consider projects like crowdsourcing as an extension of museums’ mission-driven work and see the value in including the voices of the public museums serve in the work presented and done. By considering these projects a part of the mission-centric work of the institution, it is possible to devote the staff, time, and resources needed to run these projects, which are timely discussions of issues affecting the lives of the public.⁸⁴

The results of these case studies help to demonstrate the promise of museum crowdsourcing of metadata as a way to enrich cataloging descriptions to better align with the expectations and needs of audiences who encounter these collections as images online, often via social media where an image is divorced from its physical context and potentially even removed from it’s official online context when reshared on image sites like Instagram or Pinterest. The case study demonstrates that there are noted limitations to crowdsourcing as well as continued questions to research around quality control, which will be specifically discussed in the upcoming **Chapter 6: Conclusion**. Both the qualitative and quantitative data shared here demonstrate the reciprocal nature of these projects, providing hands-on and transparent experiences for the public, as well as increased accessibility and representation for institutional data and collections discoverability.

By grounding this work within the practice-based action research approach, this work is not only a research topic situated within decades-long literature reviews, but also a very real case study evolving through the actual work done using Adler Planetarium collections. These results prove that as online habits of the public and access to collections have shifted, it has become a more notable issue for both museums and the public that cataloging focuses on *is-ness* rather than *aboutness*. These results further demonstrate through the case study at the Adler Planetarium the ways in which crowdsourcing projects can, in fact, bridge this gap, while also providing new online participatory experiences to the public that can align with the mission-centric work of the museum.

In closing, I believe these results help to support the call for more institutions to engage in crowdsourcing, and, in particular, metadata-generating projects with the public. These projects create meaningful opportunities for the public to experience collections whilst making them more easily discoverable by others. Increasing discoverability, accessibility, and

⁸³ Ridge et. al, *Collective Wisdom Handbook*.

⁸⁴ Ridge et. al, *Collective Wisdom Handbook*.

representation within our collections is a central component to online museums, and crowdsourcing is proving to be one of the most engaging ways to do this with the public.

Chapter 6: Summary, Implications, Conclusions

Introduction:

This thesis is grounded in three years of practice-based action research, but also a decade of work within the cultural heritage sector, specifically work I have undertaken in my own career as a digital collections access professional. Though the research that has culminated in this thesis was initially sparked by difficulty in discovery of collections for my own colleagues and internal staff within the sector, it quickly evolved. If internal staff struggled to find objects due to the language included and excluded in the catalogs of these institutions, how did the public, who did not know what was in fact there, fare in their searches?

This led to my initial review and contextual grounding within **Chapter 2: Contextual Review**, which aimed to demonstrate how the issues of discoverability could breed mistrust within the public and further foster an unwelcoming environment. It is within this context that a review of 20 years worth of digital accessibility projects, in particular those of crowdsourcing metadata, was reviewed within **Chapter 3: Literature Review**. This created a basis for my own research within the larger work of the field, while introducing my own unique attempt to foster these projects within the engagement program offerings of institutions. I endeavored to show the feasibility and reach of this kind of programmatic shift by clearly laying out my project design choices and methodology to encourage reproducibility while acknowledging the scope and limitations to my own research within **Chapter 4: Methodology & Project Design**. By providing detailed examples of the quantitative and qualitative results of the year-long case studies conducted from 2021-2022 at the Adler Planetarium in **Chapter 5: Data & Results**, I have provided multiple pathways into data that shows the effectiveness, and limitations, to this sort of program.

Now, as digital content continues to become a more prevalent and integrally necessary component of cultural heritage engagement strategies in a post-COVID-19 world, this programmatic shift and work has become more imperative to ground in data and push for replication. Being situated at the Adler Planetarium from 2016-2022, I endeavored to expose the ways in which the curatorial, institutional control over language production within the cultural heritage sector, specifically that of metadata production, has limited the representation and connection to the communities these institutions serve, and how a focus on digital engagement programs that focus on transparency and participation can begin to tackle this issue.

Within this thesis, not only were the limitations of the professionally produced language gap demonstrated throughout, but the reinforcement of inherent bias in cultural heritage data

representations became clearer as well. Picking up on two decades worth of research into crowdsourcing, I have been able to demonstrate not only the promise and effectiveness of crowdsourcing as a tool for bridging the language gap and mitigating institutional biases, but also the impact that crowdsourcing can have when refocused and reclassified as an integral digital engagement tool.

Addressing the Research Questions:

Throughout this thesis, I have endeavored to highlight how my case studies, contextual review, and literature reviews all tackled the five research questions I posed at the beginning of this study; however, it is now imperative to expressly answer each in turn with reference to data previously infused throughout this thesis. This thesis demonstrated the language gap and discoverability issues I detected and noted at the start of my own research and demonstrated the promise of crowdsourcing projects to not only tackle this gap but engage a public audience in the process of description as well. By answering each of the five questions below, I endeavor to demonstrate the success of such projects and encourage other cultural heritage institutions to replicate these successes with a change to their description procedures.

How has the professionalization of language production impacted discovery?

Within **Chapter 2: Contextual Review**, I demonstrated how the cataloging of *is-ness* over *aboutness* was a major perpetuator of the language gap. Professional cataloging often centers on what something *is* (its materiality, date, creator, location, etc.) but not on what it may be *about* or might reflect. The distinction is not a mere matter of semantics. While the descriptive text on a wall label in a gallery, for example, might address a cultural heritage object's subject matter—the “aboutness” of the object—this dimension of the object has not usually been represented in catalogs; that is, these objects and their images have not traditionally been *cataloged* according to their “aboutness.”¹ Instead, museum records which make up the basis of the online public search portals, as well as the internal search portals for staff, often focus on the facts of an object's creation, such as who made it, what it is made of, what size it is, when it was made, and where it was made.

Outside of the museum description process, this is also a noted issue in archival processes and library cataloging. As I demonstrated, there is also evidence that users struggle

¹ Alyx Rossetti, “Subject Access and ARTstor: Preliminary Research and Recommendations for the Development of an Expert Tagging Program,” *Art Documentation: Journal of the Art Libraries Society of North America* 32, no. 2 (Fall 2013): 284–300.

to find materials when catalogs use only minimally descriptive metadata (a core set of metadata fields the Embedded Metadata Working Group of the Smithsonian Institution [EMDaWG] has designated essential for all collections as to provide better online access to images and ensure preservation of these images in the future).² As Jennifer Schaffner of the research division of the Online Computer Library Center (OCLC) stated in 2009, the minimally described collections can actually lead to hidden collections.³ The term “hidden collections” describes collections in institutions that could deepen public understanding of the histories of people of color and other communities whose work and experiences have been insufficiently recognized by traditional narratives. The term originates in a project initiated by the Council on Library and Information Resources (CLIR).⁴

The focus on *is-ness* over *aboutness* was not only demonstrated by scholars and practitioners like Kris Wetterlund⁵ and Jennifer Schaffner⁶ within the literature, but it was also visible within the metadata pulled from the Adler Planetarium’s catalog data for the 1,090 objects included in the case studies. By pulling only publicly searchable text to focus on the terms that currently facilitate or hinder public inquiry, this data (found in **Appendix 13**⁷ within the WOP, Rare Book Illustration, and Archival Photographs tabs) helped to demonstrate the language gap professionally created description processes create. The data set included in this project specifically helps to extend the relevancy and reproducibility of this study across the cultural heritage sector, having included rare book illustrations cataloged by library standards using MARC, museum-cataloged terms and images for works on paper, and archival photographs cataloged with the archival standards DACS.

How have the limitations in discovery of collections impacted the trust of the public?

² Stephanie Ogeneski Christensen et al., “Basic Guidelines for Minimal Descriptive Embedded Metadata in Digital Images,” April 2010, <<http://www.digitizationguidelines.gov/guidelines/GuidelinesEmbeddedMetadata.pdf>>.

³ Jennifer Schaffner, “The Metadata Is the Interface: Better Description for Better Discovery of Archives and Special Collections, Synthesized from User Studies,” OCLC: A Publication of OCLC Research, May 2009, <<https://library.oclc.org/digital/collection/p267701coll27/id/444/>>.

⁴ “Digitizing Hidden Collections: Amplifying Unheard Voices,” <<https://www.clir.org/hiddencollections/>>.

⁵ Kris Wetterlund, “Flipping the Field Trip: Bringing the Art Museum to the Classroom,” *Theory Into Practice* 47, no. 2 (Spring 2008): 110–17.

⁶ Jennifer Schaffner, “The Metadata Is the Interface: Better Description for Better Discovery of Archives and Special Collections, Synthesized from User Studies,” OCLC: A Publication of OCLC Research, May 2009, <<https://library.oclc.org/digital/collection/p267701coll27/id/444/>>.

⁷ **Appendix 13: Metadata Project Data Set**

<https://docs.google.com/spreadsheets/d/1LoKTMcYlqfGkpT1Ht3DJX3sdnD7DGqxp0Pv-Gm-P0XQ/edit#gid=1184666756>

The literature over the last 20 years demonstrates a distinct connection between representation, discovery, and trust. Within the **Chapter 2: Contextual Review** section “*Public Trust and Cultural Heritage Institutions - A Challenge of the 2020s*,” pieces by Hedstrom and King,⁸ Nina Simon,⁹ Todd Honma,¹⁰ and David Thomas¹¹ demonstrated that inclusion of narratives was key to the maintenance of public trust, and issues with discovery led to distrust within the Internet Age.¹²

However, this was also noted within the qualitative analysis of the optional survey¹³ included as part of the case study for *Tag Along with Adler*. One set of survey questions was particularly helpful in gauging audience perspectives on concepts like trust and representation. **Figures 7-14** graph the responses to eight survey questions about museums, science, communities, and representation. Response options ranged from Strongly Disagree to Strongly Agree, and even with only 5.5% of users reporting, the responses support my initial hypothesis about the value of museum crowdsourcing projects in regards to trust.

Approximately 23.9% of survey respondents did not agree with the statement “Stories like mine are in museum collections,”¹⁴ 69% did not agree with the statement “Stories like mine are included in museum exhibitions,”¹⁵ and 39.6% did not agree with the statement that “I see people like me in science today.”¹⁶ The extremely high percentage of participants who felt museums were essential to communities¹⁷ (94.4%) and communities were essential to museums¹⁸ (94.9%) points to a clear opportunity for museums to leverage their position within the community to initiate participatory experiences that bring the public into the process of description, helping to not only increase the representation that is notably lacking in professional

⁸ Hedstrom, Margaret, and John Leslie King. “On the LAM: Library, Archive, and Museum Collections in the Creation and Maintenance of Knowledge Communities,” 2003, 33

⁹ Simon, Nina. “On White Privilege and Museums.” Museum 2.0 (blog), March 6, 2013.

<http://museومتwo.blogspot.com/2013/03/on-white-privilege-and-museums.html>.

¹⁰ Honma, Todd. “Trippin’ Over the Color Line: The Invisibility of Race in Library and Information Studies,” 2005, 27.

¹¹ Thomas, David, Simon Fowler, and Valerie Johnson. *Silence in the Archive*. United Kingdom: Facet Publishing, 2017.

¹² Mayr, Eva, Nicole Hynek, Saminu Salisu, and Florian Windhager. “Trust in Information Visualization,” 2019. <https://doi.org/10.2312/trvis.20191187>.

¹³ **Appendix 15: Tag Along with Adler User Survey** link:

<https://docs.google.com/forms/d/e/1FAIpQLSfkmwYpPciVLBi0vGOkxH3daFw4mw6dkXpidxlpE4DPHjACg/viewform>

¹⁴ Figure 8

¹⁵ Figure 9

¹⁶ Figure 10

¹⁷ Figure 11

¹⁸ Figure 12

cataloging staff, but also transparently bringing the community into the essential work of the museum.

How have crowdsourced descriptions/metadata provided more diverse entry points to collections?

As the first two questions helped ground the presence of a semantic gap or disconnect in metadata produced professionally and that of the public user and express the importance of this gap in the development of trust, it is also possible to use the data within the thesis to demonstrate both that the semantic gap between the language and description style museum professionals use (e.g., technical language, focus on physicality, and provenance) and the language and description style the public uses (e.g., conversational language, focus on context, and aboutness) does in fact exist and that projects like these can begin to bridge this gap.

As discussed above, I had conducted a full survey of the Adler cataloging data in conjunction with the design of the project, and the most frequent terms across extant Adler records (**Figure 15**) were locations of objects (where objects were created, where books were published), item types (instrument names, book types [folios, manuscripts], document types), date of creation, and creators (object makers, authors, etc.). Although this data is clearly important for recording the provenance and overall historicity of the objects, it does not contribute significantly to an understanding of their *aboutness*.

By comparison, the participants working with the 11 subject sets of *Tag Along with Adler* (**Figure 16**) eschewed terms focusing on the *is-ness* of makers, locations, and dates, instead producing language geared toward describing what is represented in an object (although importantly still including terms related to object type, such as diagram, drawing, and photograph). Comparing even only the 30 most frequent terms from the Adler catalog and the 30 most frequent tags from the *Tag Along with Adler* project reveals a distinct gap between the way museums and the public describe collections. These results help to show that crowdsourcing does have the desired effect of enhancing collections records to better suit the language of their users, which will go a long way toward improving the searchability of collections, especially for the public. Looking at **Appendix 14**,¹⁹ it's possible to compare the terms created by the professional cataloguers at the Adler Planetarium, those created by the two AI tagging models of this project, and those generated by the public as part of the *Tag Along with Adler* project for a sample of each collection type.

¹⁹ **Appendix 14 Examples of Dataset**

https://docs.google.com/presentation/d/1dob9fIVF_Ft9ygRw5GVFGNZuVw-OP9GqIn6ehJk-j3Q/edit?usp=sharing The example set of data in this Appendix accounts for 10% of the project data.

Within the qualitative survey,²⁰ there was also data to support that the transparency of crowdsourcing projects could actually provide the opportunity to build trust and engage participants in the process. There is an opportunity for museums—as places with recognized standing in the community²¹—to help foster discussions about searchability and discovery on the internet. The survey results show that only 18.7% of participants agreed they could trust what they find online²² but, conversely, 76% of them believe they can find things online easily.²³ This study’s degree of transparency—and that of crowdsourcing projects in general—could be adapted to empower communities to better distinguish between fact and fiction online and to increase their trust of online searches by imparting knowledge of how to identify bias and recognize shortcomings in automation and algorithms, including but hardly limited to the search of a museum’s collection.

How can framing the crowdsourcing projects as a mission-centric engagement program of the institution entice participation in the process by a more diverse public?

Crowdsourcing offers the opportunity to leverage a novel methodology for museums to build new relationships with their audiences, disrupting the usual relationship between the museum and the user by inviting the public to act as curators, experts, and researchers. In the process, it simultaneously enriches the user’s experience and the museum’s data and access points.²⁴ Crowdsourcing also ultimately expands the museum’s voice by incorporating a vocabulary and style of description aligned with the public’s own intellectual interests and perceptions. It thus expands who can access these collections while also allowing for mission-driven experiences that encourage engagement with the institution.

In the contemporary online ecosystem, the public contends with misinformation, inherent biases in the results of their searches, and frequently invisible AI that underpins their methods of discovery, making now the time to eliminate a status quo that damages the very missions of institutions by hampering the ability to discover collections. In fact, this is the ideal time to begin tackling transparency in search as part of the cultural heritage institutional missions. In the

²⁰ **Appendix 15: Tag Along with Adler User Survey** link:

<https://docs.google.com/forms/d/e/1FAIpQLSfkmwYpPciVLBi0vGOkxH3daFw4mw6dkXpidxlpE4DPHjACg/viewform>

²¹ Figure 11

²² Figure 13

²³ Figure 14

²⁴ Ridge, Mia, Samantha Blickhan, Meghan Ferriter, Austin Mast, Ben Brumfield, Brendon Wilkins, Daria Cybulska, et al. The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage - Community Review Version. PubPub, 2021.

<https://britishlibrary.pubpub.org/pub/introduction-and-colophon/release/2>.

words of the Collective Wisdom Project, “doing nothing is also a decision. Doing nothing in this context, by choosing not to engage with values, is likely to support the status quo, including existing power structures, instead of taking the opportunity for challenge and consciously course-setting.”²⁵

It is time to examine and consider projects like crowdsourcing as an extension of museums’ mission-driven work and to see the value of including the voices of the communities cultural heritage institutions serve in the work that they present and the projects they initiate. By considering such participation part of the mission-centric work of the institution, it is possible to devote the staff, time, and resources needed to address contemporary discussions about the issues affecting the lives of the public both inside and outside of museums.²⁶ As Mia Ridge stated in a 2022 interview, a major impetus for her own revival of crowdsourcing projects at the British Library in 2015 was “the opportunities crowdsourcing presents for deeper engagement with library collections, awareness of the huge amount of poorly described material, and by the chance to contribute to research and practice in the field.”²⁷

Within this case study project, two pieces of qualitative analysis are helpful in discussing engagement, specifically the aforementioned survey²⁸ and the Zooniverse TalkBoards themselves.²⁹ Over 97% of survey respondents stated that they would participate in another Zooniverse project centered on the Adler’s collections in the future (**Figure 33**), which helps to support the interest in these projects and validate the time and resources needed to be devoted to make them successful. Additionally, qualitative survey questions on experience helped to show that volunteers overwhelmingly found the case studies to be engaging (**Figure 34**), thought provoking (**Figure 35**), and fun (**Figure 36**). When taking these qualitative statements and statistics in tandem with the quantitative statistics that demonstrate the ability of these projects to enrich collections and cross the semantic gap between catalogers and the public, these projects prove to be a valuable and integral piece of digital engagement programming for the future.

²⁵ Ridge, Mia, Samantha Blickhan, Meghan Ferriter, Austin Mast, Ben Brumfield, Brendon Wilkins, Daria Cybulska, et al. *The Collective Wisdom Handbook: Perspectives on Crowdsourcing in Cultural Heritage - Community Review Version*. PubPub, 2021.

<https://britishlibrary.pubpub.org/pub/introduction-and-colophon/release/2>.

²⁶ Ridge et al, *Collective Wisdom Handbook*.

²⁷ Mia Ridge. Email Interview with Dr. Mia Ridge of the British Library. Email, June 9, 2022.

²⁸ **Appendix 15: Tag Along with Adler User Survey** link:

<https://docs.google.com/forms/d/e/1FAIpQLSfkmwYpPciVLBi0vGOkxH3daFw4mw6dkXpidxpE4DPHjACg/viewform>

²⁹ **Appendix 16: Talk Board Comments** -

<https://docs.google.com/spreadsheets/d/1AYWVgTLGtCZ4w47DULbOgJtAneZ9l8ld30MiipgE4l8/edit#gid=390470576>

Not only did the case studies demonstrate the ability of these crowdsourcing projects to be seen as a mission-centric engagement programming, but they also demonstrate an enticement in this specific case study for participation, as well as a larger group of voices. In the benchmark study *steve.museum* hosted from 2007-2008,³⁰ their metadata crowdsourcing project saw 2,382 total participants, with users having been recruited through general museum email listserv, the press, blog postings, and volunteer requests.³¹ In comparison, the year-long *Tag Along with Adler* project run as part of this thesis saw 6,976 individual participants, almost 3x the number of the *steve.museum* project, with recruitment consisting of the inclusion of the project on the Zooniverse platform, inclusion in the *Being Human Festival*, and being marketed by the Adler Planetarium's branded social media and email listservs.

Perhaps more importantly than the number of participants was the demonstrated diversity of the participants within this thesis' projects versus those of previous projects. It is important to note that the *steve.museum* did not report on the demographics of their users; however, within **Chapter 4: Methodology & Project Design**, I reported the demographics of the Zooniverse platform users, users of other crowdsourcing projects, and the demographics of the Adler Planetarium membership and visitor base.

By looking at **Figures 9-12**, it is possible to view the demographics of those who participated in this thesis' case studies' optional surveys. The results of the voluntary demographic survey linked on the *Tag Along with Adler* project strongly align with the results of various surveys on traditional crowdsourcing platforms. Most notably, the majority of respondents to *Tag Along* self-identified as White/Caucasian, with ethnic diversity being the least distributed of the four demographics gauged. However, it is important to note that these figures also demonstrate that though the majority of project participants who participated in the demographic survey identified as White/Caucasian (60.6%), this is still almost 20% fewer than the National Academies of Sciences observed in their 2018 survey.³² Similarly, there was a

³⁰ Trant, Jennifer. "Tagging, Folksonomy, and Art Museums: Results of Steve.Museum's Research." University of Arizona University Libraries, 2009. <http://hdl.handle.net/10150/105627>. Pg. 16

³¹ Trant, Jennifer. "Tagging, Folksonomy, and Art Museums: Results of Steve.Museum's Research." University of Arizona University Libraries, 2009. <http://hdl.handle.net/10150/105627>. Pg. 18

³² National Academies of Sciences, Engineering, Division of Behavioral and Social Sciences and Education, Board on Science Education, Committee on Designing Citizen Science to Support Science Learning, Kenne Ann Dibner, and Rajul Pandya. *Demographic Analyses of Citizen Science. Learning Through Citizen Science: Enhancing Opportunities by Design*. National Academies Press (US), 2018. <https://www.ncbi.nlm.nih.gov/books/NBK535967/>.

breakdown more similar to that reported by the Adler Planetarium's 2018 Intercept Survey³³ than that of the Zooniverse platform.³⁴

This demonstrates that by framing the project as part of the Adler Planetarium's digital offerings and utilizing the Adler Planetarium's official channels to market the project, the projects were able to draw more diverse audiences to the project than are typically reported on citizen science platforms. By framing the projects as part of the mission-centric engagement work of the institution, the demographics more closely resembled that of the institution than that of a crowdsourcing project, demonstrating this shift in framework does in fact help bring in a more diverse set of project participants. By modeling this project using the Zooniverse platform, which is a free platform accessible to any institution who may want to attempt a similar project, this thesis also provides reproducible design considerations that allow any cultural heritage institution to adopt a similar model with proper devotion of staff time and effort.

What are the best ways to create a project that optimizes the chances of creating diversity within the project participants and the descriptions they create?

Though the pivot of the Adler Planetarium to include the *Tag Along with Adler* project as part of their COVID-19 online offerings, thus promoting it via their channels, had a noted impact on participation, as shown above, there were other intentional design choices made to gauge best practices for optimizing chances at diversity within participants and descriptions created. As laid out in previous chapters, these included a data set with multiple collections types (613 Works on Paper, 195 Archival Rare Photographs, and 282 Rare Book Illustrations), the inclusion of AI-generated metadata tags (iMet Collection Attribute Classifier and the Google Cloud Vision API taggers), testing on a bespoke platform and a preexisting third-party platform, gamification, and incremental releases of data.

The inclusion of the three different collections types was done specifically to make this research more applicable to the cultural heritage field at large, but it also was done to attempt to gauge if audiences had a preference for a specific collection type, or conversely, an aversion to a collection type. **Figure 25** looks at the average number of tags added per image for each collection type and shows that the collection type seems to have very little impact on the tagging behaviors of the volunteers demonstrating that volunteers responded quite similarly across the three collection types, indicating that the impetus to tag and the ability to tag various collections housed in cultural heritage institutions is there and is promising. Though the collection type

³³ **Appendix 4: Adler Survey of Visitors and Supporters -- Graphical Key Finding Report - January 8 2019** <https://drive.google.com/file/d/1LA60o7XDNx2DIEzCiBohGYuF5nJgBydE/view?usp=sharing>

³⁴ <https://blog.zooniverse.org/2015/03/05/who-are-the-zooniverse-community-we-asked-them/>

seemed to have little impact on optimizing participant diversity, there did seem to be an indication that library collections may see more value in bringing the public into the description process. As shown in **Figure 26**, roughly 85% of tags generated by the public for this collection were new to the catalog.

The collection type appeared to have little impact on the optimization of participant diversity and on the diversity of metadata added, which in itself was an exciting finding for the reach of this study; however, the inclusion of AI tags did show remarkable draw to users. The inclusion of AI tags appeared to entice user engagement with the Zooniverse workflow “Verify AI Tags,” receiving 2-3x the engagement of the “Tag Images” workflow. Additionally when examining the qualitative data of the optional survey free text comments space, almost 12% of all comments centered around AI, again demonstrating an interest in the technology that drew participants to the project.

As mentioned in the previous section, a question in this research arose from the *steve.museum* project, specifically, could hosting this kind of project on a third-party site dedicated to crowdsourcing projects increase the number of participants and the diversity of those participants in comparison to hosting a project on a bespoke, self-created site? With full transparency, the scope of this question goes beyond the research and data available to fully state, as the demographic data needed to gauge user diversity was not available in the literature for *steve.museum* and many other projects, and within my own data it was gauged through a voluntary survey with only 5.5% of participants providing response; however, it is possible to discuss the platform selection optimization in terms of participant number alone.

Within this research, I hosted one case study on the Zooniverse platform, a site with over 2 million dedicated volunteers participating in crowdsourcing projects, and I hosted one case study of a gamified workflow on a self-hosted Heroku site. The Zooniverse-hosted case study ran for almost a year from March 2021 to March 2022 and saw 3,557 registered volunteers with 6,976 individual participants, while the gamified workflow on the self-hosted site ran for four months, November 2021 to February 2022, and recorded 512 individual users. This indicated that the use of a preexisting platform could provide a dramatic increase in participation in much the same way the previous comparison of my own Zooniverse-hosted project compared to the *steve.museum* bespoke platform.

Both the *steve.museum* bespoke platform and my own gamified case study that was self-hosted on Heroku relied on email listservs to members and the public to encourage volunteers to their project, compared to the built-in community of over 2 million volunteers on the Zooniverse site, again demonstrating that the use of a self-hosted site compared to a

preexisting platform appears to have an effect on participation. Though the lower number of volunteers can, and should, be attributed in part to the platform selection, it is also important to acknowledge and note that the experiences presented on the Zooniverse site and the Heroku bespoke site were in themselves different. The Zooniverse-hosted workflows were created using the Zooniverse Project Builder that comes with limited functionality and specific tasks available, whereas the Heroku bespoke site was designed with gamification in mind. As noted in **Chapter 5: Data & Results**, it could have been that the gamified workflow itself on the Heroku site was a contributor to the lower engagement on the site. As the game experience was a two-minute verification task before the free tagging experience was prompted, it could be that participants grew disinterested with the experience before the two minutes of approval task ended and left prior to the tagging task. It is difficult to judge the experience of the Heroku participants, however, as not a single participant filled out the optional survey, and due to the COVID-19 pandemic, it was not possible to do any onsite testing or in-person testing.

However, it is important to note that hosting on a preexisting platform like Zooniverse is not a panacea in itself – other efforts and design choices made in this study are still crucial to engaging a diverse and large crowd. During the time *Tag Along with Adler* ran on the Zooniverse platform, the J. Paul Getty Museum launched a project called *Drawing Knowledge*³⁵ on Zooniverse as well. In an interview with Drawing Department members Edina Adams and Casey Lee, the pair described the impetus for launching their own Zooniverse project was also to provide experiences during COVID-19 closures.³⁶ The pair stated, “Instead of translating an in-gallery experience such as an exhibition, a gallery talk or a study room visit to a virtual one, our crowdsourcing project was meant to create a dialogue between museum experts and an online community. The project enabled participants to engage with the drawings collection and share their knowledge about the works, thus flipping the roles.”³⁷

Aligning with my own study in *Tag Along with Adler*, the *Drawing Knowledge* project also endeavored to collect “metadata that would allow for a more efficient search of the collection. This information could also potentially be analyzed by the Museum’s Education and Interpretive Content Specialists to learn about the baseline knowledge of our audiences.”³⁸ The Getty’s team had no prior experience with Zooniverse and therefore were initially shocked by the response

³⁵ <https://www.zooniverse.org/projects/babkluna/drawing-knowledge>

³⁶ Adam, Edina, and Casey Lee. Email Interview with The J. Paul Getty Museum Drawings Department--Edina Adam, PhD, Assistant Curator, and Casey Lee. Email, May 6, 2022.

³⁷ Adam, Edina, and Casey Lee. Email Interview with The J. Paul Getty Museum Drawings Department--Edina Adam, PhD, Assistant Curator, and Casey Lee. Email, May 6, 2022.

³⁸ Adam, Edina, and Casey Lee. Email Interview with The J. Paul Getty Museum Drawings Department--Edina Adam, PhD, Assistant Curator, and Casey Lee. Email, May 6, 2022.

rates they saw on the platform, “in the first week of the project’s launch, over 1,100 people engaged with the project, completing 235 out of the 1,017 images.”³⁹ Similar to the *Tag Along* project, the Getty team did not rely solely on Zooniverse to draw in volunteers. They also shared on various social media platforms (Instagram, Facebook, Twitter) to ensure demographic diversity. According to data provided by Getty’s communication team, Facebook is primarily used by millennials and older generations, while Instagram reaches a large number of Gen Z and Gen Alpha users, while hosting the project on the Getty’s website and the Zooniverse site helped potential first-time exposure to Zooniverse for Getty audiences and vice versa, bringing a museum audience to the site and a crowdsourcing audience to the collection.⁴⁰

The Getty team also noted that staff time and effort are essential to the success of crowdsourcing projects such as these, with a noted takeaway from their experience being the time-consuming analysis and post-processing.⁴¹ With proper support from institutions, the Getty team remarked that they saw a real promise for these projects to create “an opportunity to engage online audiences without trying to recreate the experience of an in-person gallery experience” that just cannot be replicated online.⁴²

Similarly, the Metropolitan Museum of Art’s Jennie Choi remarked that the Met would consider additional crowdsourcing projects, particularly “if we could get our data onto a Zooniverse-like platform with a large active user base and if we had the necessary in-house staff to process the data.”⁴³ As Choi continued, “If an institution has a large collection and wants to provide an additional access point for users searching their collections, crowdsourcing would be a good way to address this.”⁴⁴ These two examples from the J. Paul Getty Museum and the Metropolitan Museum of Art help demonstrate the value current practitioners see in projects described in this thesis, as well as the importance of design choices such as platform selection and staff allocation, while alluding to limitations I will cover below.

One additional design choice that did seem to have an impact on increasing the number of users of the project was the decision to do an incremental release in data. As shown in **Chapter 5: Data & Results**, this decision to release 100 images at a time appears to have had

³⁹ Adam, Edina, and Casey Lee. Email Interview with The J. Paul Getty Museum Drawings Department--Edina Adam, PhD, Assistant Curator, and Casey Lee. Email, May 6, 2022.

⁴⁰ Adam, Edina, and Casey Lee. Email Interview with The J. Paul Getty Museum Drawings Department--Edina Adam, PhD, Assistant Curator, and Casey Lee. Email, May 6, 2022.

⁴¹ Adam, Edina, and Casey Lee. Email Interview with The J. Paul Getty Museum Drawings Department--Edina Adam, PhD, Assistant Curator, and Casey Lee. Email, May 6, 2022.

⁴² Adam, Edina, and Casey Lee. Email Interview with The J. Paul Getty Museum Drawings Department--Edina Adam, PhD, Assistant Curator, and Casey Lee. Email, May 6, 2022.

⁴³ Choi, Jennie. Email Interview between Jennie Choi and Jessica BrodeFrank. Email, March 29, 2022.

⁴⁴ Choi, Jennie. Email Interview between Jennie Choi and Jessica BrodeFrank. Email, March 29, 2022.

an impact on diversifying users, as it had a marked impact on superusers. Over 50% of the project data was created by participants who were not superusers, those who did not continue to engage with the project across incremental releases, which was 78% of all users. Additionally, the incremental release of data also seemed to keep the project engagement higher on Zooniverse, with notable bumps in participation with each release. Looking at **Figure 40**, this can be seen. Though there was a noted drop in engagement from the first week of the project release, the rest of the project period shows ebbs and flows of engagement. By examining the daily engagement of the project, shown in **Appendix 16**,⁴⁵ a trend emerges. Within 2-5 days of the new set being released, the user engagement doubled. The incremental release of data appeared to have the desired effect of enticing engagement with the project in the longer term, which allowed a larger group of volunteers the opportunity to participate.

Implications of This Research:

A “Post”-Pandemic World

An unexpected implication of this research evolved during the COVID-19 pandemic period, which began in the spring of 2020 and continued throughout the course of my research. As the world reacted to a time of rapid change and uncertainty, the cultural heritage field contended with changing community needs, context, and behaviors to arts and culture organizations.⁴⁶ A 2022 report co-authored by Jen Benoit-Bryan, PhD; Madeline Smith, MA; and Peter Linnett looked at in-depth surveys of over 75,000 adults across the United States, comprising 500+ arts, culture, and community organizations.⁴⁷ The study launched in May 2020 and was designed to provide actionable information about these changing needs for the communities served by cultural heritage institutions during the physical closure and digital pivot necessitated by the COVID-19 pandemic.⁴⁸ As the cultural heritage world “pivoted” to digital

⁴⁵ **Appendix 16: Talk Board Comments**

<https://docs.google.com/spreadsheets/d/1AYWVgTLGtCZ4w47DULbOgJtAneZ9l8ld30MiiPgE4l8/edit#gid=1498625802>

⁴⁶ Linnett, Slover. “Rethinking Relevance, Rebuilding Engagement: Findings from the Second Wave of a National Survey about Culture, Creativity, Community and the Arts.” Slover Linnett, January 31, 2022. <https://sloverlinett.com/insights/rethinking-relevance-rebuilding-engagement-findings-from-the-second-wave-of-a-national-survey-about-culture-creativity-community-and-the-arts/>.

⁴⁷ Linnett, Slover. “Rethinking Relevance, Rebuilding Engagement: Findings from the Second Wave of a National Survey about Culture, Creativity, Community and the Arts.” Slover Linnett, January 31, 2022. <https://sloverlinett.com/insights/rethinking-relevance-rebuilding-engagement-findings-from-the-second-wave-of-a-national-survey-about-culture-creativity-community-and-the-arts/>.

⁴⁸ Linnett, Slover. “Rethinking Relevance, Rebuilding Engagement.”

content in unprecedented ways, hybrid (simultaneously available in person and online) content was rapidly developed as a new model for engagement.⁴⁹

Notably, this study showed that the perceived importance of cultural organizations to Americans jumped over the course of the pandemic: pre-pandemic surveys reflected that only 37% of Americans noted cultural organizations as important to them, but over the course of the pandemic, 56% of Americans responded they viewed arts and culture organizations as important to them.⁵⁰ This same survey also found that 76% of Americans wanted their cultural organizations to be active in addressing social issues within their communities over the course of the pandemic period, with 42% identifying systemic racial injustice as the top issue they wanted their institutions to address.⁵¹

Not only did the expectations of Americans for their cultural heritage institutions change, but they also changed their participation habits. As Moore, Paquet, and Wittman stated, “while backgrounded by the grief of a pandemic that isolated us in different ways, museums made strides in accessibility and virtual event production and reached a remote audience ready to engage.”⁵² During the pandemic almost half (45%) of Americans participated in a community-based or participatory activity connected to their cultural heritage institution, with little variation across race or ethnicity.⁵³ As the pandemic shifted expectations of cultural heritage institutions towards institutions that address social issues and, notably, racial injustice, and primed the community for digital experiences, participatory online experiences presented themselves as a crucial offering for the public’s engagement with collections and learning objectives, but also for the institution to make sense and meaning of collections and collecting practices with their communities. Previously in this thesis, a multitude of concerns plaguing the field of cultural heritage were addressed, with the lack of participation from Black, Indigenous, and People of Color (BIPOC) visitors, poor interpretation of material culture, and the failure of professionalism within the field to address legacies of bias and institutional/systemic racism⁵⁴ being covered most clearly in **Chapters 2-3**.

In particular, during the period of this research project (2019-2022), the world underwent massive changes, and these changes created ripples for the field of cultural heritage institutions and direct implications for the research conducted in this thesis. As the field enters perhaps the

⁴⁹ Moore, Porchia, Rose Paquet, and Aletheia Wittman. *Transforming Inclusion in Museums: The Power of Collaborative Inquiry*. London: Rowman & Littlefield, 2022. Pg.5

⁵⁰ Linnett, Slover. “Rethinking Relevance, Rebuilding Engagement.”

⁵¹ Linnett, Slover. “Rethinking Relevance, Rebuilding Engagement.”

⁵² Moore, Paquet, and Wittman, *Transforming Inclusion in Museums*, pg. 6

⁵³ Linnett, Slover. “Rethinking Relevance, Rebuilding Engagement.”

⁵⁴ Moore, Paquet, and Wittman, *Transforming Inclusion in Museums*, pg. 4

next stage of *New Museology*,⁵⁵ it is still important to take Peter Vergo's 1989 work to heart, recognizing that the field of theory and practice has focused too heavily on museum methods and too little on the purpose of the museum aligning to the Critical Heritage Studies framework.⁵⁶ With the community now versed in digital engagement platforms and projects, with a technological prowess exceeding that of the pre-pandemic times, and with calls from these same communities for cultural heritage institutions to be socially responsive, there is more promise than ever for collaborative experiences such as those described in this thesis.

As institutions begin reimagining their programming and collaborative experiences with an eye to a post-pandemic world, it is important to note the value of web-based, offsite experiences such as the crowdsourcing projects tested in this thesis. The Slover Linett survey demonstrated an additional reason why it is more important now, in a world emerging from a two-plus year pandemic, for institutions to continue to create and support online accessible experiences. The Slover Linett survey found that "for many BIPOC groups, the ability to participate in arts and culture activities was limited by a lack of affordable transportation, which disproportionately affects American Indians/Alaska Natives, Black/African Americans, and Hispanics/Latinxs (33%, 27%, and 26% vs. 14% overall)."⁵⁷ When looking at the survey result breakdowns in my own research projects, shown in **Figure 13 (b,c)**, **Figure 14 (b,c)**, and **Figure 15 (b,c)**, Black/African and Hispanic/Latinx respondents continually indicated a distrust and lack of representation within museums at markedly levels higher than their White/Caucasian counterparts.

Further, a year into the pandemic (by 2021), over half of Americans (64%) stated that they had participated in one or more online arts and culture activities. The digital offerings that became necessary during the pandemic provided unprecedented opportunities for cultural organizations to reach new audiences that haven't traditionally attended in-person.⁵⁸ As institutions reopened physically in 2021 and 2022, the importance of retaining digital experiences was highlighted, as those who indicated they will remain "digital only" users of cultural institutions within the Slover Linett survey were much more likely to be Black/African or Hispanic/Latinx.

⁵⁵ Moore, Paquet, and Wittman, *Transforming Inclusion in Museums*, pg. 13

⁵⁶ Moore, Paquet, and Wittman, *Transforming Inclusion in Museums*, pg. 13

⁵⁷ Linnett, Slover. "Rethinking Relevance, Rebuilding Engagement: Findings from the Second Wave of a National Survey about Culture, Creativity, Community and the Arts." Slover Linett, January 31, 2022. <https://sloverlinett.com/insights/rethinking-relevance-rebuilding-engagement-findings-from-the-second-wave-of-a-national-survey-about-culture-creativity-community-and-the-arts/>. Pg. 7

⁵⁸ Linnett, Slover. "Rethinking Relevance, Rebuilding Engagement," pg. 7

As cultural heritage institutions strive to remain relevant to their public and expand the importance and knowledge of the collections they hold, it is clear that online participatory experiences such as crowdsourcing offer the opportunity to expand access to collections to more diverse audiences (in particular the Black/African and Hispanic/Latinx audiences). These diverse audiences, in turn, add contextual richness to collections that are not represented by the typical cultural heritage cataloging staff demographics as demonstrated above. Additionally, by creating participatory projects that tackle emerging technologies such as AI and machine learning, the cultural heritage institutions can provide a valuable service to these communities, providing spaces to learn, discuss, and debate the biases and social issues rife in the technology, thus becoming the socially responsive institutions that the communities are calling for.

AI and Machine Learning:

As mentioned in the **Chapter 4: Methodology & Project Design**, the inclusion of the AI tags in this thesis was specifically done to reflect emerging projects in the sector from the late 2010s to early 2020s. Previous projects run at institutions such as the Metropolitan Museum of Art,⁵⁹ the Barnes Foundation,⁶⁰ Massachusetts Institute of Technology,⁶¹ Philadelphia Museum of Art,⁶² Harvard Art Museums,⁶³ and the Library of Congress,⁶⁴ all employed machine vision to analyze, categorize, and interpret their collections images.⁶⁵ When considering that AI already underlies many routine aspects of our daily lives, specifically our search behaviors on social media and search engines, the inclusion of AI tags in this project was designed to spark with

⁵⁹ Zhang, Chenyang, Christine Kaeser-Chen, Grace Vesom, Jennie Choi, Maria Kessler, and Serge Belongie. "The IMet Collection 2019 Challenge Dataset." ArXiv:1906.00901 Cs, June 3, 2019. <http://arxiv.org/abs/1906.00901>.

⁶⁰ "Using Computer Vision to Tag the Collection. | by Shelley Bernstein | Barnes Foundation | Medium." Accessed March 22, 2021. <https://medium.com/barnes-foundation/using-computer-vision-to-tag-the-collection-f467c4541034>.

⁶¹ Kessler, Maria. "The Met x Microsoft x MIT: A Closer Look at the Collaboration | The Metropolitan Museum of Art." Accessed March 22, 2021. <https://www.metmuseum.org/blogs/now-at-the-met/2019/met-microsoft-mit-reveal-event-video>.

⁶² Engineering, Penn. "Penn Engineering and the Philadelphia Museum of Art Join Forces to Envision the Future." Medium, November 12, 2019. <https://medium.com/penn-engineering/penn-engineering-and-the-philadelphia-museum-of-art-join-forces-to-envision-the-future-bde4cbfc282f>.

⁶³ Harvard Art Museums. "AI Explorer." Accessed March 22, 2021. <https://ai.harvardartmuseums.org/>.

⁶⁴ Cordell, Ryan. "Machine Learning + Libraries: A Report on the State of the Field." Library of Congress, July 14, 2020. <https://labs.loc.gov/static/labs/work/reports/Cordell-LOC-ML-report.pdf>.

⁶⁵ Ciecko, Brendan. "AI Sees What? The Good, the Bad, and the Ugly of Machine Vision for Museum Collections." Museums and the Web 2020, 2020.

project participants the ways in which the language and specific tags used to describe are instrumental to their daily search and discovery taste, often in ways they do not realize.⁶⁶

Looking at the qualitative results of the demographic survey and the Zooniverse TalkBoards, as shown in **Chapter 5: Data & Results**, it is clear that the *Tag Along with Adler* project was successful in engaging participants in conversation and sparking discussions on AI. Within the TalkBoards “Notes,” of the 110 participants who engaged in conversations throughout the year of the project, 12 specifically raised AI within their comments, or about 11% of users. Similarly, within the demographic survey’s free text comment space, 11.6% raised AI within their comments. Within both spaces, discussions mostly centered around effectiveness of the AI tags, questions around the training models, or recognition of the bias imbued within the AI-generated tags. As indicated in **Chapter 5: Data & Results** (pg. 169), AI tagging was not only effective as a conversation and learning objective of this project, but it also appeared to be a draw to the project itself; with the “Verify AI Tags” workflow consistently receiving more participation than the “Tag Images” workflow.

The implication of this specific piece of the thesis goes beyond evaluating the effectiveness of AI programs and machine learning to create metadata tags; instead, it signals the importance for cultural heritage institutions to include these emerging technologies as part of transparent projects, using them to not only enrich collections but also engage in conversations with the public, providing a structured and safe space to delve into these technologies. As Kate Zwaard, director of digital strategy at the Library of Congress, emphasized, cultural heritage institutions are different from Silicon Valley in the best of ways, specifically in the fact that these institutions can be deliberate about technological adoption and can make decisions based not on keeping up with technology trends and competitors, but instead on what technology is shown to work to the “explicit benefit of patrons.”⁶⁷

Throughout the course of this research it became apparent that using AI in tandem with crowdsourcing platforms showed some of the most promising benefits to patrons. As Ryan Cordell noted in his 2020 report on machine learning and libraries, “the majority of machine learning experiments in libraries stem from a simple reality: human time, attention, and labor will always be severely limited in proportion to the enormous collections we might wish to describe and catalog.”⁶⁸ As the results of *Tag Along with Adler* reflected, crowdsourcing has the ability to bring description to collections, and bringing in AI and machine learning technology to the

⁶⁶ Ciecko, “AI Sees What?”

⁶⁷ Cordell, Ryan. “Machine Learning + Libraries: A Report on the State of the Field.” Library of Congress, July 14, 2020. <https://labs.loc.gov/static/labs/work/reports/Cordell-LOC-ML-report.pdf>. Pgs. 1-2

⁶⁸ Cordell, “Machine Learning + Libraries,” pg. 1

project itself helps entice participation by the public. Bringing together the technology of AI and machine learning with the participatory experience of crowdsourcing is promising to be the next expansion in the field for cultural heritage.⁶⁹

By building on their existing roles as trusted centers for conversations and transformative experiences, cultural heritage institutions have the chance to become focal points for the collaborations needed to cultivate responsible use of machine learning and AI, and in a way that serves the public's call for social response. Jennie Choi of the Metropolitan Museum of Art was a key member of the team that worked on the iMet tagger used in this thesis. In a 2022 interview conducted with Choi,⁷⁰ she stated she saw a need for institutions with large collections that wanted to provide additional access points for their users to these collections to engage in crowdsourcing. Choi stated, "Museums looking for additional voices and perspectives may benefit from inviting the public to tag their works. It could provide a new way of seeing a collection."⁷¹ Choi also stated that if her team were to undergo another project similar to the iMet tagging project, they would do so if they "could get our data onto a Zooniverse-like platform with a large active user base,"⁷² noting the marked potential, previously shown in this thesis, that engaging with a preexisting crowdsourcing platform can have on the success of a project.

Considering that "algorithms are neither neutral nor objective"⁷³ and are programmed by human beings who have both conscious and unconscious biases, much the same way that has been noted for human beings conducting cataloging in cultural heritage, heritage institutions have a unique position as institutions that serve the public to lead the conversation about ethical description and search.⁷⁴ As Catherine D'Ignazio and Lauren Klein argue in *Data Feminism*,⁷⁵ the very goal of mitigating bias might not be enough, as the terms themselves "locate the source of the bias in individual people and specific design decisions"⁷⁶ rather than in systems of power.⁷⁷ All people come with bias, including project participants, professional staff, project teams, and AI trainers. As Cordell notes when referencing D'Ignazio and Klein in his own report, when considering collections that will underlie machine learning and AI projects, cultural heritage institutions should attempt to not simply encode an idea of fairness into the algorithms used, but instead work actively towards equity by foregrounding marginalized voices, though

⁶⁹ Cordell, "Machine Learning + Libraries," pg. 3

⁷⁰ Choi, Jennie. Email Interview between Jennie Choi and Jessica BrodeFrank. Email, March 29, 2022.

⁷¹ Choi, Jennie. Email Interview between Jennie Choi and Jessica BrodeFrank. Email, March 29, 2022.

⁷² Choi, Jennie. Email Interview between Jennie Choi and Jessica BrodeFrank. Email, March 29, 2022.

⁷³ Cordell, "Machine Learning + Libraries," pg. 12

⁷⁴ Cordell, "Machine Learning + Libraries," pg. 12

⁷⁵ D'Ignazio, Catherine, and Lauren F. Klein. *Data Feminism*. The MIT Press, 2020.

⁷⁶ D'Ignazio, Catherine, and Lauren F. Klein. *Data Feminism*. The MIT Press, 2020. Pgs. 60-61

⁷⁷ Cordell, "Machine Learning + Libraries," pg. 15

every individual has their own biases, by foregrounding an approach to metadata production that includes many voices, there is greater opportunity for more diversity.⁷⁸

By bringing AI and machine learning models into crowdsourcing projects, it is possible to actively challenge the oppressive natures of both algorithms and professional cataloging, actively confronting notions of neutrality and consciously working to forefront the voices of diverse groups of people. Incorporating AI and machine learning into crowdsourcing projects can also serve to bridge the gap noted by Cordell between the gold standard of professional cataloging and the need to describe large-scale collections to make them searchable.⁷⁹ As noted previously, crowdsourcing projects take significant time and resources of their own and cannot be thought of simply as outsourcing cataloging work from the professional to the crowd; however, by seeing these projects as necessary and significant digital engagement projects that provide not only the needed socially responsive opportunities for institutions to engage in conversations about emerging technologies and noted biases, but also to include a more diverse array of voices in the description process whilst providing additional opportunities to engage in virtual spaces, these projects can be seen as critical collaborations for institutions to devote proper staff and resources to run. When considering the need for more digital experiences in a post-pandemic world, and the accessibility created by these projects not just in terms of diversification of language and bridging the language gap but also in terms of providing image descriptions, the devotion of resources to these projects becomes easier to defend.

Accessibility – Image Descriptions and Alt-Text on the Web:

An important implication of this research was on the breadth of accessibility that crowdsourcing metadata projects can bring to institutional collections, not just in expanding diverse narratives and access points through metadata tags, but also expanding access to collections images through the creation and enrichment of image descriptions and alt-text online. As cultural heritage institutions look towards diversity, equity, accessibility, and inclusion work, it is imperative that this work includes steps to make our digital resources more accessible online. A crucial step to making digital resources, and in particular digital images, accessible online is the inclusion of alt-text and long descriptions. Alt-text, or alternative text, is the textual substitute for non-textual content on web pages.⁸⁰

Alt-text serves multiple functions for online users with visual or cognitive disabilities. Up to 250 million people with blindness or moderate to severe vision impairment benefit from image

⁷⁸ Cordell, "Machine Learning + Libraries," pg. 15; D'Ignazio & Klein, *Data Feminism*, pgs. 60-61.

⁷⁹ Cordell, "Machine Learning + Libraries," pg. 41

⁸⁰ "WebAIM: Alternative Text." Accessed August 31, 2022. <https://webaim.org/techniques/alttext/>.

descriptions, in addition to countless others with information processing differences, such as dyslexia, for whom text-to-speech technologies provided by screen readers are critical.⁸¹ As described previously, an unforeseen complication to my particular research was the COVID-19 pandemic, and, in fact, 2020 was a pivotal year for web accessibility due to the pandemic. As many disabled people were at the highest risk for severe illness from the pandemic, they became the most reliant on online experiences; however, for many there were barriers and struggles to access essentials online with inaccessible websites and applications being a major issue due to lack of alt-text.⁸²

When alt-text is embedded into images and included on the website design, it can be announced audibly by screen readers in place of the image, but even for non-disabled users, alt-text can enhance experiences. If an image fails to load due to broadband or internet issues, or the particular user has blocked or disabled images within their browser, the inclusion of alt-text ensures that the browser is able to present the alternative text in place of the image. Furthermore, alt-text is parsed by search engines and is used in the assessment of the pages purpose and content, helping to increase search result propagation.⁸³

Importantly for the implications of this research, alt-text should not simply repeat caption information or cataloging information noting a work's medium or providing curatorial and historical background; instead, it should describe the *aboutness* of the image – it should describe what sighted visitors would see when they look at the image itself.⁸⁴ This is where metadata crowdsourcing projects as described in this thesis can be seen further as an opportunity for the cultivation of alt-text as well as the enrichment of cataloging and visitor engagement. As the American Alliance of Museums stated in their 2022 “Excellence in DEAI Report,” the “field must shift away from transactional DEAI work focused on checking boxes and toward transformational institutional and collective work centered around equity and cultural and structural change.”⁸⁵ Throughout this thesis, I have asserted the importance of representation within the cataloging process and the ways in which metadata crowdsourcing projects help

⁸¹ Quinn, Brendan. “IPTC Announces New Properties in Photo Metadata to Make Images More Accessible.” IPTC (blog), October 27, 2021.

<https://iptc.org/news/iptc-announces-new-properties-in-photo-metadata-to-make-images-more-accessible/>

⁸² Quinn, Brendan. “IPTC Announces New Properties in Photo Metadata to Make Images More Accessible.” IPTC (blog), October 27, 2021.

<https://iptc.org/news/iptc-announces-new-properties-in-photo-metadata-to-make-images-more-accessible/>

⁸³ “WebAIM: Alternative Text.” Accessed August 31, 2022. <https://webaim.org/techniques/alttext/>.

⁸⁴ Watlington, Emily. “How Museums Are Making Artworks Accessible to Blind People Online.” ARTnews.Com (blog), February 12, 2020.

<https://www.artnews.com/art-in-america/columns/the-met-mca-chicago-blind-access-alt-text-park-mcarthur-shannon-finnegan-1202677577/>.

⁸⁵ American Alliance of Museums. “Excellence in DEAI Report,” August 2, 2022. <https://www.aam-us.org/2022/08/02/excellence-in-deai-report/>.

cultivate such diverse representation, and this representation absolutely matters; however, I go a step further here to assert the importance that these projects also have in the opportunity to create more equitable outcomes and build more inclusive environments online for all.⁸⁶

The lack of alternative text in cultural heritage media creates a vacuum for access. When alt-text is missing, then screen readers, search engines, and browsers will read only the path to the images, providing zero context of the included image and instead reading poorly named files.⁸⁷ This obscures the user experience and privileges the sighted and those with reliable broadband access over the rest of the population. Though technology is getting better at recognizing what an image depicts, algorithms come with their own biases, as has been touched upon clearly in this thesis. And moreover, algorithms alone cannot understand the context an image has within a given page; for example, “a maple leaf might represent Canada, or it might just illustrate the leaf of a tree... authors must provide alternative text that represents the content and function of their images” in order to provide this kind of context.⁸⁸

An interesting development within my own research was the continual inclusion of metadata tags added in full-sentence structures describing the images seen within the project. Within the tags added for the project, on average across the 11 incremental data releases, about 5% of tag submissions were done in these full-syntax styles. Full-sentence descriptions were added by volunteers unprompted by the project team; in fact, the project text asked users to “Add words or phrases that best describes or identifies key elements or features of this image. Please place commas between each individual tag (word or phrase).”

Much like the perceived barriers to participation mentioned in **Chapter 4: Methodology & Project Design**, the alt-texts can be intimidating to write. As the Northwestern University team noted, someone without a background in the collection subject matter may feel like they don't have the authority to describe a collection piece or artwork; however, with the impetus for description being not a specialization but on everyday language used to describe what one sees, anyone can be brought into the process.⁸⁹ This is reminiscent of much of the work reported in **Chapter 3: Literature Review**, and is a noted barrier for crowdsourcing projects as I have laid out in this thesis.

⁸⁶ American Alliance of Museums. “Excellence in DEAI Report,” August 2, 2022. <https://www.aam-us.org/2022/08/02/excellence-in-deai-report/>.

⁸⁷ Shim, Soo Yeon. “Art Museums & Alt Text.” Medium (blog), May 12, 2019. <https://medium.com/@sooyshim/art-museums-alt-text-952cfca1d33b>.

⁸⁸ “WebAIM: Alternative Text.” Accessed August 31, 2022. <https://webaim.org/techniques/alttext/>.

⁸⁹ Northwestern University Block Museum. “Productive Constraints: Writing Alt Texts at The Block.” Stories From The Block, June 16, 2021. <https://nublockmuseum.blog/2021/06/15/productive-constraints-writing-alt-texts-at-the-block/>.

A deeper dive into using these sorts of crowdsourcing projects for the creation of alt-text descriptions, specifically around process and quality control stages, is outside the scope of this thesis. However, what is clear in the results of this thesis is the opportunity such projects have in this kind of research. Despite being one of the most notable issues affecting web accessibility, the process and methods of implementing alternative text on the web is still lacking.⁹⁰ Many organizations still view accessibility requirements as a costly way to avoid even costlier lawsuits, such as the more than 100 lawsuits filed against New York galleries in 2019 for violations to the Americans with Disabilities Act, which requires that businesses and public places accommodate disabled people – and in a virtual world, this includes alternative text.⁹¹ Even those institutions with the best intentions often find themselves overwhelmed by the backlog of images on websites requiring alternative text or confused by the process and requirements for alt-text.⁹²

It is a truth in itself that alt-text requires significant labor, as is a noted truth about cataloging. The implications of this specific research show the potential of crowdsourcing in describing the *aboutness*, or context, of images within cultural heritage institutions, and I argue this description can be used for both the expansion of cataloging terms and the creation of alternative text. As noted by Emily Watlington, “when organizations say they can’t afford to do something, they often mean they don’t value it. Pleading poverty as a reason to avoid producing alt-text runs counter to the legal and moral imperative to remove barriers.”⁹³ Viewing crowdsourcing projects as engaging experiences with institutions’ publics and as sources for nuanced contextual descriptions, it is possible to allocate the labor and the time needed to make a project successful, leading to the creation of cataloging language and alternative text. Additionally, as the technologies that cultural heritage institutions utilize to provide access to their collections innovate, including virtual catalogs and embedded metadata, so too must the processes used.

The latest version of the International Press Telecommunications Council’s (IPTC) Photo Metadata Standard, launched in 2021, included for the first time two new properties: alt-text and

⁹⁰ “WebAIM: Alternative Text.” Accessed August 31, 2022. <https://webaim.org/techniques/alttext/>.

⁹¹ Watlington, Emily. “How Museums Are Making Artworks Accessible to Blind People Online.” ARTnews.Com (blog), February 12, 2020. <https://www.artnews.com/art-in-america/columns/the-met-mca-chicago-blind-access-alt-text-park-mcarthur-shannon-finnegan-1202677577/>.

⁹² Watlington, Emily. “How Museums Are Making Artworks Accessible to Blind People Online.” ARTnews.Com (blog), February 12, 2020. <https://www.artnews.com/art-in-america/columns/the-met-mca-chicago-blind-access-alt-text-park-mcarthur-shannon-finnegan-1202677577/>.

⁹³ Watlington, “How Museums Are Making Artworks Accessible...”

extended description.⁹⁴ The inclusion of these fields within the IPTC embedded metadata fields provides opportunities for unprecedented accessibility. As Beth Zierbarth, director of access at the Smithsonian stated, “all publicly available images can now be made accessible” when institutions include information within these fields.⁹⁵ Embedding image descriptions for accessibility into photo metadata promises to allow access to millions who would otherwise be confronted by silence when presented with inaccessible images online. Embedding alt-text into the image file itself through use of the IPTC functionality also allows the metadata and alt-text to travel with the image anywhere it is copied or placed online – an important tool within the modern online landscape⁹⁶ By viewing metadata crowdsourcing projects as a possible source of alt-text generation, there is even more defense for the previously stated need for institutions to invest in these as asserted in this thesis.

Volunteerism – Providing Opportunities for Engagement and Expansion of Volunteer Programs:

The opportunity that crowdsourcing projects have to expand volunteer programs is a large implication of this research, and one that calls back to the ethical considerations for such projects which I raised in **Chapter 2: Contextual Review**. Within this earlier chapter, I raised the initial question in response to critics of crowdsourcing: How should project designs be optimized to prevent ethical gray areas around labor practices, to best utilize staff time, to optimize searchability, and to report in ways to be more applicable to the field at large? Within **Chapter 2: Contextual Review**, I provided examples that were further expanded in **Chapter 3: Literature Review** of previous crowdsourcing projects and how the lessons from these projects could help tackle any gray areas around labor practices.

In particular, I asserted that by incorporating co-production, focusing on engagement as an equitable two-way street, and creating projects that bring mission-driven learning objectives to the project’s design, these projects could be impactful and ethically sound in the exchange of volunteer labor for experience. However, it is important to discuss further how museum volunteerism has been called into question during the course of this thesis. In a forthcoming publication for the Smithsonian Institution, I have partnered with Dr. Samantha Blickhan to discuss “Reconsidering Digital Collections Through Crowdsourcing,” with an entire section of this chapter devoted to this volunteerism change.

⁹⁴ Quinn, Brendan. “IPTC Announces New Properties in Photo Metadata to Make Images More Accessible.” IPTC (blog), October 27, 2021.

<https://iptc.org/news/iptc-announces-new-properties-in-photo-metadata-to-make-images-more-accessible/>

⁹⁵ Quinn, “IPTC Announces New Properties in Photo Metadata...”

⁹⁶ Quinn, “IPTC Announces New Properties in Photo Metadata...”

The fact is that museums have been utilizing public volunteers in various aspects for centuries, with the most iconic example being the docent. Though docent programs began in the late 19th and early 20th centuries at the Museum of Fine Arts in Boston, the term and the essence of a voluntary position that is “neither a teacher nor a curator nor an administrator nor a recreation leader, but a combination of all of these and more” is now seen globally across museum content types.⁹⁷ With the advent and expansion of women’s club movements in the United States between 1890 and 1930, Karen Blair notes that the docent transitioned from the realm of white male museum governors, to that of the “affluent, educated, predominantly white middle-class women,” who worked through these voluntary associations.⁹⁸

Though the docent program may be the most synonymous form of museum volunteerism, it is by no means the only way that museums have engaged the public to contribute their time. Hannah Turner documented what could be dubbed a proto-citizen science activity with the public created by the Smithsonian Institution in the 19th century as part of the creation and expansion of the U.S. National Entomological Collection (USNM), now a part of the National Museum of Natural History.⁹⁹ The USNM’s strategy to enlist the public in the collection of “Indian relics” and skulls was one of the earliest citizen science projects and in fact one of the first museum volunteer programs.¹⁰⁰

With the advent of the social web in the 21st century, museum volunteerism transitioned yet again, leading to the age of citizen science projects and participatory experiences, bringing museum volunteerism outside the museum walls and into the homes of anyone with an internet connection. As Nina Simon has argued, “the social web has made it easier to share objects and stories than ever before, and that’s changing the way professionals think about sharing in cultural institutions.”¹⁰¹ Dedicated platforms such as the Smithsonian Transcription Center, the Library of Congress’s By the People, and Zooniverse can entice participants “out of passive spectating into action and then model that experience for others.”¹⁰² These programs harken back to those previously described in **Chapter 2: Contextual Review** and **Chapter 3: Literature Review**.

⁹⁷ Katherine Giltinan (2008) The Early History of Docents in American Art Museums: 1890-1930, *Museum History Journal*, 1:1, 103-128, DOI: 10.1179/mhj.2008.1.1.103. Pg. 104

⁹⁸ Katherine Giltinan (2008) The Early History of Docents in American Art Museums: 1890-1930, *Museum History Journal*, 1:1, 103-128, DOI: 10.1179/mhj.2008.1.1.103. Pg. 115

⁹⁹ Turner, Hannah. *Cataloguing Culture: Legacies of Colonialism in Museum Documentation*. Vancouver: UBC Press, 2020.

¹⁰⁰ Turner, Hannah. *Cataloguing Culture: Legacies of Colonialism in Museum Documentation*. Vancouver: UBC Press, 2020.

¹⁰¹ Simon, Nina. *The Participatory Museum*. Santa Cruz, California: Museum 2.0, 2010. Pg. 172

¹⁰² Simon, Nina. *The Participatory Museum*. Santa Cruz, California: Museum 2.0, 2010. Pg. 256

What is important to note is that though I have covered the criticism of crowdsourcing projects (those that bring museum volunteerism to the home of the volunteer), there have recently been criticism and calls for change for more traditional forms of volunteerism like docent programs. A prime example can be seen at the Art Institute of Chicago. The Art Institute of Chicago announced in September 2021 that the docent program as it was currently envisioned was being dismantled and replaced with paid educational positions. Beginning with a Chicago Tribune editorial¹⁰³ and a Wall Street Journal article,¹⁰⁴ the backlash from the press to this decision was swift, with both news outlets condemning the decision as a form of anti-white racism targeting the wealthy white women who most frequently held these positions since the 1930s.

The decision the Art Institute announced in September 2021 is still politically charged and debated into the late-2022 period of this thesis. However, an important component of the Art Institute of Chicago's decision was the desire to "forge stronger relationships with an ethnically and socioeconomically diverse public. Like other museums, it has sometimes struggled" in this work when it comes to attracting volunteers and guests.¹⁰⁵ As noted in **Chapter 5: Data & Results**, citizen science platforms are not perfect, and they do come with their own limitations when it comes to diversity; however, they do provide noted abilities to grant more equitable access to volunteer opportunities and engagement, as noted in this thesis.

I argue that by rethinking what volunteerism is in the modern cultural heritage institution, it would be possible to redesign and reallocate team members and resources. As museums, archives, and libraries strive to remain relevant with their communities and expand their reach, it is clear that online participatory experiences, such as the metadata crowdsourcing projects described in this thesis, provide the opportunity to expand access to collections to wider audiences, while in turn providing engagement opportunities to these audiences. If these projects were able to be seen as the volunteer opportunities that they are, it may be easier for institutions to allocate the resources needed to moderate chat boards, build data sets, process

¹⁰³ Chicago Tribune. "Editorial: Shame on the Art Institute for Summarily Canning Its Volunteer Docents." Accessed June 3, 2022.

https://www.chicagotribune.com/opinion/editorials/ct-edit-art-institute-docents-firing-20210927-dfrho66bjb_a2bp27phz2yndwzu-story.html.

¹⁰⁴ Bottum, Faith. "Opinion | Indecency on Display at the Art Institute of Chicago." Wall Street Journal, October 15, 2021, sec. Opinion.

<https://www.wsj.com/articles/indecency-art-institute-of-chicago-docents-diversity-firing-11634310172>.

¹⁰⁵ Zorach, Rebecca. "Why the Art Institute of Chicago's New Docent Program Faces Whitelash." Hyperallergic, November 9, 2021.

<http://hyperallergic.com/691425/why-the-art-institute-of-chicagos-new-docent-program-faces-whitelash/>.

contributions, and overall support the work it takes to make the projects impactful and successful as both voluntary engagement experiences and enrichment of collections context.

Trust and Representation within Cultural Heritage – DEAI and Beyond:

A major stated impetus for this thesis and the practice-based action research undertaken was to explore the opportunities to engage audiences while expanding representation and access to collections. Throughout **Chapter 3: Literature Review** and **Chapter 5: Data & Results**, I have documented the extent to which metadata crowdsourcing projects, and in particular the *Tag Along with Adler* project, do in fact accomplish both these goals, but it is still important to note that the implications of this research evolved due to the social climate during the research period.

The year 2020 saw not only the upheaval of the cultural heritage sector due to the COVID-19 pandemic, but also mass demonstrations and calls for change in regards to racial inequality in the wake of the US-based murders of Breonna Taylor and George Floyd.¹⁰⁶ The public awareness began to shift with antiracist literature topping reading lists and calls for change resounding throughout the world. Institutions like the Smithsonian's National Museum of African American History and Culture responded to these calls, building virtual learning portals such as "Talking About Race,"¹⁰⁷ partnering with noted antiracist authors like Ibram Kendi to introduce and tackle concepts like institutional racism, bias, and structural racism.

Change came at the highest levels of cultural heritage institutions. The International Council of Museums (ICOM) had proposed a new definition of a *museum* in 2019. The proposed definition was a departure from "dominant paradigms for what is, and should be, at the center of the work that museums do in society"¹⁰⁸ – with a focus on diversity, equity, and inclusion, it was considered too political by many voting members of ICOM and was actually struck down.¹⁰⁹ However, in the wake of the 2020 dual upheaval of the COVID-19 pandemic and social justice movements, a new definition was again proposed at ICOM in 2022, and this time it was ratified. The new definition of a museum now reads:

A museum is a not-for-profit, permanent institution in the service of society that researches, collects, conserves, interprets and exhibits tangible and intangible heritage.

¹⁰⁶ Moore, Porchia, Rose Paquet, and Aletheia Wittman. *Transforming Inclusion in Museums: The Power of Collaborative Inquiry*. London: Rowman & Littlefield, 2022. Pg.75

¹⁰⁷ National Museum of African American History and Culture. "Being Antiracist." Accessed October 10, 2022. <https://nmaahc.si.edu/learn/talking-about-race/topics/being-antiracist>.

¹⁰⁸ Moore, Porchia, Rose Paquet, and Aletheia Wittman. *Transforming Inclusion in Museums: The Power of Collaborative Inquiry*. London: Rowman & Littlefield, 2022. Pg.75

¹⁰⁹ Liu, Jasmine. "Carefully Worded Definition of 'Museum' Eschews Neutrality." *Hyperallergic*, August 25, 2022. <http://hyperallergic.com/756031/carefully-worded-definition-of-museum-eschews-neutrality/>.

Open to the public, accessible and inclusive, museums foster diversity and sustainability. They operate and communicate ethically, professionally and with the participation of communities, offering varied experiences for education, enjoyment, reflection and knowledge sharing.¹¹⁰

This new definition stresses a new aim for museums to facilitate diversity and sustainability, with the museum's mission and reason for being shifting from the previous definition's use of the word "study" to the new definition stating museums exist to be places for "reflection and knowledge sharing."¹¹¹ This subtle shift signals that the cultural heritage sector is moving away from a neutral position of privileged authority and towards a more level network of collaboration, and considering the ICOM definition of museums is often a determinant in definition that national governments use to define museums and their activities, this shift is critical in how organizations may be funded or taxed.¹¹²

As Moore, Paquet, and Wittman argue, this is a global shifting of cultural heritage institutions that acknowledges the non-neutral nature of the activities professionals in museums, archives, and libraries conduct, demanding these professionals do more critical reflection on these activities' context and processes.¹¹³ In **Chapter 2: Contextual Review**, I demonstrated the extent to which activities in cultural heritage institutions are not neutral, and indeed are steeped in bias, but my research is most imperative to this call in its focus on the need to do critical reflection on *processes*.

With a Critical Heritage approach to metadata creation, one that emphasizes the political, cultural and social phenomenon of cultural heritage itself¹¹⁴ this thesis calls for a combination of traditional, professionally created metadata enriched by user generated metadata. By reimagining the cataloging process from one dictated solely by institutional authority to one of shared co-creation with the public, it is possible to create a process of description that also responds to the call of the public to make institutions more visitor centered, places of enjoyment, leisure, and participation; even if it is impossible to reach every member of the public.¹¹⁵

¹¹⁰ Liu, Jasmine. "Carefully Worded Definition of 'Museum' Eschews Neutrality." Hyperallergic, August 25, 2022. <http://hyperallergic.com/756031/carefully-worded-definition-of-museum-eschews-neutrality/>.

¹¹¹ Liu, Jasmine. "Carefully Worded Definition of 'Museum' Eschews Neutrality." Hyperallergic, August 25, 2022. <http://hyperallergic.com/756031/carefully-worded-definition-of-museum-eschews-neutrality/>.

¹¹² Liu, Jasmine. "Carefully Worded Definition of 'Museum' Eschews Neutrality."

¹¹³ (Moore, Porchia, Rose Paquet, and Aletheia Wittman. Transforming Inclusion in Museums...)

¹¹⁴ Gentry, Kynan, and Laurajane Smith. "Critical Heritage Studies and the Legacies of the Late-Twentieth Century Heritage Canon." *International Journal of Heritage Studies* 25, no. 11 (2019): 1148.

¹¹⁵ (Moore, Porchia, Rose Paquet, and Aletheia Wittman. Transforming Inclusion in Museums...) Pg. 13

With this blended approach to metadata creation, in addition to contributing to transparency and accountability, the more open process of metadata production presents opportunities for sharing, reusing, and innovating metadata.¹¹⁶ Though I will address this more below within limitations, this openness of metadata and increase in access points does come with concerns that need to be considered and addressed by those looking to adopt a blended approach. Metadata filtering is an important metadata principle, especially for this blended approach, which libraries and system developers should consider when designing and developing access portals.¹¹⁷ This will become increasingly important as the size and the diversity of metadata increases through the continual process of metadata enriching within this blended approach, with a need to be able to sort and filter terms to prevent excess results populating searches or to allow a more specific search, say of just catalogue metadata versus terms created by users.

In August 2022, the American Alliance of Museums published their newest “Excellence in DEAI Report,”¹¹⁸ specifically responding to the “social, political, and cultural polarization, and clear structural racism and other forms of oppression in the United States and around the world,”¹¹⁹ by centering diversity, equity, accessibility, and inclusion in the understanding and practice of museums. One of the key implications of this report was the express call for institutions to shift away from white-dominated characteristics of work, specifically those of perfection, risk aversion, and conflict avoidance.¹²⁰ As I demonstrated in **Chapter 3: Literature Review**, many of the resounding criticisms to crowdsourcing projects, such as the ones I champion in this thesis, revolved around risk aversion, conflict avoidance, and a call for perfectionism. As I have demonstrated in this thesis, and as the AAM report itself calls for, it is more important to foster an environment of iterating and trying new things, with a focus on transparency.¹²¹ This is perfectly encapsulated in the following quote from the report:

“Making mistakes, being accountable about those mistakes, iterating, and trying again will support museums and museum leaders in building the capacity and skills to sustain

¹¹⁶ Alemu, Getaneh, and Brett Stevens. *An Emergent Theory of Digital Library Metadata: Enrich Then Filter*. 1st ed. Chandos Publishing, 2015. P. 84.

¹¹⁷ Alemu, Getaneh, and Brett Stevens. *An Emergent Theory of Digital Library Metadata: Enrich Then Filter*. 1st ed. Chandos Publishing, 2015. P. 89.

¹¹⁸ American Alliance of Museums. “Excellence in DEAI Report,” August 2, 2022. <https://www.aam-us.org/2022/08/02/excellence-in-deai-report/>.

¹¹⁹ American Alliance of Museums. “Excellence in DEAI Report,” August 2, 2022. <https://www.aam-us.org/2022/08/02/excellence-in-deai-report/>. Pg. 2

¹²⁰ American Alliance of Museums. “Excellence in DEAI Report,” August 2, 2022. <https://www.aam-us.org/2022/08/02/excellence-in-deai-report/>. Pg. 6-7

¹²¹ American Alliance of Museums. “Excellence in DEAI Report,” Pg. 6-7

DEAI in the long term. DEAI in museums is not about getting everything perfect; it is about lifelong learning and continuous improvement.”¹²²

There is a flexibility afforded to institutions who focus on these newer definitions of diversity, equity, accessibility, and inclusion, and ability to work with the public, to not fear mistakes but instead embrace opportunities to try to be better. With this ability to constantly adapt by including and incorporating feedback and experiences of their own community, peers, and the field at large, institutions can be more agile and responsive, which remains key in the current environment plagued by pandemic, climate crisis, and social justice movements.¹²³ By being transparent and vulnerable with the public, with a focus on co-creation, institutions can more effectively create opportunities for diverse groups of people to have a voice, enabling the institutions to be more proactive and effective in responding to the changing times we occupy.¹²⁴

Limitations:

Throughout **Chapter 5: Data & Results** and thus far in this chapter, I have focused on the implications of this research, focusing on the results of my research and the opportunities for change they may afford to the field at large; however, it is still imperative to the validity of these implications to also discuss the limitations to the results presented and the arguments made throughout this thesis. I have attempted to state limitations clearly throughout the course of this thesis, from the **Chapter 4: Methodology & Project Design** section on limitations to the method and project design, to integrating limitations into the results chapter itself. Here I will attempt to go further yet, by discussing additional shortcomings to my own research as well as limitations of this work within the field at large.

COVID-19 Impacts:

During the scope of this thesis, both in the ideation and running of the case study projects, and in the period of writing up, the world was forced to shutter and pivot due to the COVID-19 pandemic. This project was altered to be fully virtual, excluding any initially planned onsite testing. In fact, a limitation to the reproducibility of the results noted in this project may be the pivot of institutions away from digital programming in favor of onsite programming as institutions have reopened.

¹²² American Alliance of Museums. “Excellence in DEAI Report,” Pg. 6-7

¹²³ American Alliance of Museums. “Excellence in DEAI Report,” Pg. 13-14

¹²⁴ American Alliance of Museums. “Excellence in DEAI Report,” Pg. 13-14

As noted in the interview conducted with staff at the J. Paul Getty Museum, the attention and interactions for virtual content exceeded all expectations during the pandemic.¹²⁵ In fact, Zooniverse itself noted a massive uptick in participation during the pandemic period. In an article in *The Museological Review: Issue 25*¹²⁶ which I wrote with former Adler colleagues Dr. Samantha Blickhan, Adriana Guzman Diaz, and Nick Lake, we reported on this phenomenon. By looking at digital programs hosted by the Adler Planetarium, including virtual exhibitions hosted on Google Arts and Culture, Zooniverse projects, as well as Adler-created YouTube content, we were able to demonstrate the large increase of users accessing digital content during the period of COVID closures. During the initial period of COVID-19 museum closures, from March 2020 to December 2020, the Adler Planetarium's Google Arts and Culture-hosted virtual exhibitions saw 32,034 unique users access content, which was 1.79x more users than had accessed during the entirety of the two year period leading up to March 2020.¹²⁷

As reported in this same article by members of the Zooniverse team situated at the Adler Planetarium, after the World Health Organization declared COVID-19 a pandemic and institutions around the world shuttered their physical doors, Zooniverse saw a massive increase in participation. From March 2020 to May 2020, this increase was set at almost 10-fold, where it eventually decreased and stabilized throughout 2020 to an average increase of 4-fold for participation.¹²⁸ As my own research projects were launched in early 2021 through early 2022 they likely missed the largest boon in participation reported within the field; however, it is important to note that during this time, there was still the noted increase in participation to Zooniverse that has not yet been reported longer term for those who may wish to replicate this sort of project. Secondly, the Adler being physically closed during this time period meant my project was able to be marketed more as a digital experience and had the full support of colleagues in the Collections Department for work that will be discussed below like quality assurance. These are circumstances that may never be able to be truly replicated again, and therefore do need to be acknowledged as potential limitations to the results of this research.

¹²⁵ Adam, Edina, and Casey Lee. Email Interview with The J. Paul Getty Museum Drawings Department--Edina Adam, PhD, Assistant Curator, and Casey Lee. Email, May 6, 2022.

¹²⁶ UoL, Museological Review. "Museological Review, Issue 25 (Re)Visiting Museums." Accessed December 1, 2022.
https://www.academia.edu/49967382/Museological_Review_Issue_25_Re_visiting_Museums.

¹²⁷ UoL, Museological Review. "Museological Review, Issue 25 (Re)Visiting Museums." Accessed December 1, 2022.

https://www.academia.edu/49967382/Museological_Review_Issue_25_Re_visiting_Museums Pg. 27

¹²⁸ Johnson, L., L. Trouille, L. Fortson, and C. Lintott. "Unlocking Your Data Through People-Powered Research with the Zooniverse" 53 (January 1, 2021): 127.02.

Limitations to Diversity:

As previously stated in **Chapter 4: Methodology & Project Design**, a noted limitation to this research from the outset was user diversity. Though the use of Zooniverse.org as a platform meant a global reach for the project, all the project text, description, and instructions were only posted in English throughout these case studies. Additionally, the Zooniverse platform was unable to export data added in character languages, resulting in unreadable results from Russian and Japanese users, whom we only know participated due to their TalkBoard conversations.

As part of the qualitative assurance process for this project, any foreign language tags were translated into English as well, to ensure the content was recorded, whilst maintaining the original language as well. It was decided that these tags could be added to the Adler Planetarium's Collections Management System, Axiell, as the system supports foreign languages and the special characters needed for many of these languages. However, the English language translated tags were also added, unattached to their original dialect. This was done to facilitate search, but also to be transparent. As the translations were done using Google Translate, the semantic meaning of tags could be lost, which was a noted issue with having to use translation services. This limitation is important to note, especially for projects looking to diversify their access points and their audiences. Anglophone dominance of the internet remains pervasive, and is important to consider in these projects both when examining results and impact, and when considering reproducibility.

Similarly, limitations must be acknowledged in the ability to discuss diversity amongst the users of the aforementioned case studies in this thesis. As a matter of ethics, the measurements of racial, ethnic, age, and sex demographics were all done via optional, anonymous surveys. Though within best practices, this decision comes with various limitations. By not requiring the volunteers answer these questions, users may have felt more comfortable in their participation, but it also led to a smaller fraction of users reporting their demographics, with just around 5% opting to do so.

Further, limitation to reporting of user demographics, and truly understanding the diversity of the participants, was affected by the platform choices. Though the demographic Google Form was attached to the header of the Zooniverse project, for the gamified Heroku-hosted application, it was in a separate "About" section, which may account for the lower turnout in submissions for this gamified experience. Again, responses to optional surveys are a known limitation to any project: with standard survey responses, it is not atypical for email surveys to receive approximately 6% response rate, with online embedded surveys (like the one

for this project) averaging around 8% response rates.¹²⁹ However, the rates this project showed, roughly 5.5%, were lower than even this average rate and therefore do need to be seen as a limitation towards the discussions on diversity.

Additionally, diversity in users may have been limited by the decision to base this research in a single institution. Unlike previous projects like the *steve.museum*, which worked within a consortium of institutions to test, not only using their collections but also reaching out to their membership listservs, my research was grounded only at the Adler Planetarium. Though attempts were made to mitigate the limitation that comes with only a single institution, including the use of Zooniverse and participation in the *Being Human Festival*, it is still important to note the limitation was there.

Limitations to Transformation - Quality Assurance and Curatorial Oversight:

An additional limitation that has been laid out from the beginning, including in **Chapter 4: Methodology & Project Design**, is the limitations to transformation in regards to the quality assurance process and curatorial oversight – in latent terms, how the interjection of staff into the process of approving and adding user-generated terms to their catalog may inadvertently reinforce the professional voice. Though the quality assurance stage of post processing data is necessary, and one in which specific choices were made to attempt to prevent censorship or professional bias, it's important to note that these things occur even with the best of intentions and strictest of policies.

As Jennie Choi stated, “Beware of bias. It’s nearly impossible to escape personal biases when describing.”¹³⁰ Choi’s quote correctly posits one of the more difficult pieces of this research: the inevitable bias that is infused by each and every person, whether a member of a crowd or a staff member. As Choi continued, “One person may add many tags for works that interest them or may under tag works that are unfamiliar or not of interest. A dog lover may tag any visible dog, no matter how prominent in an image, while a cat lover may not.”¹³¹ As much as project leads need to be aware of the bias each and every individual participant may have, it is also important to devote that same understanding and attention to the post processing of tags. As Alemu and Stevens discussed, metadata diversity relies on the inclusion of a multitude of potentially conflicting metadata points ascribed by diverse users, and this conflict though biased

¹²⁹ Delighted. “What Is a Good Survey Response Rate for Customer Surveys in 2022?,” February 17, 2022. <https://delighted.com/blog/average-survey-response-rate>.

¹³⁰ Choi, Jennie. Email Interview between Jennie Choi and Jessica BrodeFrank. Email, March 29, 2022.

¹³¹ Choi, Jennie. Email Interview between Jennie Choi and Jessica BrodeFrank. Email, March 29, 2022.

in its own way, actually supports the multitude of perspectives and interpretations of various groups of potential users.¹³²

This was why the case studies reported within this thesis focused not on accuracy, but instead on a quality assurance (QA) around “wrongness”. This process is documented more thoroughly on pages 125-126; however, what is important to note is that the Adler Planetarium made the decision to mark any tags that were blatantly wrong, for example: someone may have misgendered an individual in an image or provided an incorrect date or location. As the Adler’s team, which at the time consisted of myself as digital collections access manager, a collections manager, and the curator, worked through the quality assurance process, the team noted how quickly the process became time consuming and difficult.

The J. Paul Getty team noted a similar realization of the expense that post production and quality assurance added to these projects. Edina Adams and Casey Lee stated, “One lesson that we learned that would impact future projects is that, due to the time consuming nature of extracting the data, the need for someone dedicated to the technical aspect of extraction and analysis in order to complete the project in a timely manner.”¹³³ Within the scope of this project, I found that for each of the data sets, which included 100 images, it took roughly 80 hours to complete all post production extraction and arrangement before the quality assurance process could even begin. Once the tags were extracted, aggregated, and arranged, the quality assurance for wrongness process began. This process took the roughly 250,000 tags created during the course of the case studies and looked for wrong tags, as well as any tags that specifically fit well as hyperlinked keywords, which will be described more below.

Within the QA process itself, roughly 500 tags were able to be reviewed each hour. This indicated that to quality assure all the tags created in this project it would take 500 hours, after the 1,760 hours needed to do the extraction and arrangement described above. For the 1,090 images included in this case study across the various workflows, the team would need 2,260 hours in post processing to make the results useable, confirming the Getty team’s lesson that post production is a large part of these projects that needs to be accounted for in the planning, but also that serves as a limitation. The Adler had only completed a fraction of the quality assurance process when my position with them ended, but it is still a reasonable sample to report results.

¹³² Alemu, Getaneh, and Brett Stevens. *An Emergent Theory of Digital Library Metadata: Enrich Then Filter*. 1st ed. Chandos Publishing, 2015. P. 102.

¹³³ Adam, Edina, and Casey Lee. Email Interview with The J. Paul Getty Museum Drawings Department--Edina Adam, PhD, Assistant Curator, and Casey Lee. Email, May 6, 2022.

Of the 1,090 images included across the project workflows, two data sets, or 200 individual images, were fully QA-ed. For the first subject set, 36,034 total tags were added by volunteers, with 2,823 (approximately 8%) marked as unequivocally wrong. For the second subject set, 38,177 total tags were added by volunteers, with 7,324 (approximately 19%) marked as unequivocally wrong. Again, a limitation to this is that the Adler team only completed two of the 11 subject sets, so the range of wrongness in user-generated tags is from 8% to 19% and leaves over 800 images and over 175,000 tags unknown. However, this does demonstrate that the quality assurance process is necessary to prevent a substantial amount of wrong tags and descriptors from entering the databases while also demonstrating that the overwhelming amount of user-generated tags are not actually wrong.

This leads to an additional limitation, a technical limitation to this project and all projects of the type: the technical limitation of the database systems. Though databases and cataloging systems differ across museums, libraries, and archives, the majority of cultural heritage institutions do rely on some form of enterprise system to maintain their data.¹³⁴ Research exists to help guide institutions to what may be a better fit within the available products, but there are numerous systems, with 65 currently vying for ratings on the G2 Business Software Reviews site.¹³⁵ In fact, recommendations for collections databases are still one of the most common threads amongst the AAM Registrar's Committee Listserv.¹³⁶

One noted limitation lies in the design of these systems for hybrid collections, like the ones the Adler houses and that make up the case study of this thesis. For institutions that have archival, library, and museum collections which all must be cataloged under different standards, this can become complicated, resulting in either ad-hoc usage of multiple systems or attempts to use a single product that can handle this hybrid approach.¹³⁷ This limitation was observed within this case study, as library collections at the Adler are cataloged at a book level, and individual illustrations that were included in this project resulted in hundreds of new descriptors to be added to a single book without the ability to geolocate them to the specific page they referenced. This was not a limitation that was able to be tackled in my time at the Adler, but it raises important questions for anyone attempting such a project to look at how the systems in

¹³⁴ Carpinone, Elana C. "Museum Collections Management Systems: One Size Does Not Fit All," n.d., 158.

¹³⁵ G2. "Best Collections Management Software in 2022: Compare 60+." Accessed December 2, 2022. <https://www.g2.com/categories/collections-management>.

¹³⁶ Carpinone, Elana C. "Museum Collections Management Systems: One Size Does Not Fit All," n.d., 158. Pg. 1

¹³⁷ Carpinone, Elana C. "Museum Collections Management Systems: One Size Does Not Fit All," n.d., 158. Pg. 130

place can, or cannot, accommodate this increase in description around the *aboutness* of objects which doesn't fit the systems built to describe *is-ness*.

Though it was not resolved during my time at the Adler Planetarium, it did spark important conversations that lend relevance to how the data from this project was QA-ed. Upon recognizing that it may not be possible to add every tag depending on the type of object (library, archive, and museum) based on the standards used to catalog them and how they were discoverable online, the team at the Adler worked with their database company, Axiell. It was the recommendation of Axiell that the Adler consider two separate forms of tags, one was termed *keywords* and the other was termed *search terms*. The differences between the two relied on where they would be added in the Axiell catalog: *keywords* would be added in a field that was visible to the public on the online public access portal for the object's individual record in which the *keywords* would also be hyperlinked to allowed users to click on a specific term and see all other records that had been tagged with this term. *Search terms* were to be added in a field that did not populate within the online public access portal for the object's individual record, but were still discoverable by the search algorithm when users did a query of the entire database.

This decision was made to prevent concerns that adding over 160,000 tags, accounting for a 20% wrongness and approximately 20% already represented in the Adler catalog or via AI tags, could slow processing speeds of the database system, making discovery a more cumbersome process. By placing only specifically selected tags as *keywords*, the system had fewer hyperlinks to slow it down. However, this again reinserted the possibility of curatorial control, with fears that this decision would imbue the search results with Adler staff's preferences for what was a *keyword* and what was a *search term*. This is a limitation that should be considered by anyone looking to replicate this type of project, particularly the nuances to biases as well as the technical limitations present in these systems.

Conclusion:

With this thesis, I have endeavored to tackle many questions that look to bring diversity, equity, and representation into cultural heritage cataloging through engaging participatory experiences that help tackle these gaps with transparency. As a practitioner in the cultural heritage field myself, and by adopting a practice-based action research methodology, I have laid the framework for how members of this field can reproduce the results reported here.

Through my **Chapter 2: Contextual Review** and **Chapter 3: Literature Review**, I have introduced the problem of the professionalization of language production and demonstrated its

impact on discovery, while also grounding this problem within the larger areas of institutional trust, transparency, and mission-centric activities. These chapters also laid the groundwork for my own case studies, introducing crowdsourcing, citizen science, and participatory experiences in cultural heritage institutions.

By framing my own case studies to utilize a science institution, I have helped expand the scope of research available, moving away from the art-focused institutions that made up the bulk of the literature and projects of the 2000-2010s. By incorporating datasets that included archival photographs, library rare book illustrations, and museum objects, my research also presents results relevant to all institution types within the cultural heritage sector. The utilization of various workflows including artificial intelligence, third-party hosted platforms like Zooniverse, gamification, and more also make the results reported here invaluable in presenting technical optimization utilizing multiple emerging, and yet still in testing, technologies.

It is my hope that the results of this thesis help expand the way the cultural heritage field at large looks at their “best practices”, reevaluating cataloging, description, participatory experiences, online experiences, and onsite interactive experiences, all while tackling extremely pertinent social issues like representation, accessibility, misinformation, and internet discoverability. The reach of these results is vast, and has impact across the cultural heritage sectors, not only reaching museums, libraries, and archives, but also applying interdepartmentally to catalogers; media and marketing experts; curators; educators; and experience designers. As I stated at the very beginning, it is the collaboration of all these individuals and institutions that make this thesis possible and impactful, and I believe the thesis has proven this relevancy to collaboration more than ever.

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Figures:

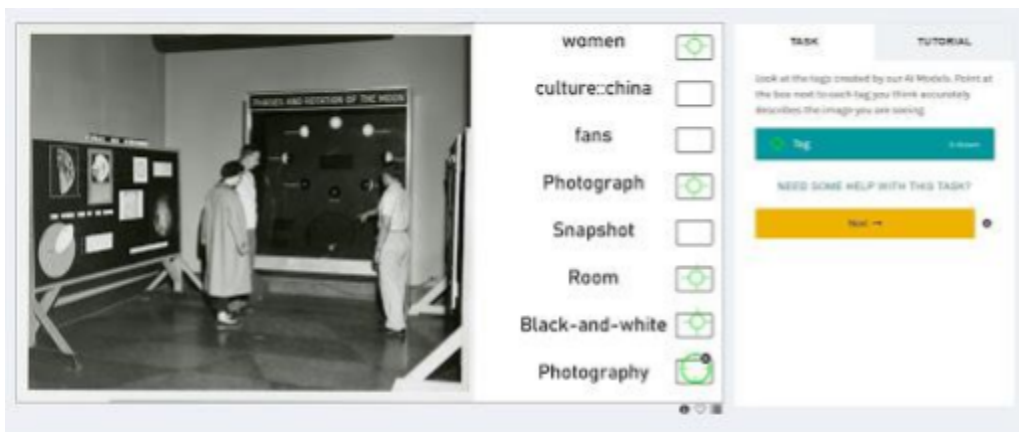


Figure 1: Screenshot of *Tag Along with Adler* "Verify AI Tags" task during February 2021 beta test

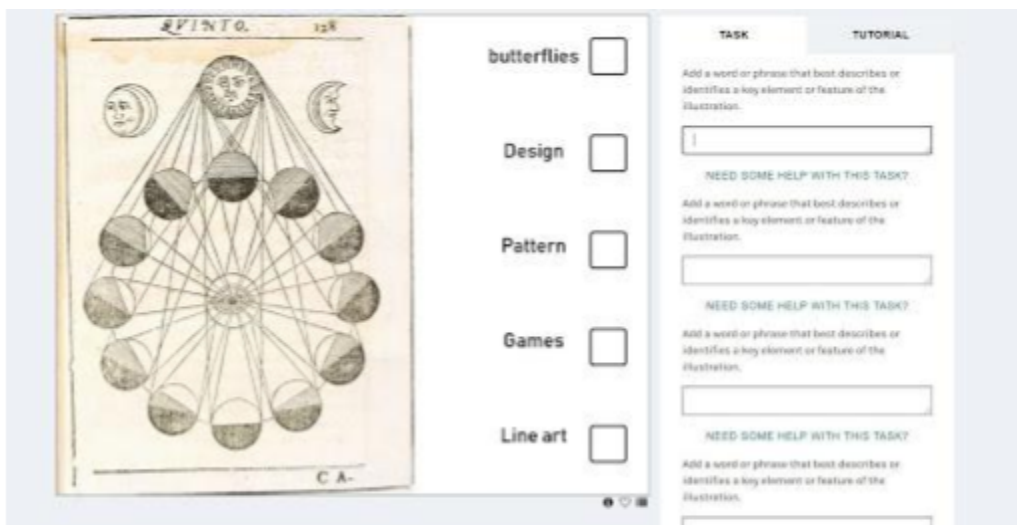


Figure 2: Screenshot of *Tag Along with Adler* "Tag Images" task during February 2021 beta test.

The text featured to the right or below the image are the AI generated tags/terms we are asking you to approve. Note, if you do not agree with any of these tags you can select "Next" which selects none of these terms. The selection is based on **your** choice so do not worry about whether you are *right* or *wrong* and just select what you believe is right.

When making selections use the point tool to create click in the box around each term/tag you believe **accurately** describes the image shown.

For tags that appear on the left of the image the box to point to will be to the left of the the tag:

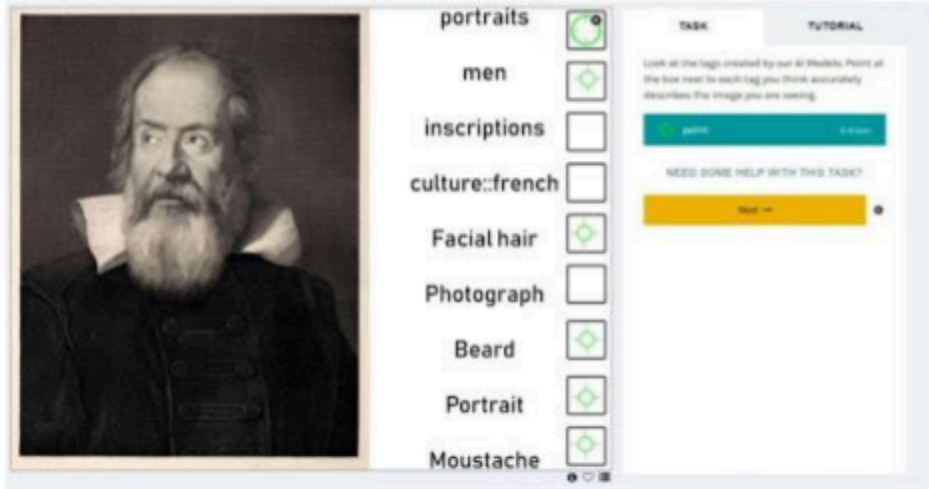


Figure 3: Screen grab of *Tag Along with Adler* "Help" text during the March 2021-March 2022 case study period.

For tags that appear on the bottom of the image the box to point to will be to the left of the tag:



If you need to move the point tool to better fit within the box you can click on the pointer circle and your cursor will turn in to a "grab" hand which allows you to move the point circle. Please try to ensure your point circle is only covering a single square.

Figure 4: Screen grab of *Tag Along with Adler* "Help" text during the March 2021-March 2022 case study period.

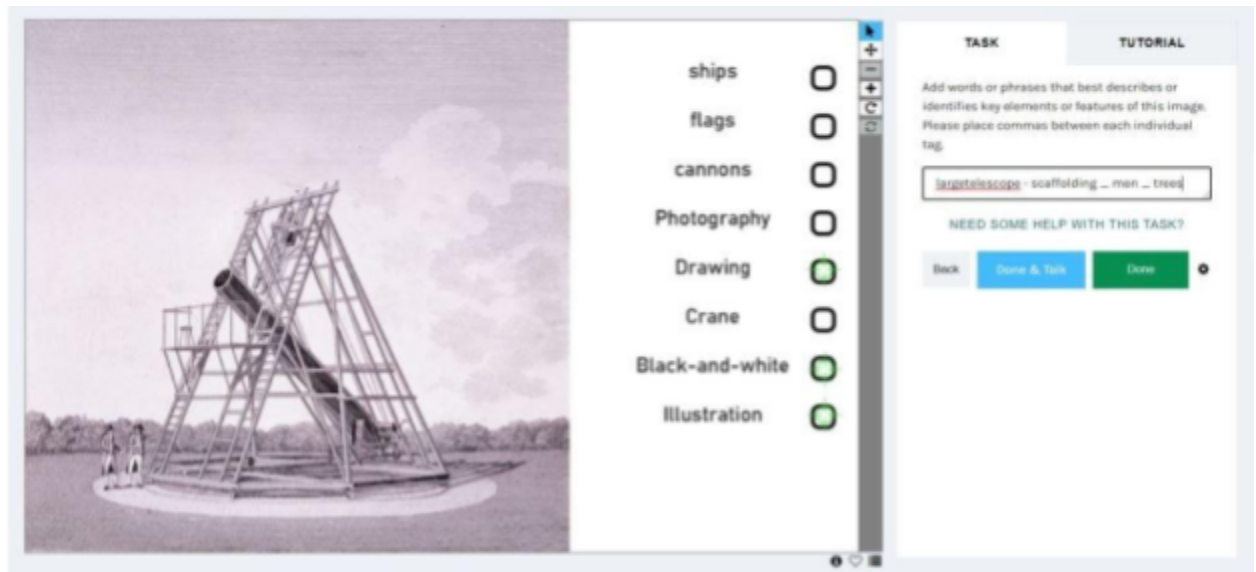


Figure 5: Screen grab of *Tag Along with Adler* "Tag Images" task included in the "Help" text to demonstrate how *not* to add tags during the March 2021-March 2022 case study period.

The screenshot displays a digital interface for a 'Tag Images' task. On the left, a historical illustration is shown with a vertical toolbar containing icons for zooming and refreshing. Below the image is a list of tags with checkboxes:

men	<input type="checkbox"/>	Cartoon	<input checked="" type="checkbox"/>
swords	<input type="checkbox"/>	Illustration	<input checked="" type="checkbox"/>
culture: french	<input type="checkbox"/>	Costume design	<input type="checkbox"/>
tags	<input type="checkbox"/>	Fictional character	<input checked="" type="checkbox"/>
soldiers	<input type="checkbox"/>	Art	<input checked="" type="checkbox"/>

On the right, the 'TASK' panel includes the following elements:

- TASK** and **TUTORIAL** tabs.
- Instructions: "Add words or phrases that best describes or identifies key elements or features of this image. Please place commas between each individual tag."
- A text input field containing: "rhino, hawk, telescope, top hat, clothing"
- A link: "NEED SOME HELP WITH THIS TASK?"
- Buttons: "Back", "Done & Talk", and "Done".

Figure 6: Screen grab of *Tag Along with Adler* "Tag Images" task during the March 2021-March 2022 case study period.



Figure 7: Screenshot of Metadata Tagging Game used in case studies from November 2021 to March 2022

Superuser Data

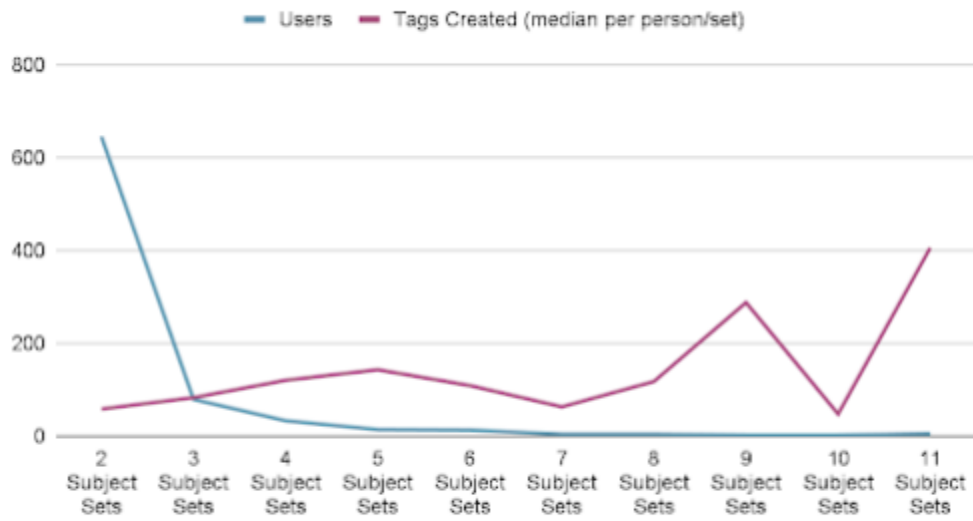


Figure 8: Chart showing Superuser Data of number of users who completed more than one subject set and the average number of tags they created for each set.

What is the highest level of school you have completed or the highest degree you have received?

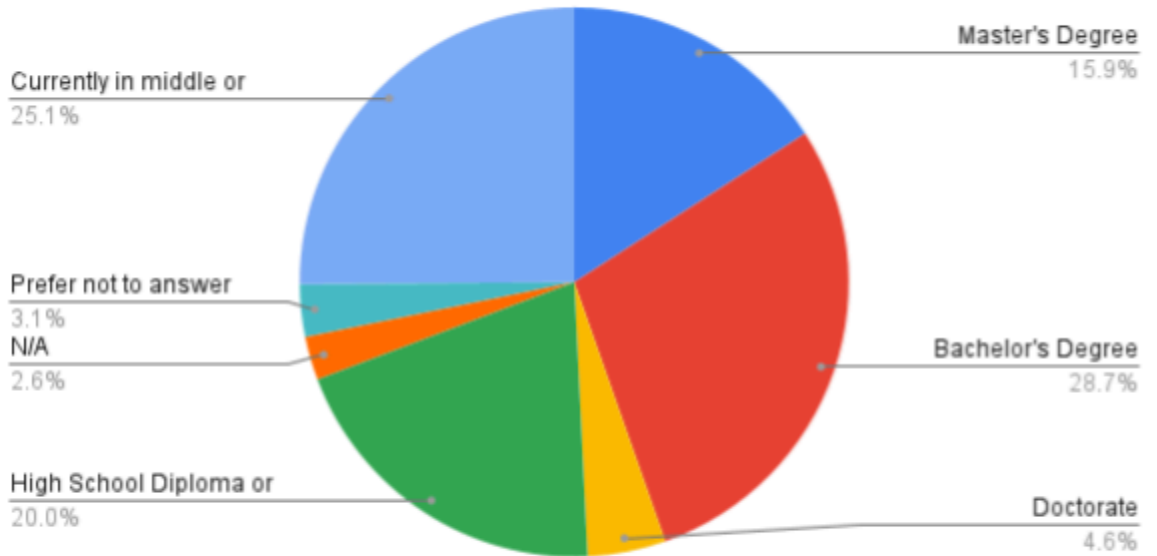


Figure 9: *Tag Along with Adler* survey demographic survey data on education level of users.

I identify my ethnicity as (select all that apply):

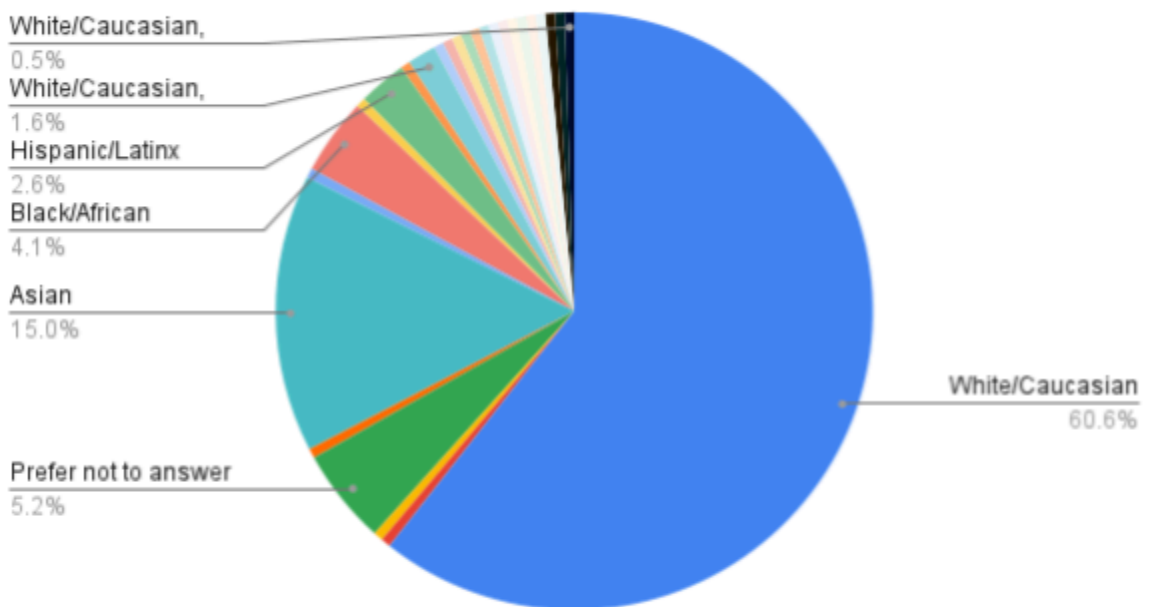


Figure 10: *Tag Along with Adler* survey demographic survey data on ethnicity of users.

Gender

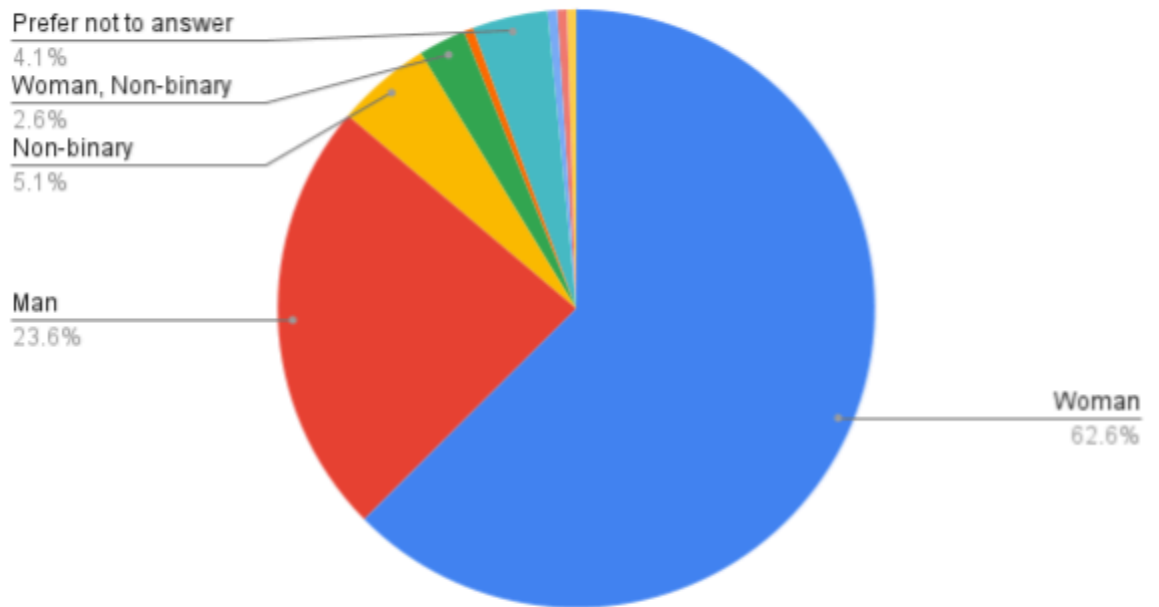


Figure 11: *Tag Along with Adler* survey demographic survey data on gender of users.

Age

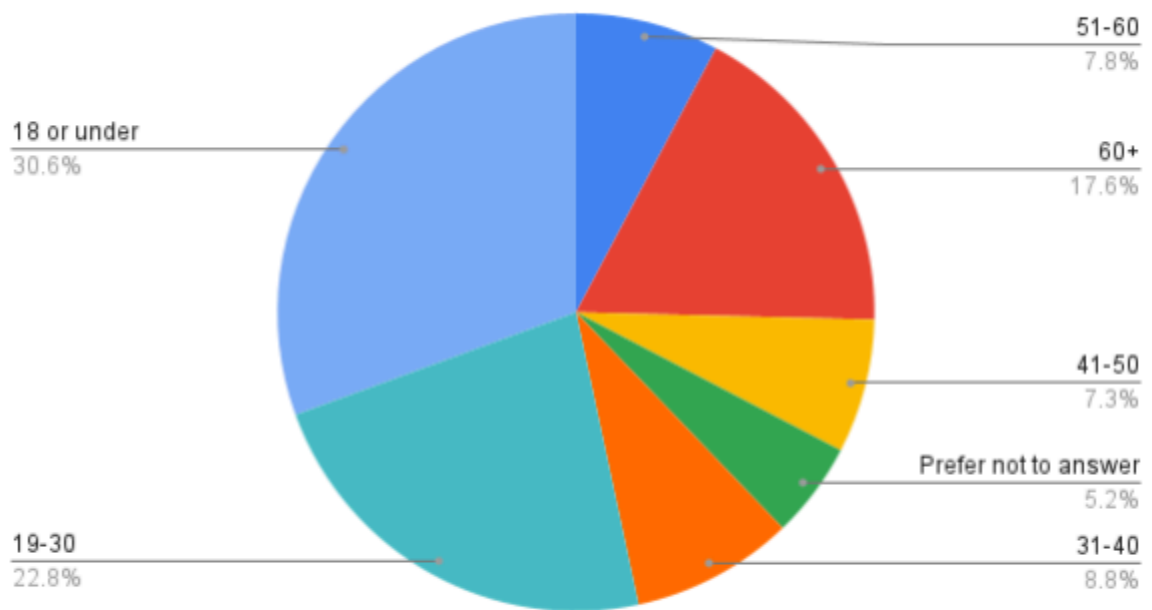


Figure 12: *Tag Along with Adler* survey demographic survey data on age of users.

I trust museums reflect multiple perspectives

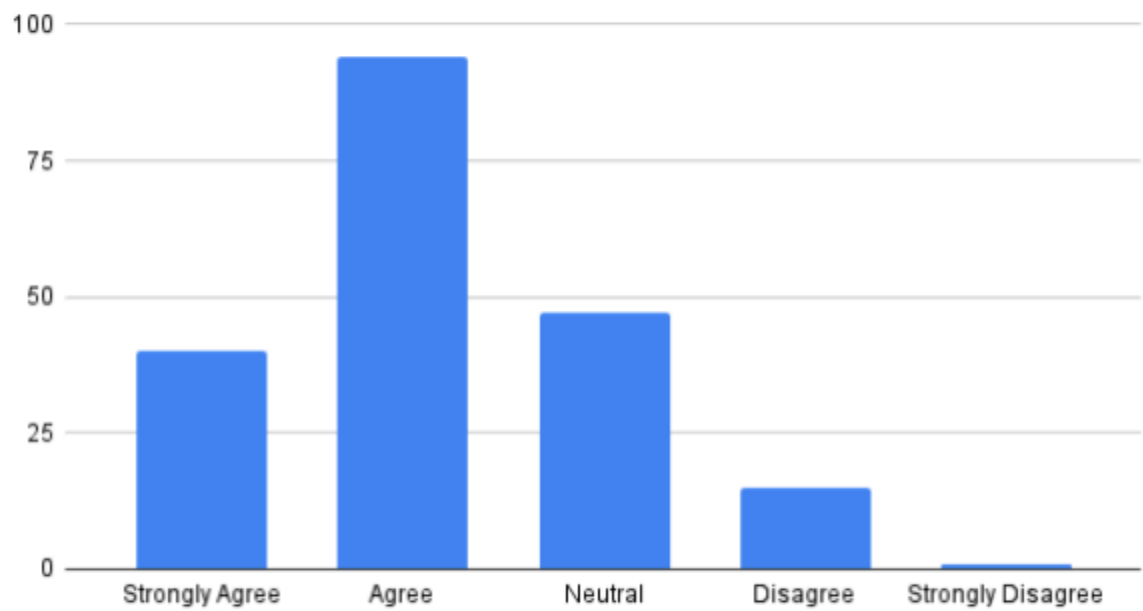


Figure 13: *Tag Along with Adler* survey demographic survey data response for question "I trust museums reflect multiple perspectives"

Asian - I trust museums reflect multiple perspectives

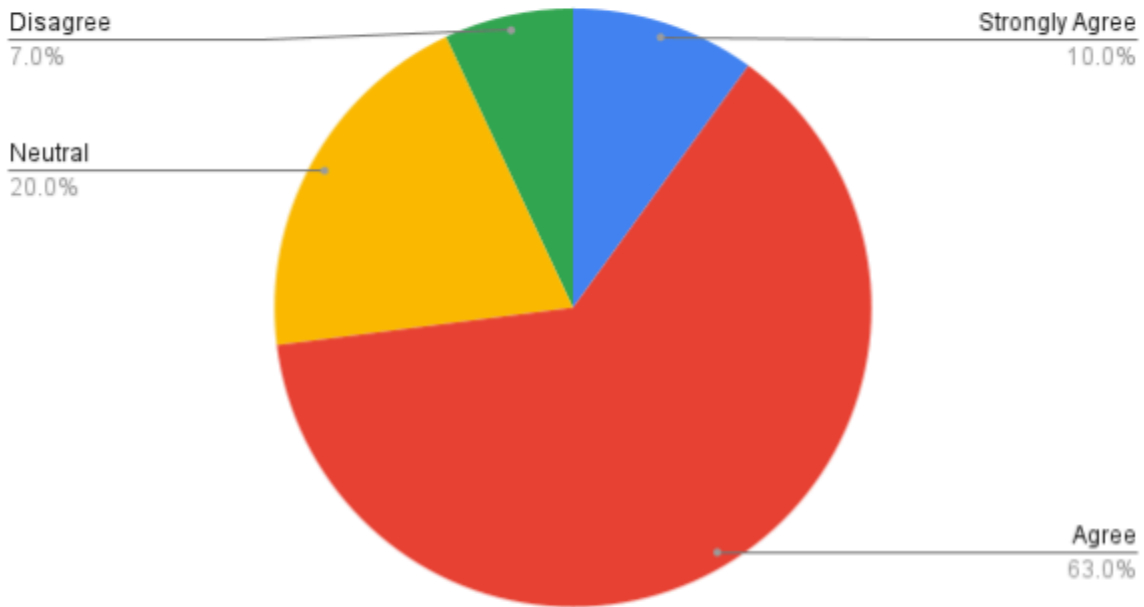


Figure 13a: Survey question "I trust museums reflect multiple perspectives" broken down by responses from users who identify as Asian.

Black/African - I trust museums reflect multiple perspectives

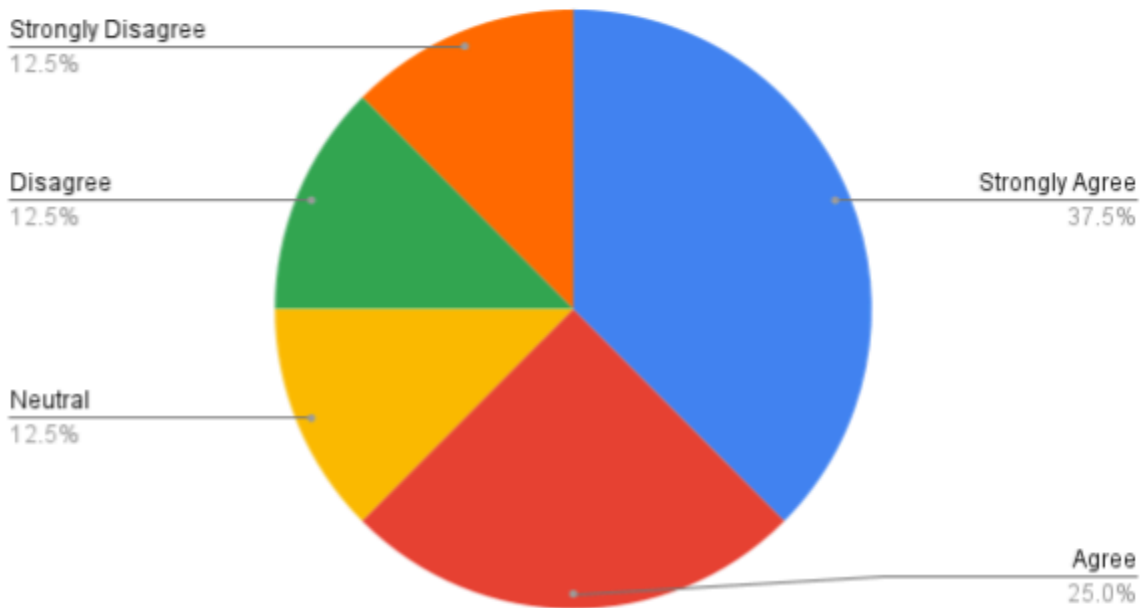


Figure 13b: Survey question "I trust museums reflect multiple perspectives" broken down by responses from users who identify as Black/African.

Hispanic/Latinx - I trust museums reflect multiple perspectives

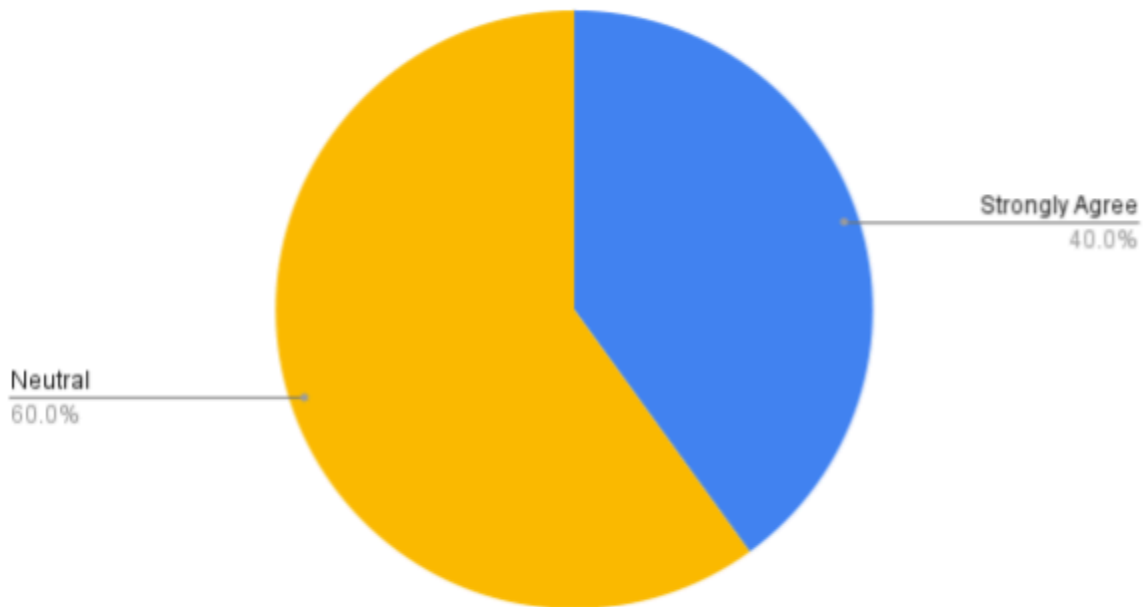


Figure 13c: Survey question "I trust museums reflect multiple perspectives" broken down by responses from users who identify as Hispanic/Latinx.

Multiple Races - I trust museums reflect multiple perspectives

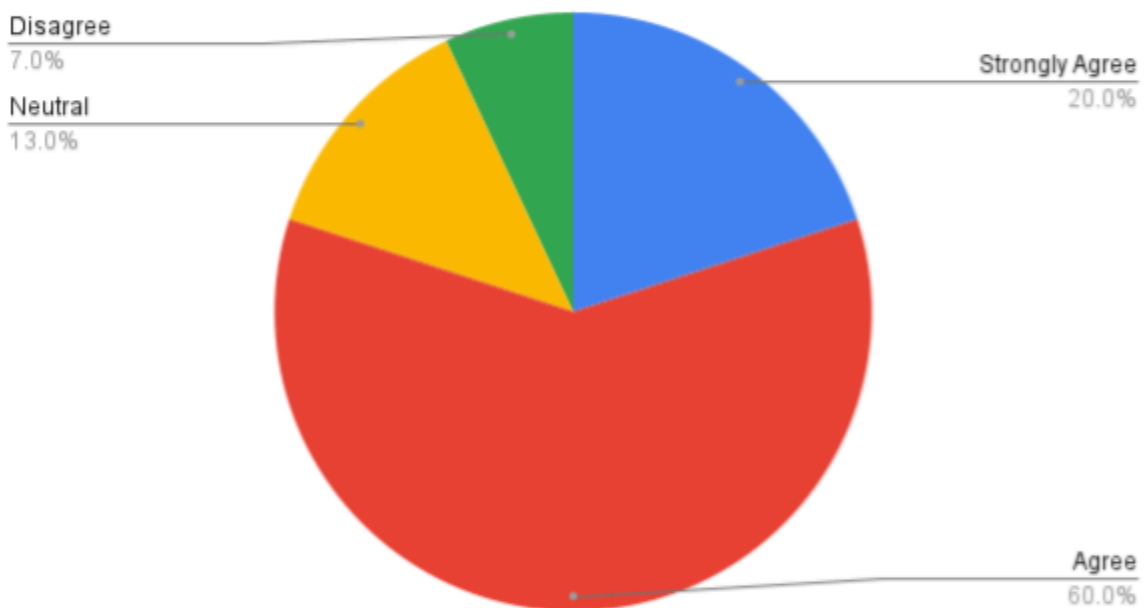


Figure 13d: Survey question "I trust museums reflect multiple perspectives" broken down by responses from users who identify as Multiple Races.

Prefer not to answer race - I trust museums reflect multiple perspectives

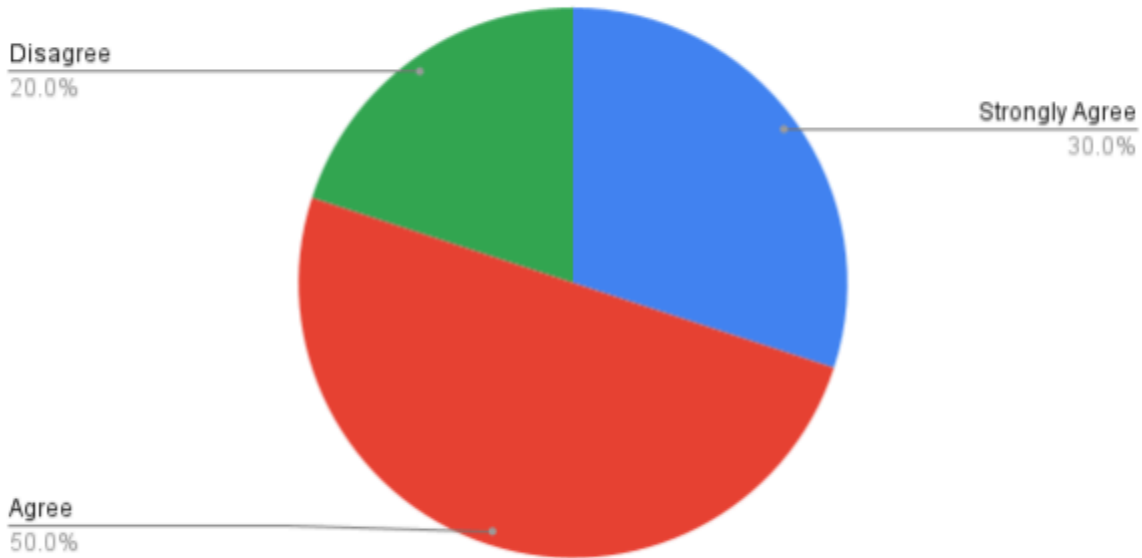


Figure 13e: Survey question "I trust museums reflect multiple perspectives" broken down by responses from users who identify as Prefer not to answer Race.

Self Added Race - I trust museums reflect multiple perspectives

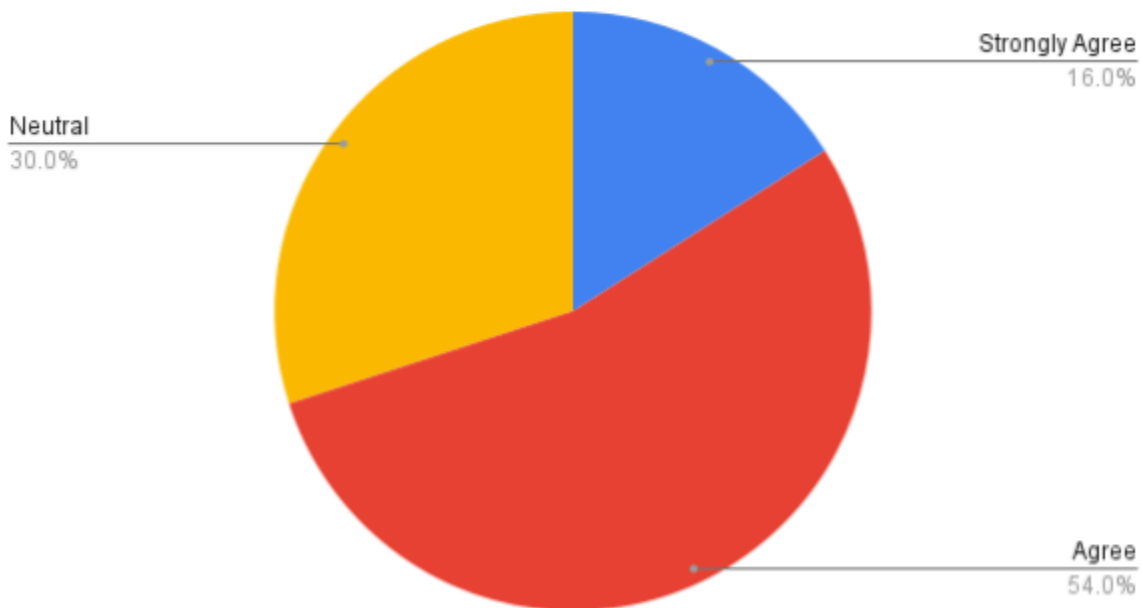


Figure 13f: Survey question "I trust museums reflect multiple perspectives" broken down by responses from users who identify as a Self Added Race.

White/Caucasian - I trust museums reflect multiple perspectives

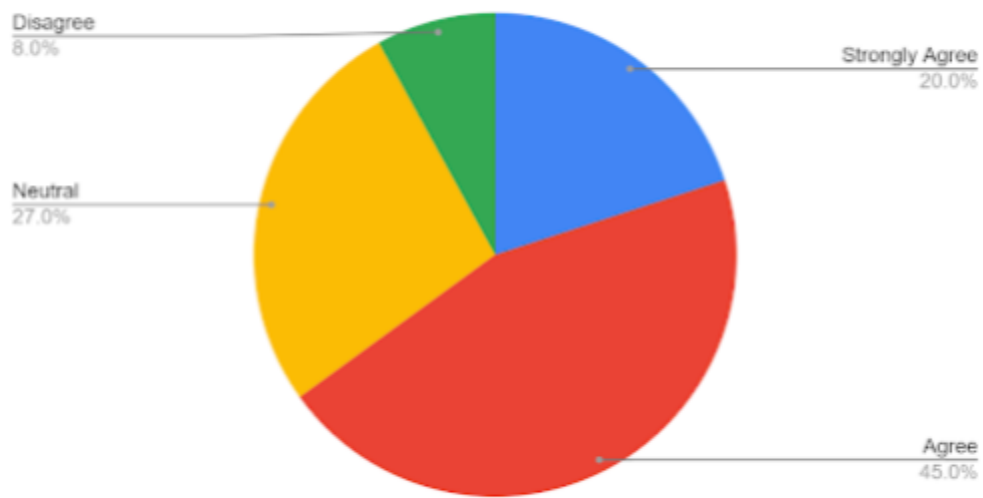


Figure 13g: Survey question "I trust museums reflect multiple perspectives" broken down by responses from users who identify as White/Caucasian.

Stories like mine are in museum collections

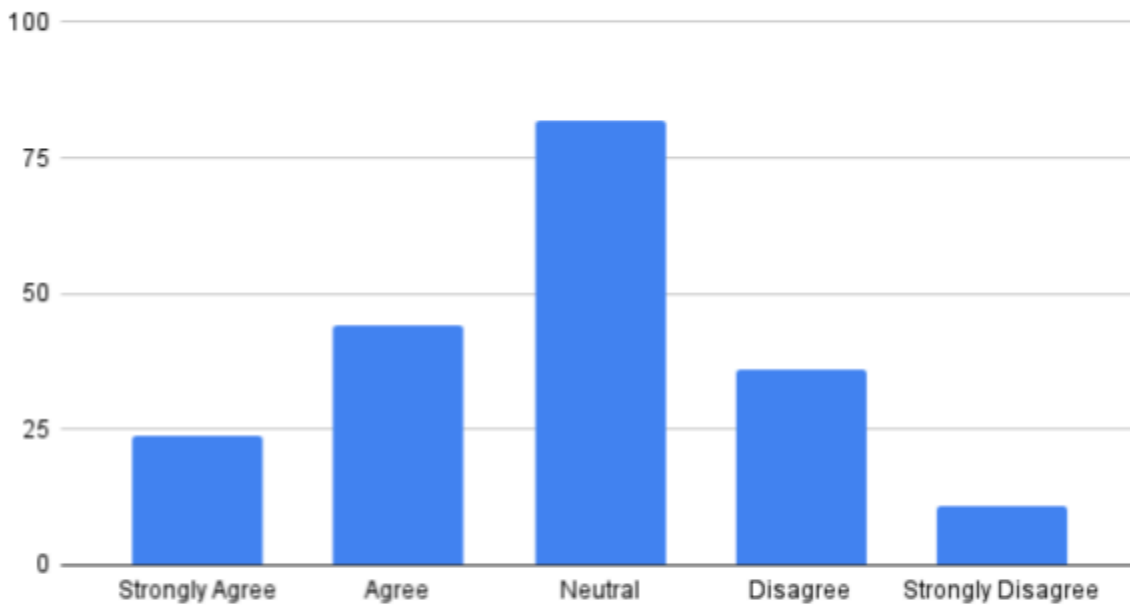


Figure 14: *Tag Along with Adler* survey demographic survey data response for question “Stories like mine are in museum collections”

Asian - Stories like mine are in museum collections

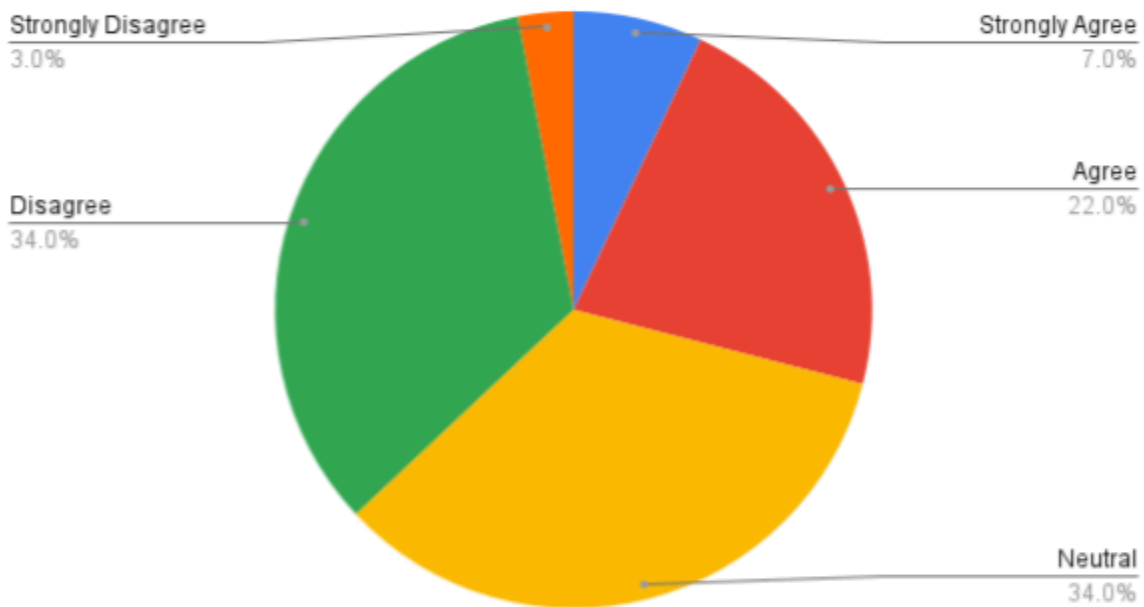


Figure 14a: Survey question “Stories like mine are in museum collections” broken down by responses from users who identify as Asian.

Black/African - Stories like mine are in museum collections

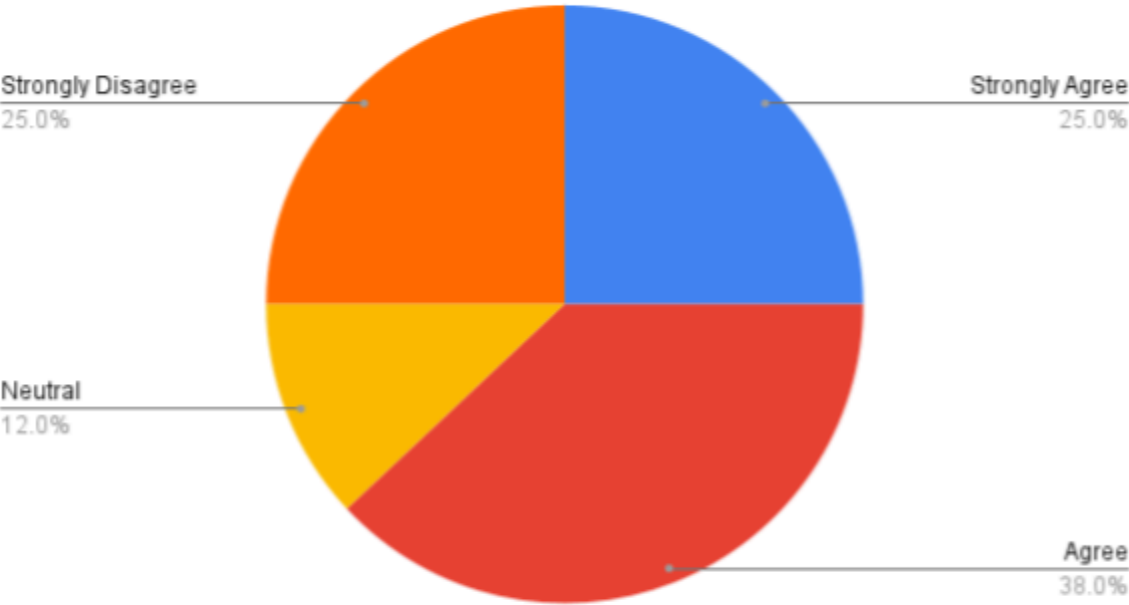


Figure 14b: Survey question "Stories like mine are in museum collections" broken down by responses from users who identify as Black/African.

Hispanic/Latinx - Stories like mine are in museum collections

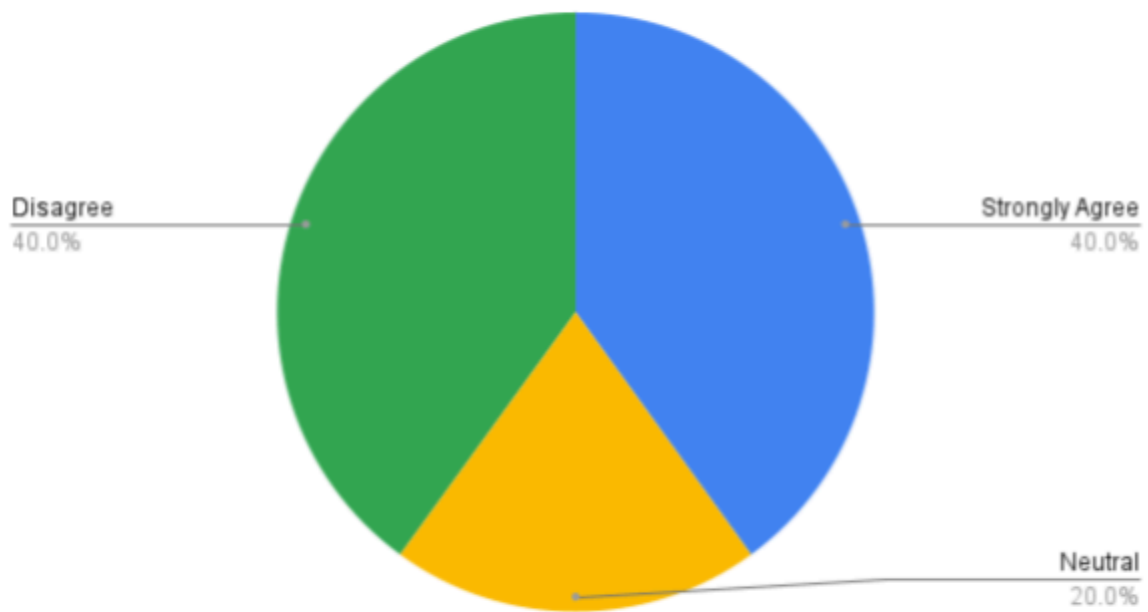


Figure 14c: Survey question "Stories like mine are in museum collections" broken down by responses from users who identify as Hispanic/Latinx.

Multiple Races - Stories like mine are in museum collections

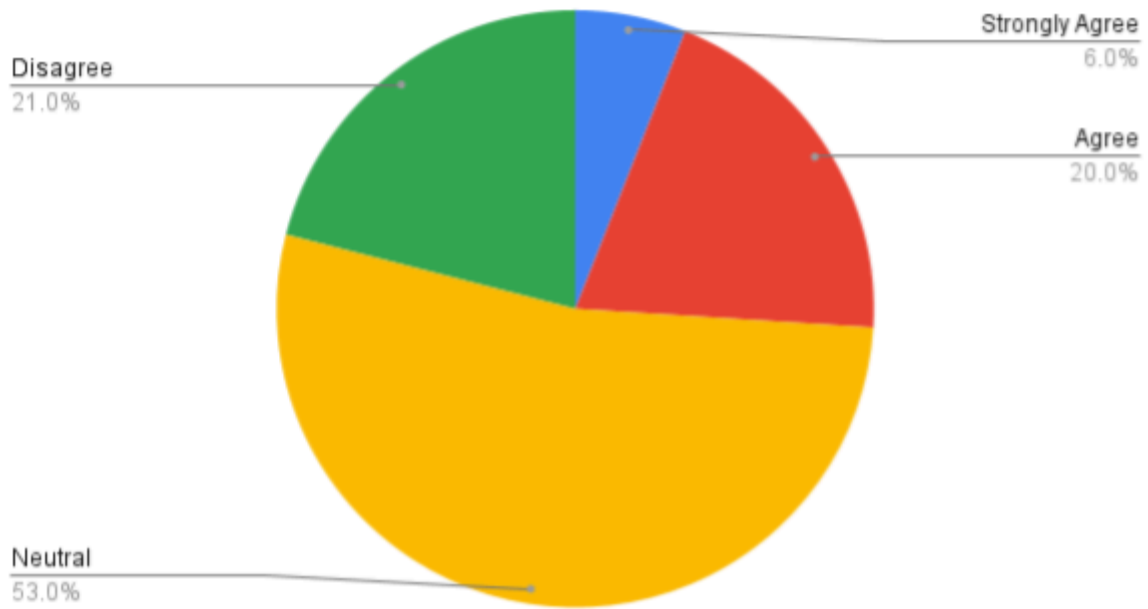


Figure 14d: Survey question "Stories like mine are in museum collections" broken down by responses from users who identify as Multiple Races.

Prefer not to answer race - Stories like mine are in museum collections

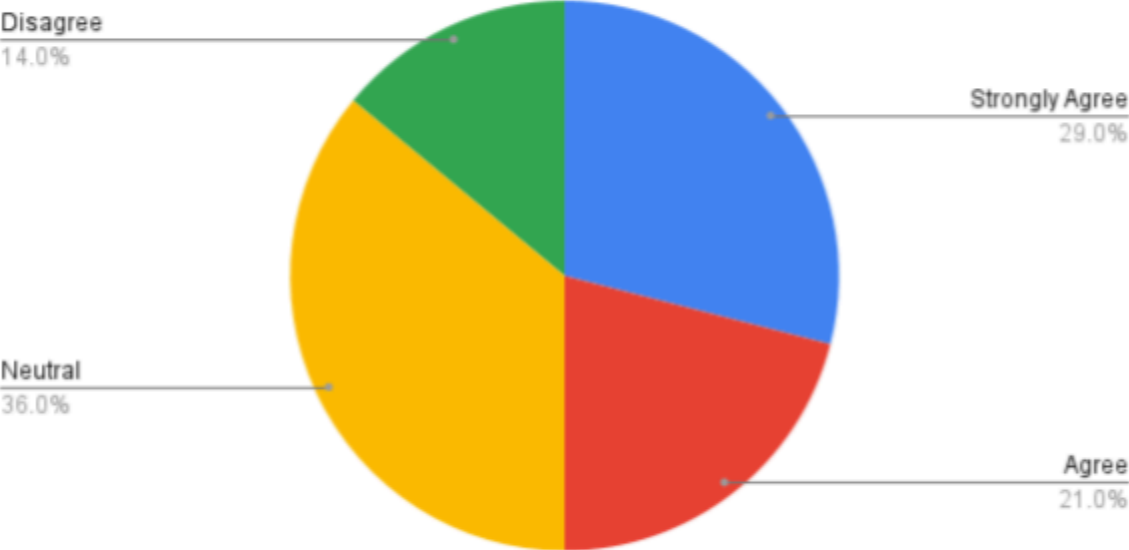


Figure 14e: Survey question “Stories like mine are in museum collections” broken down by responses from users who identify as Prefer not to answer Race.

Self Added Race - Stories like mine are in museum collections

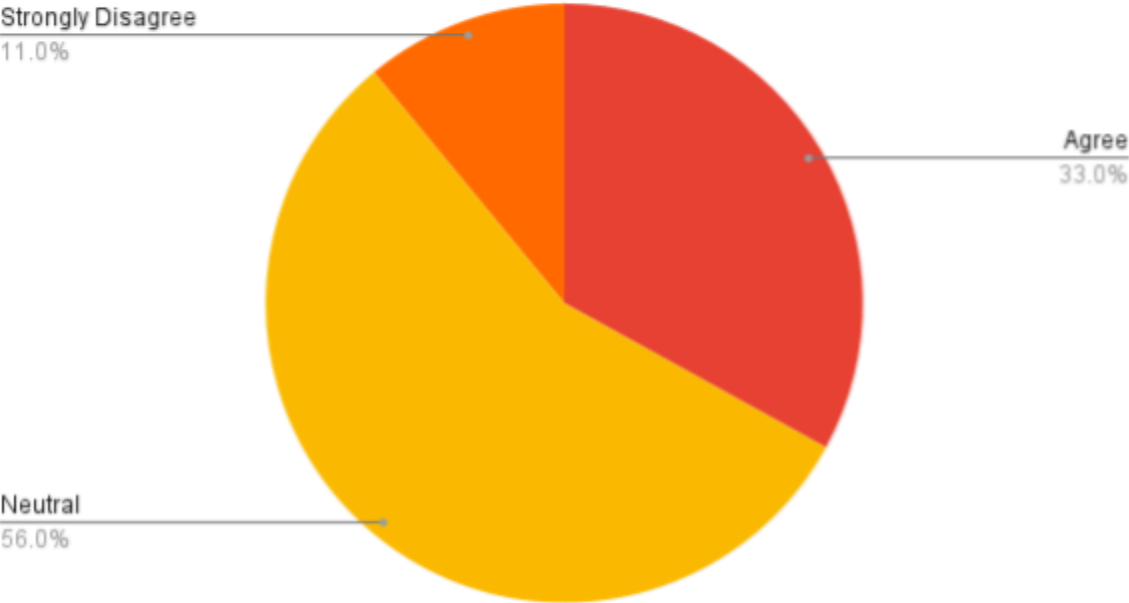


Figure 14f: Survey question "Stories like mine are in museum collections" broken down by responses from users who identify as a Self Added Race.

White/Caucasian - Stories like mine are in museum collections

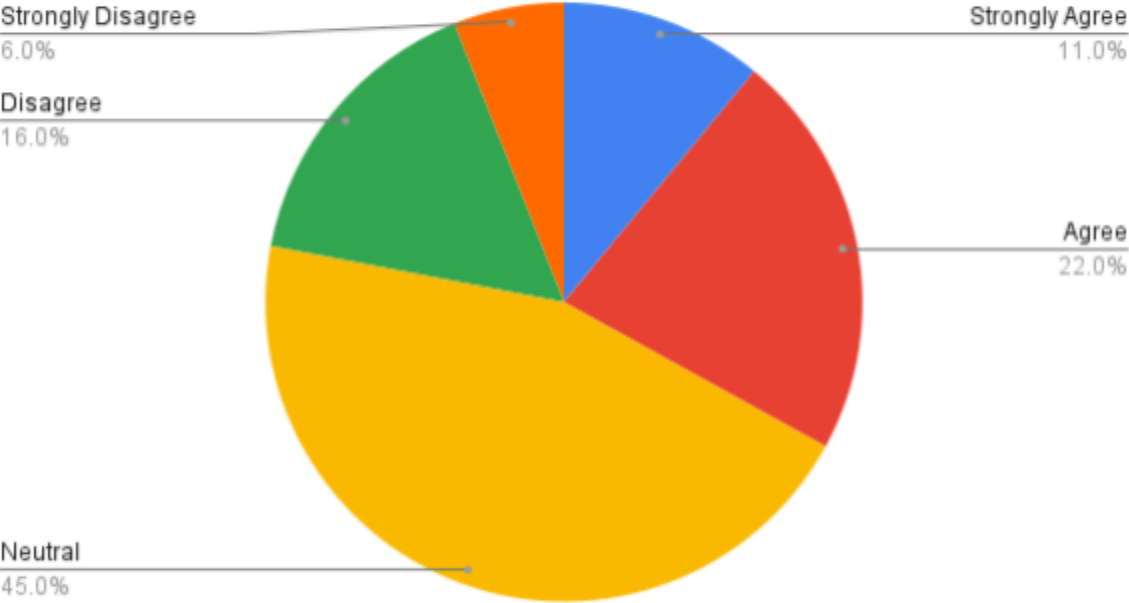


Figure 14g: Survey question "Stories like mine are in museum collections" broken down by responses from users who identify as White/Caucasian.

Stories like mine are in museum exhibitions

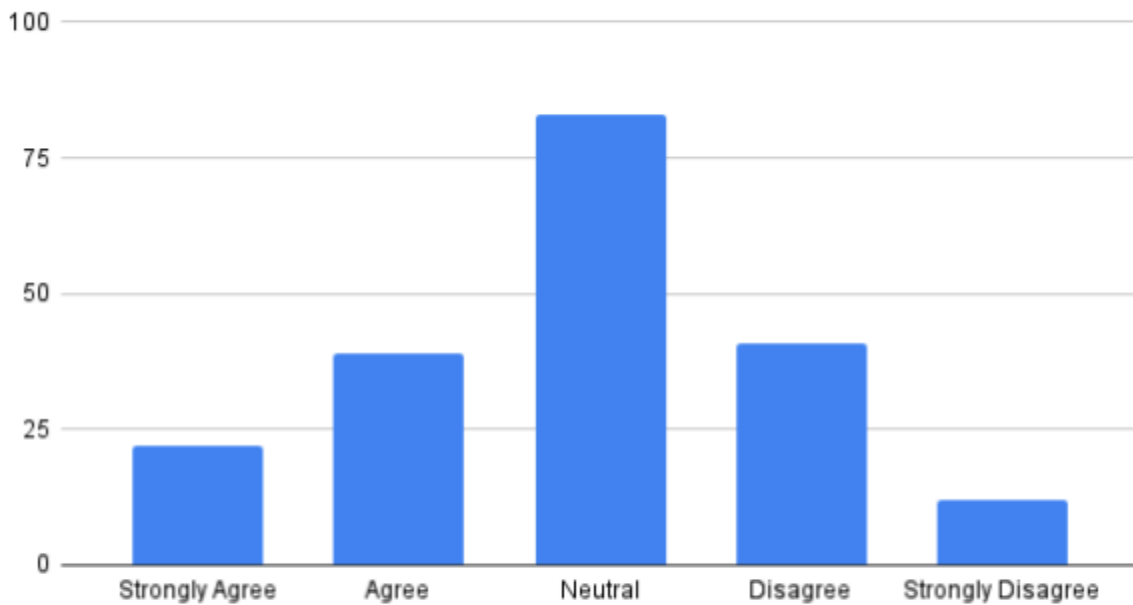


Figure 15: *Tag Along with Adler* survey demographic survey data response for question "Stories like mine are in museum exhibitions."

Asian - Stories like mine are in museum exhibitions

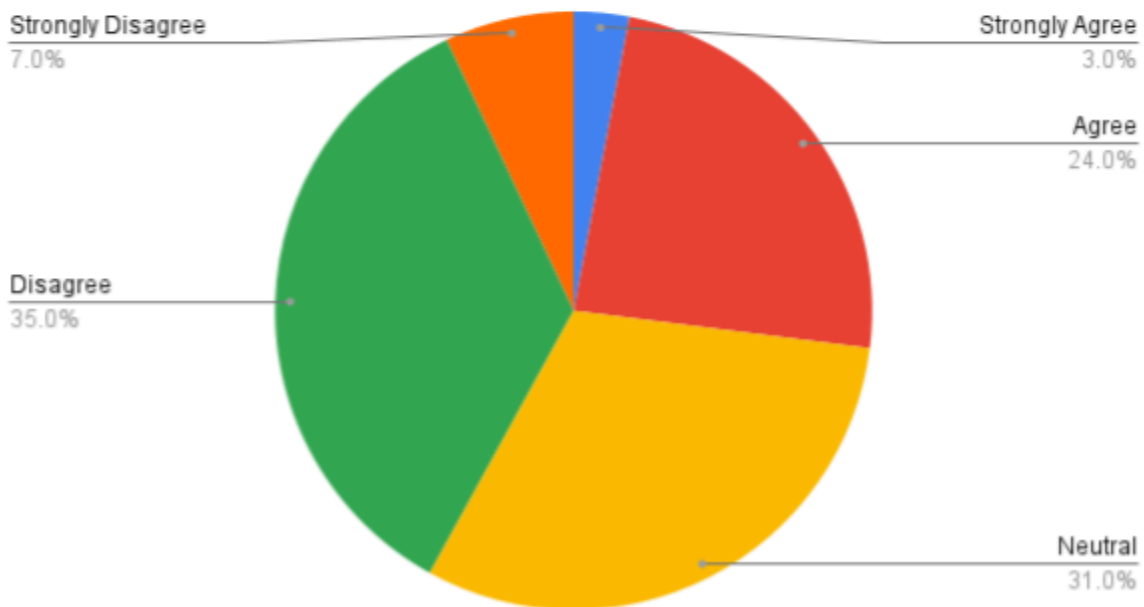


Figure 15a: Survey question "Stories like mine are in museum exhibitions" broken down by responses from users who identify as Asian.

Black/African - Stories like mine are in museum exhibitions

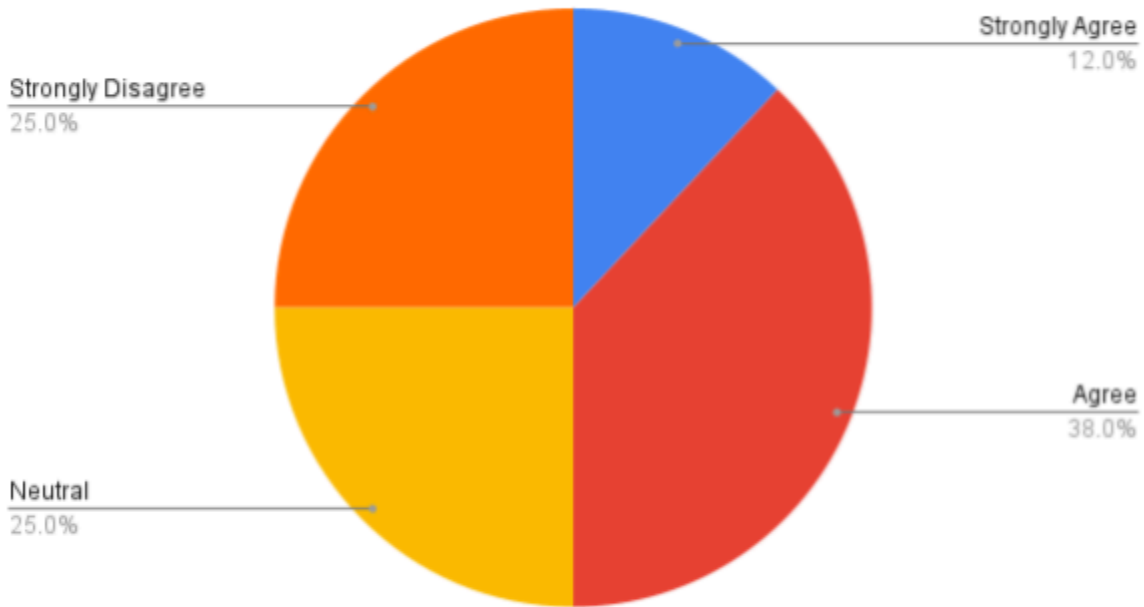


Figure 15b: Survey question "Stories like mine are in museum exhibitions" broken down by responses from users who identify as Black/African.

Hispanic/Latinx - Stories like mine are in museum exhibitions

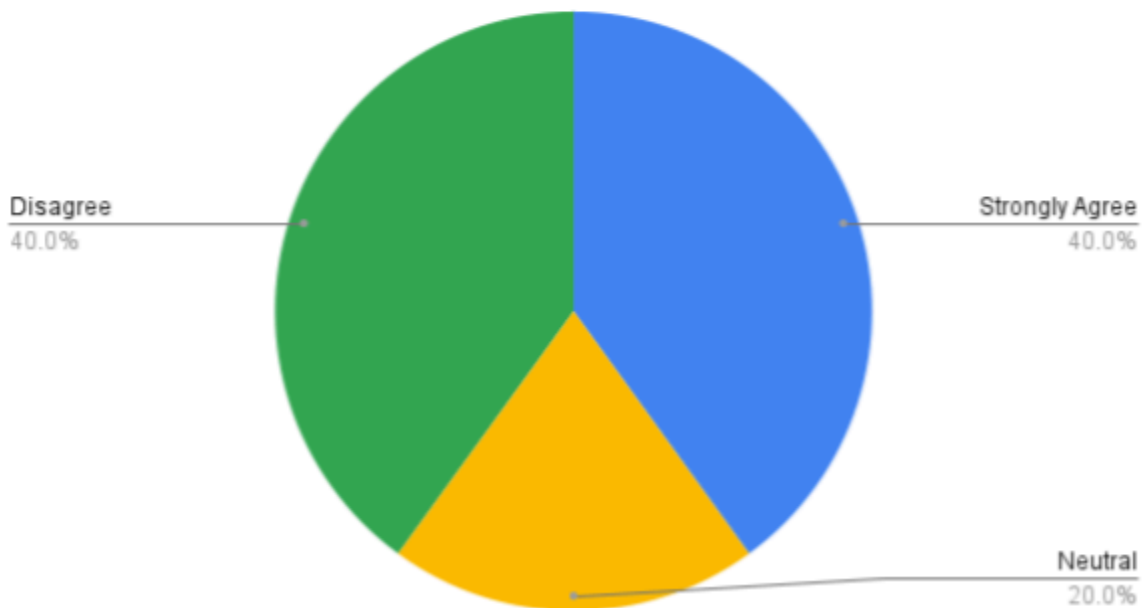


Figure 15c: Survey question "Stories like mine are in museum exhibitions" broken down by responses from users who identify as Hispanic/Latinx.

Multiple Races - Stories like mine are in museum exhibitions

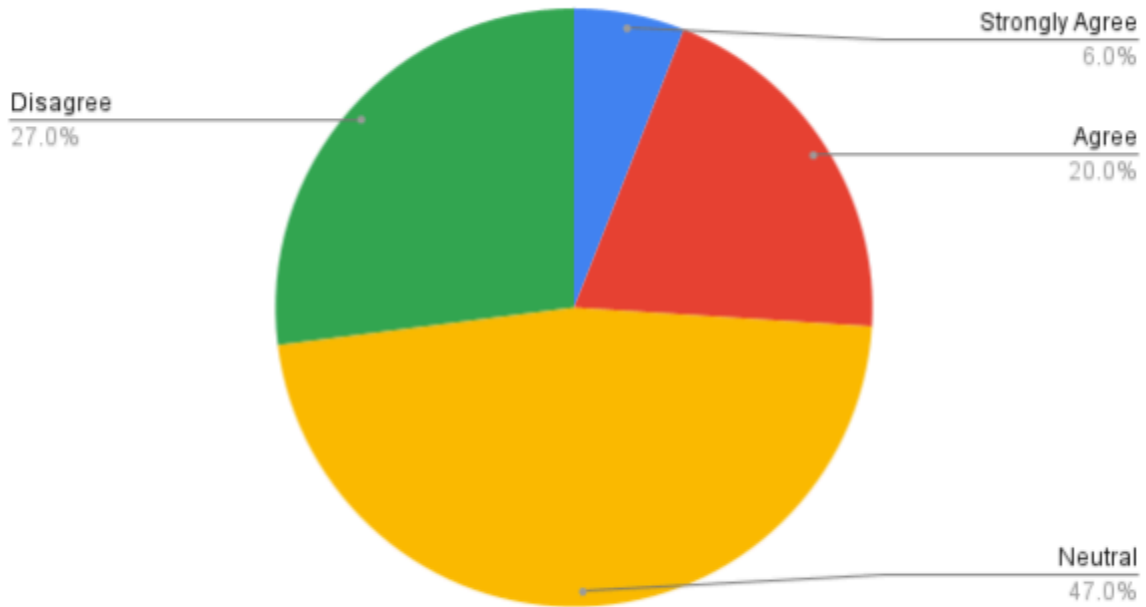


Figure 15d: Survey question "Stories like mine are in museum exhibitions" broken down by responses from users who identify as Multiple Races.

Prefer not to answer race - Stories like mine are in museum exhibitions

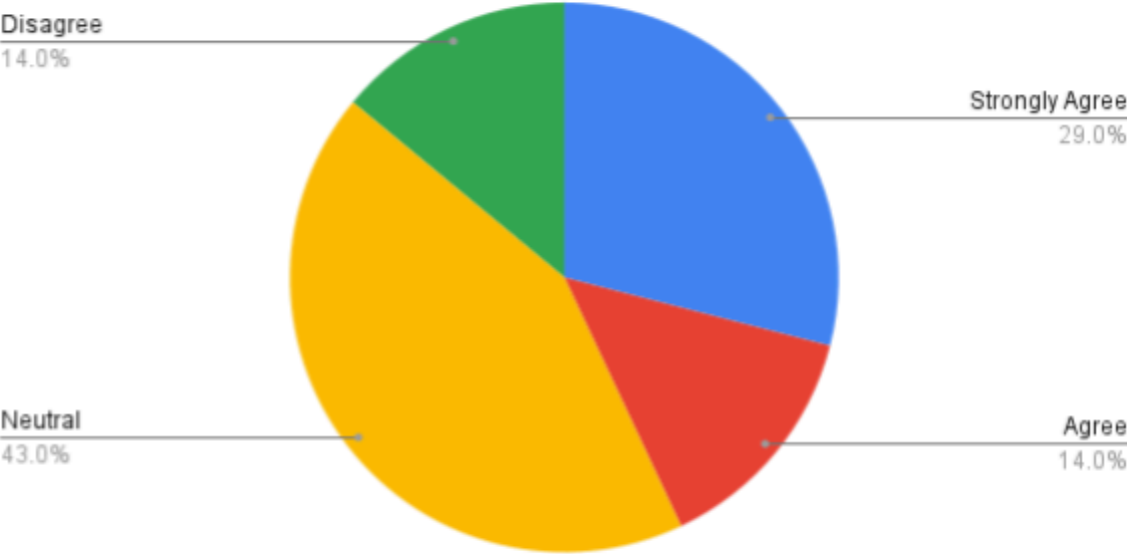


Figure 15e: Survey question "Stories like mine are in museum exhibitions" broken down by responses from users who identify as Prefer not to answer Race.

Self Added Race - Stories like mine are in museum exhibitions

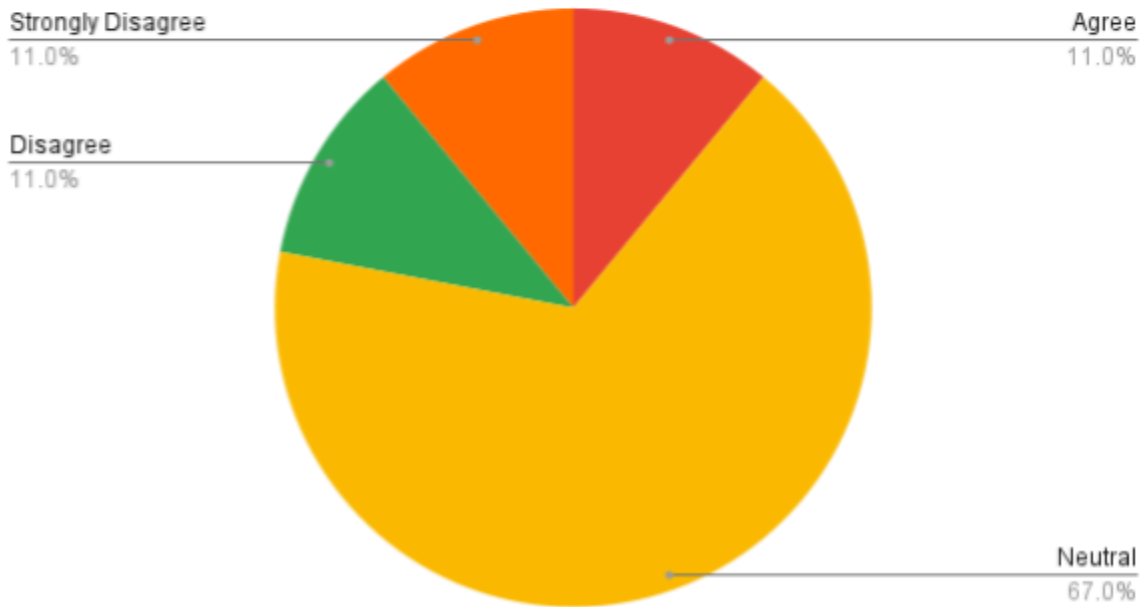


Figure 15f: Survey question "Stories like mine are in museum exhibitions" broken down by responses from users who identify as a Self Added Race.

White/Caucasian - Stories like mine are in museum exhibitions

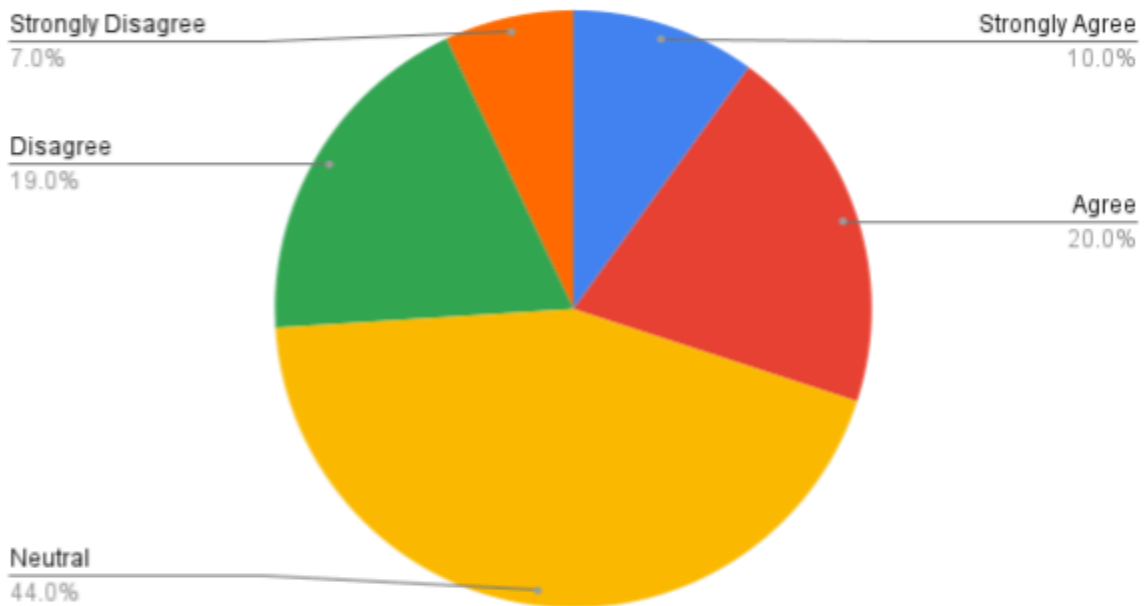


Figure 15g: Survey question "Stories like mine are in museum exhibitions" broken down by responses from users who identify as White/Caucasian.

I see people like me in science today

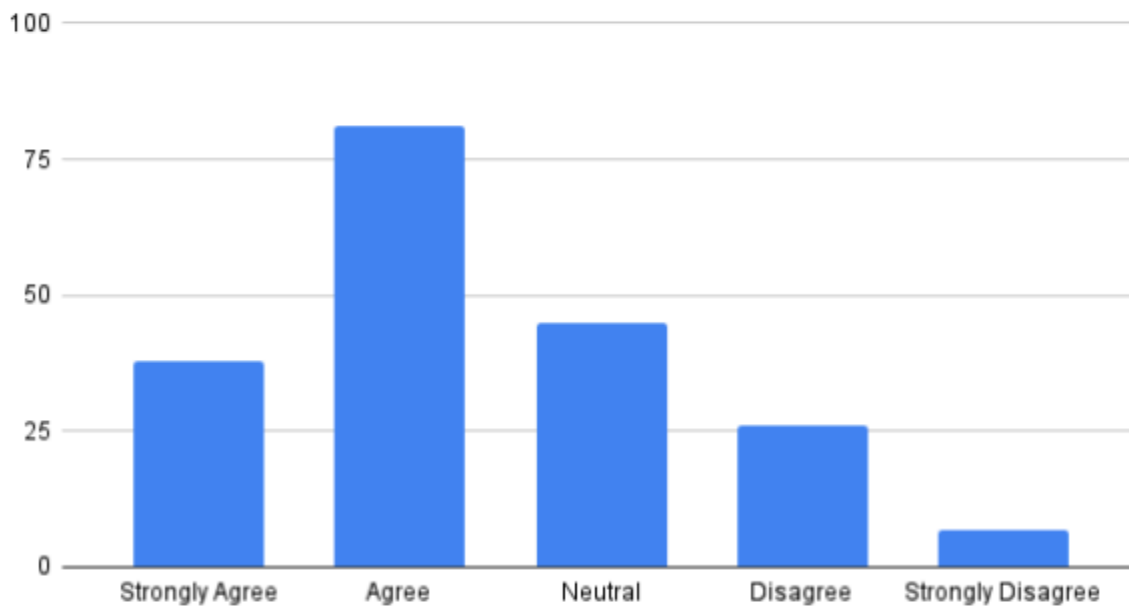


Figure 16: *Tag Along with Adler* survey demographic survey data response for question "I see people like me in science today."

Museums are essential to communities

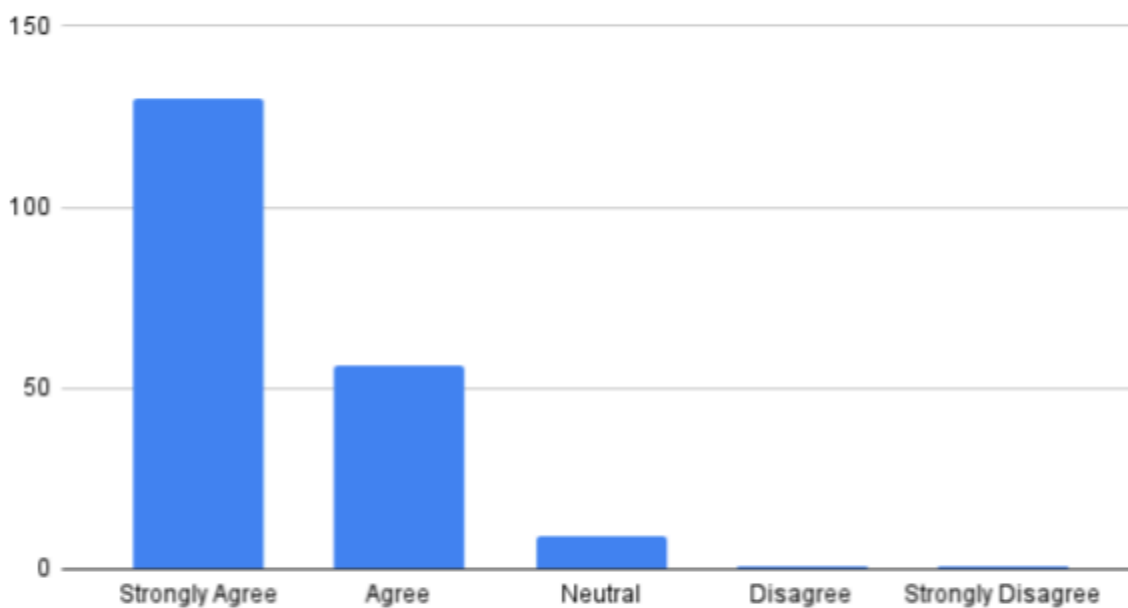


Figure 17: *Tag Along with Adler* survey demographic survey data response for question "Museums are essential to communities."

Communities are essential to museums

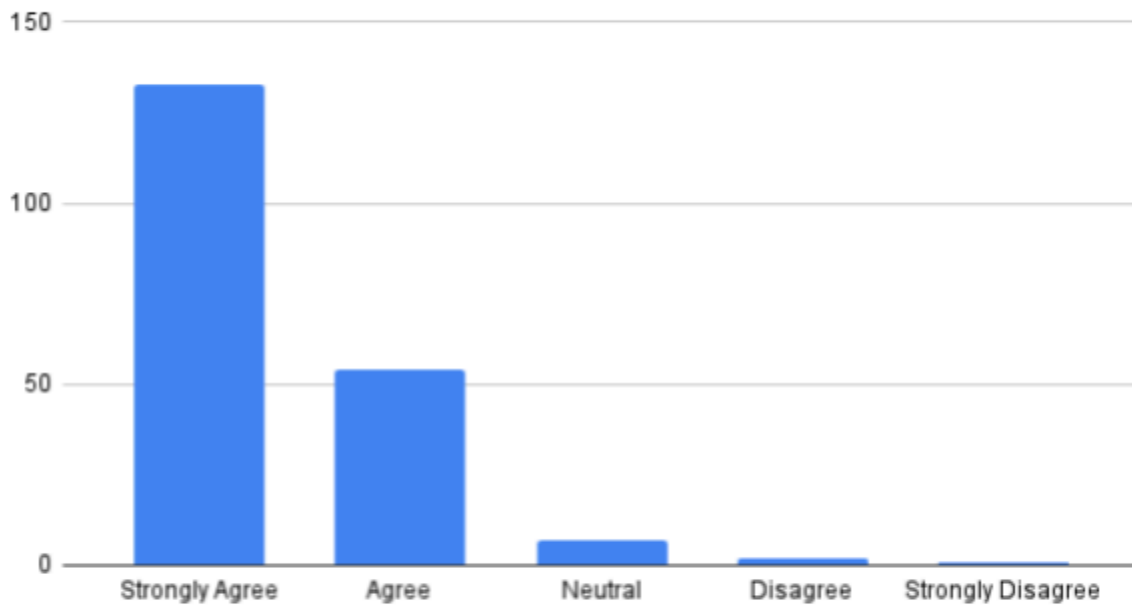


Figure 18: *Tag Along with Adler* survey demographic survey data response for question "Communities are essential to museums."

I trust what I find online

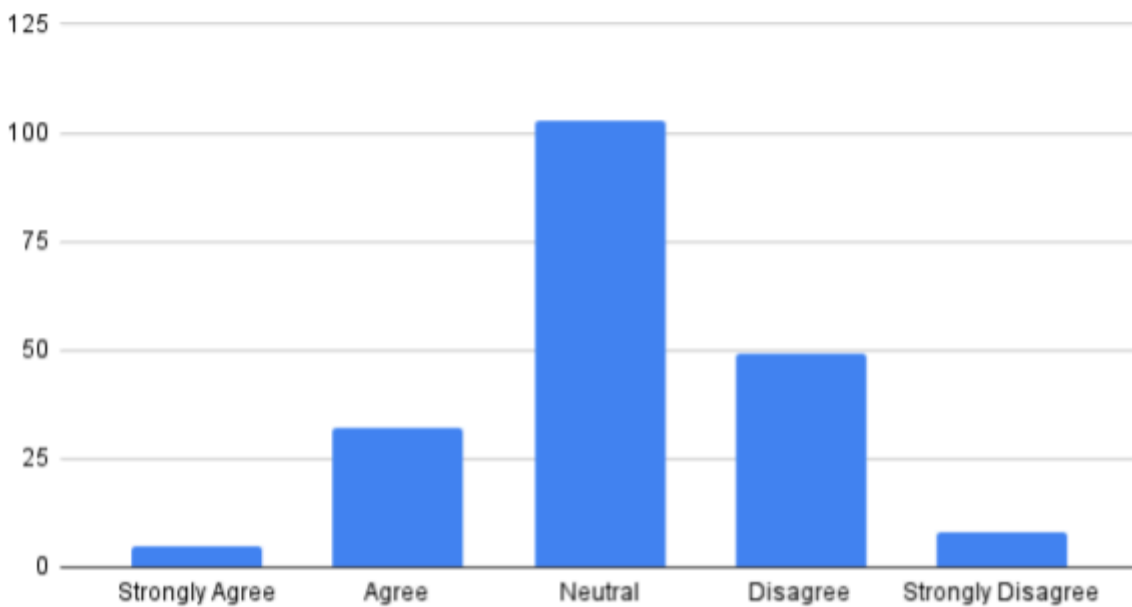


Figure 19: *Tag Along with Adler* survey demographic survey data response for question "I trust what I find online"

I can find things online easily

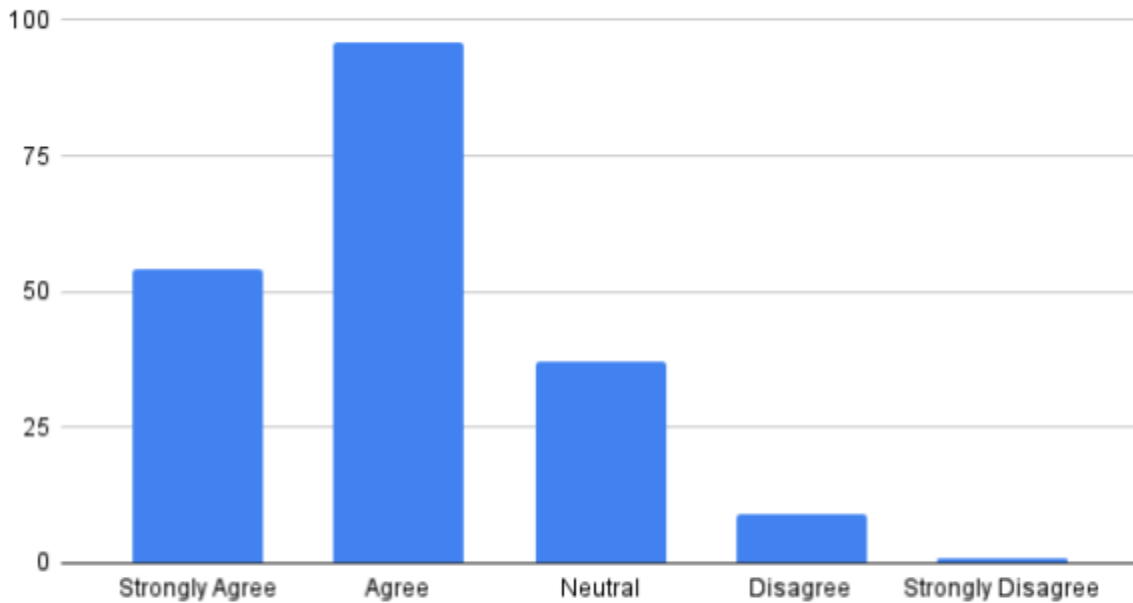


Figure 20: *Tag Along with Adler* survey demographic survey data response for question "I can find things online easily."

Adler 30 Most Common Search Terms

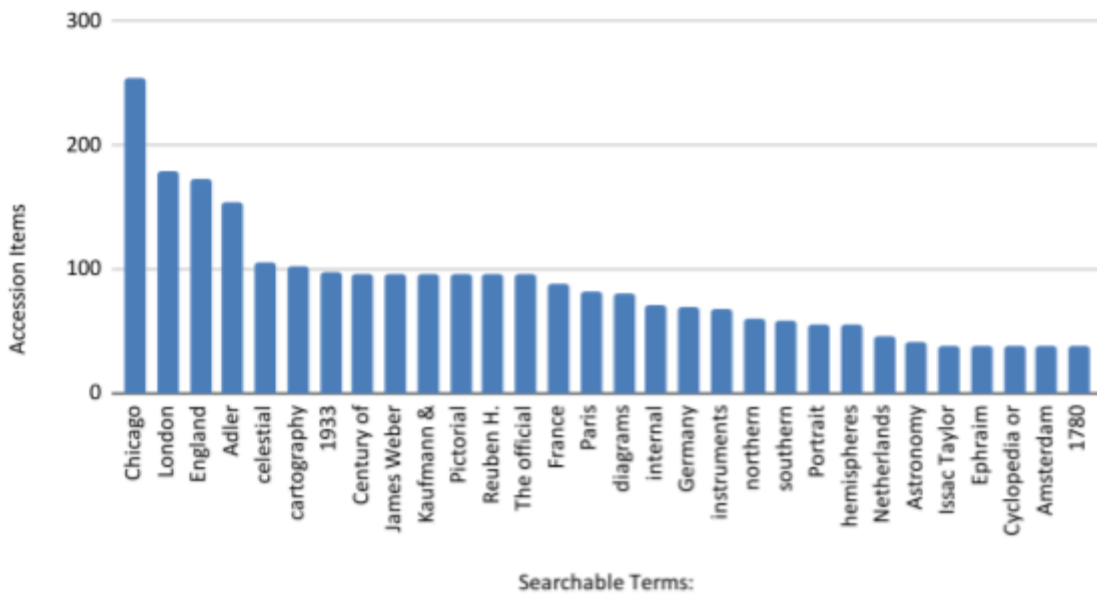


Figure 21: Top 30 terms (and frequency) in the Adler Planetarium catalogue for images included in *Tag Along with Adler*

User Generated 30 Most Common Search terms

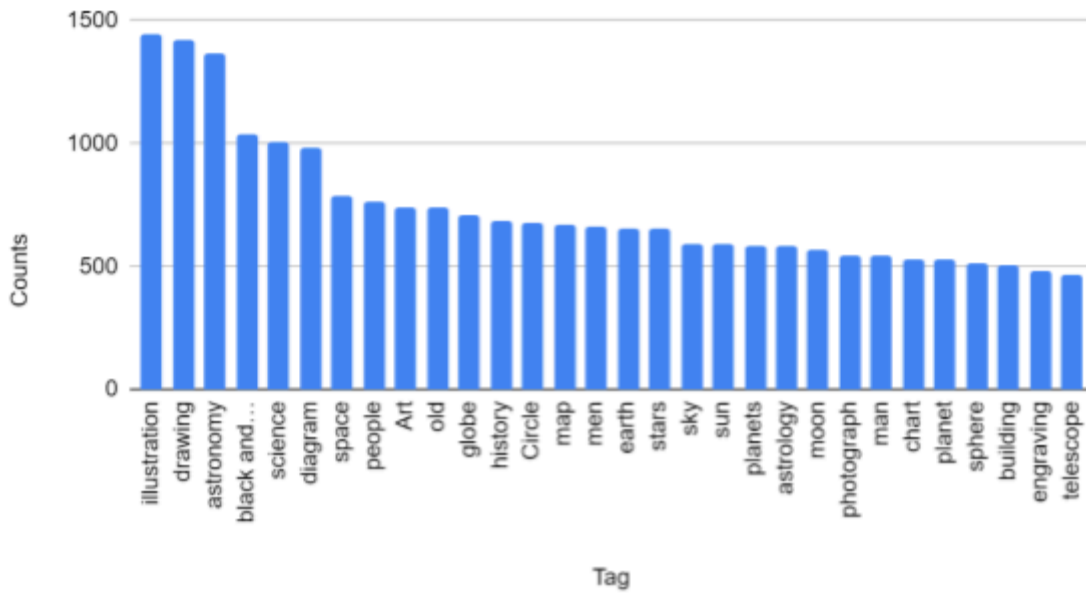


Figure 22: Top 30 terms (and frequency) created by users for images included in *Tag Along with Adler*.



Figure 23a: Adler Historic Photograph (APHP.S5.C.F1.1) overlaid with terms created by Adler Planetarium cataloguers



Figure 23b: Adler Historic Photograph (APHP.S5.C.F1.1) overlaid with terms created by Tag Along with Adler volunteers

Tag Images

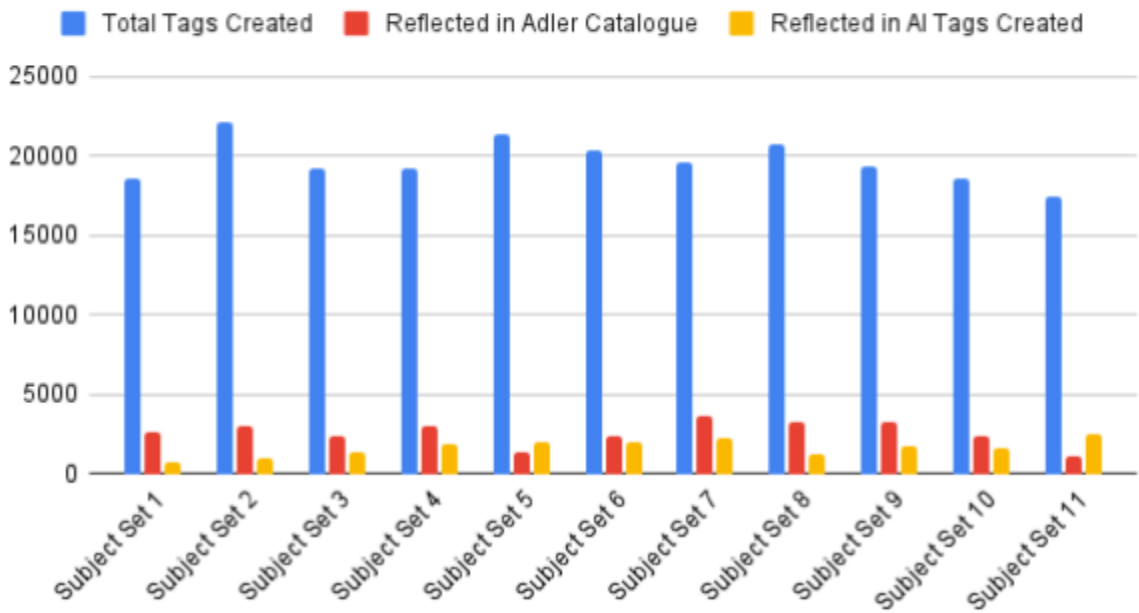


Figure 23: Tag Along with Adler bar graph of results showing the total tags created vs. which of these tags were already included in the Adler catalogue or created by the AI tagging models for the Tag Images Workflow.

Verify AI Tags

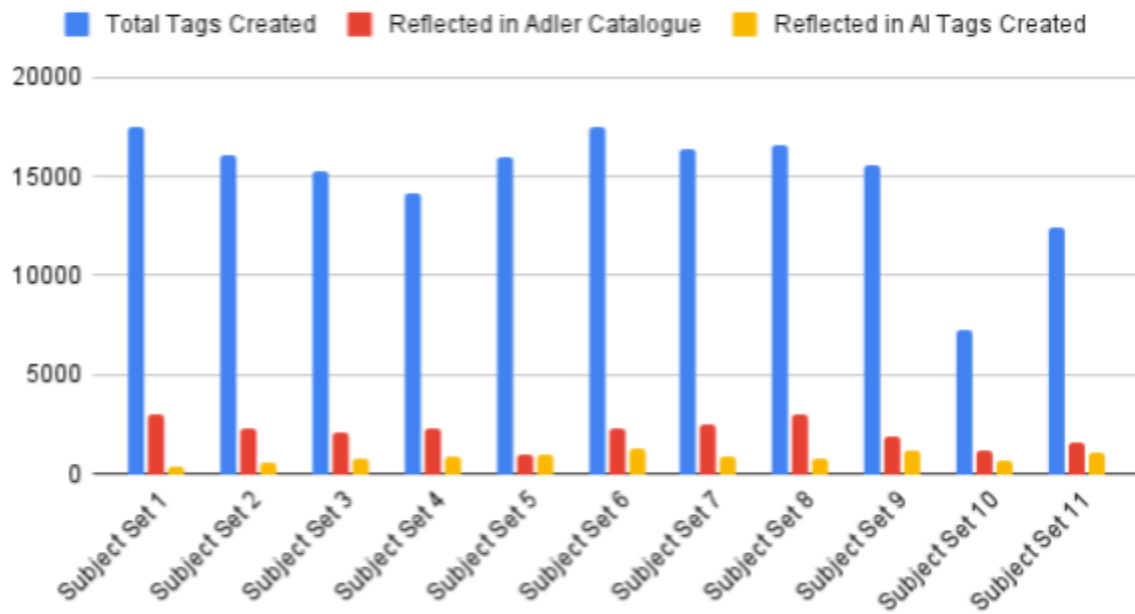


Figure 24: *Tag Along with Adler* bar graph of results showing the total tags created vs. which of these tags were already included in the Adler catalogue or created by the AI tagging models for the Verify AI Tags Workflow.

AI Tag Verification by Collection Type

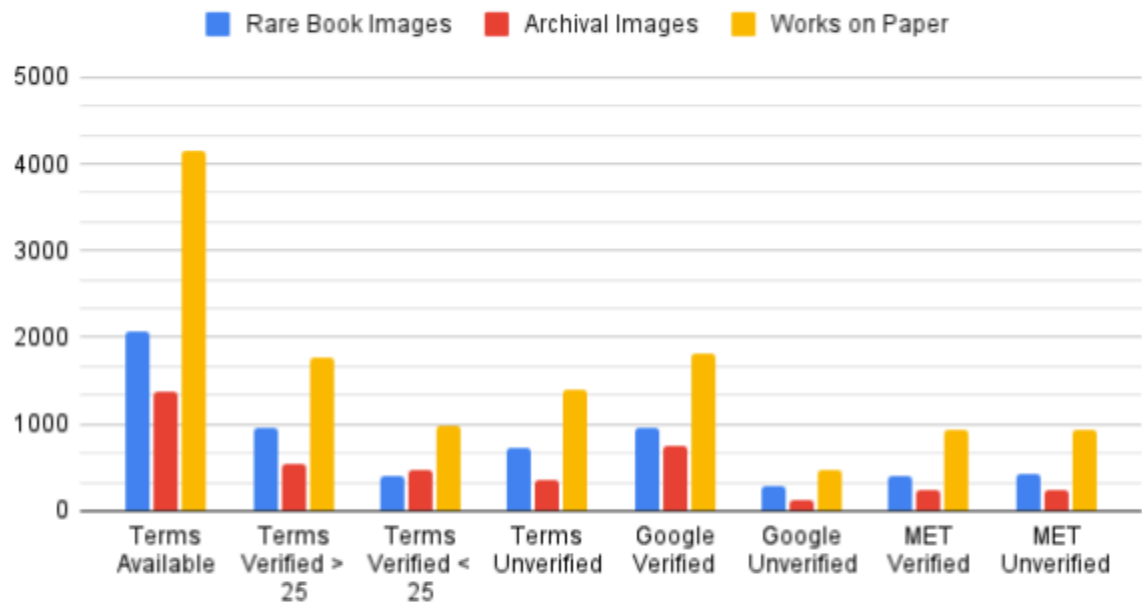


Figure 25: “Verify AI Tags” Verifications by Collection breakdowns (Rare Books Images, Archival Images, and Works on Paper).”

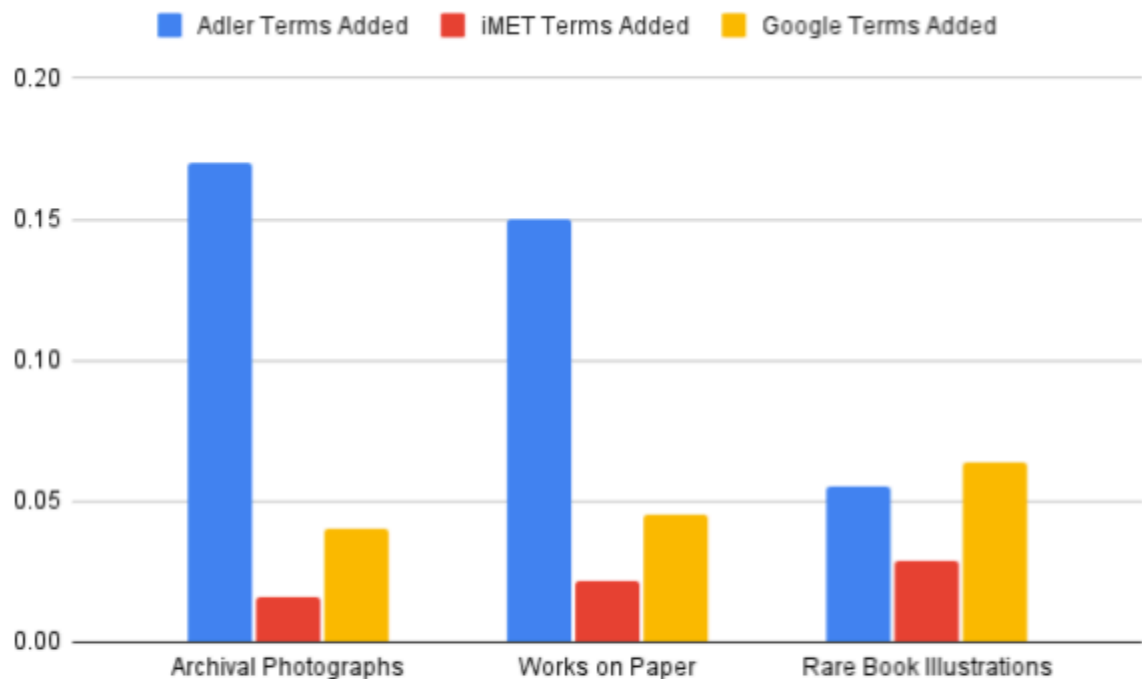


Figure 26: Percentage of terms created by taxonomies (Adler Catalogue, IMET AI Tagging model, Google Cloud Vision API tagging model) for the three distinct collection types (Archival Photographs, Works on Paper, Rare Book Illustrations)

Number of Terms Added by Taggers: vs. Collection/Catalogue

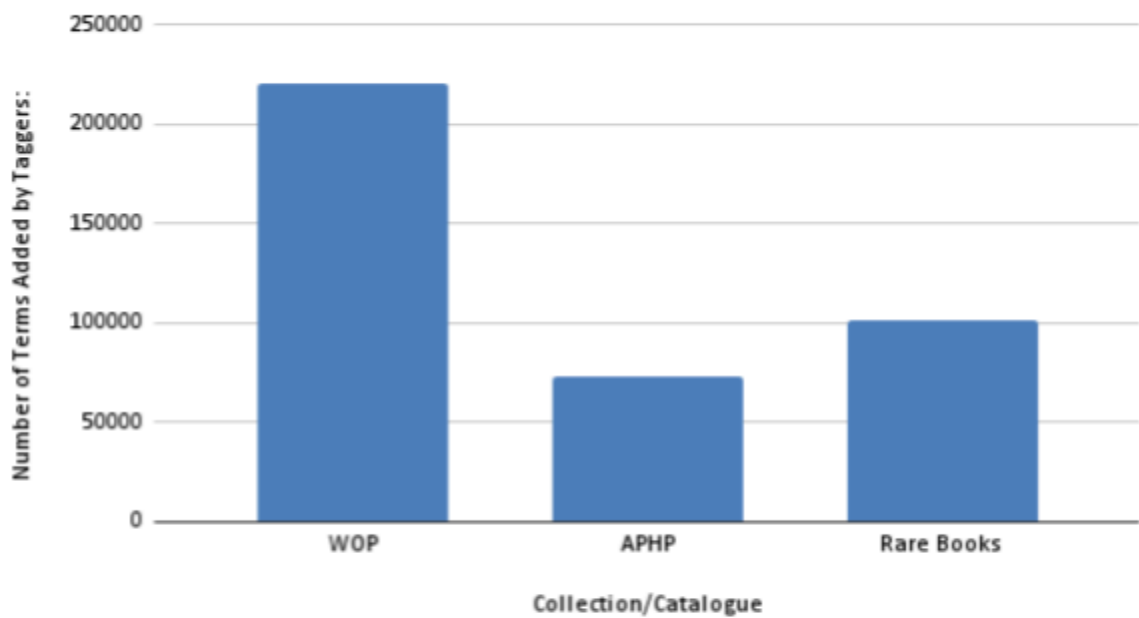


Figure 27: Number of terms added by volunteers as part of the Tag Along with Adler project, by collection type (Works on Paper, Archival Photographs APHP, and Rare Book Illustrations).

Average Tags Per Image: vs. Collection/Catalogue

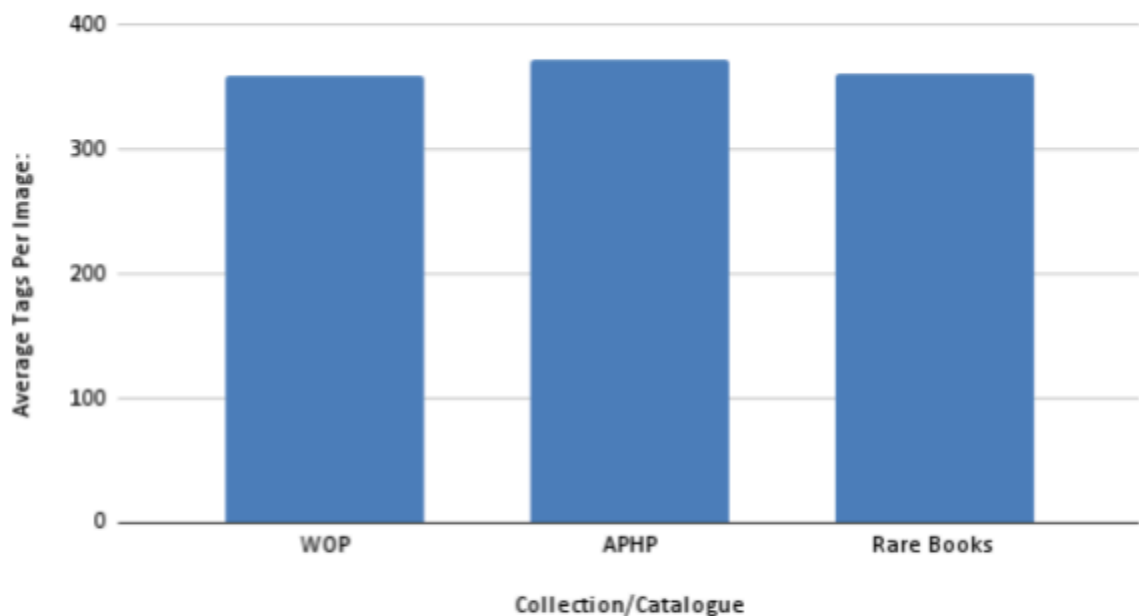


Figure 28: Number of terms added by volunteers as part of the Tag Along with Adler project, by collection type adjusted to reflect average tags added per image (Works on Paper, Archival Photographs APHP, and Rare Book Illustrations).

Country	+ Users	New users	Engaged sessions	Engagement rate	Engaged sessions per user	Average engagement time	Event count
Totals	512 100% of total	512 100% of total	241 30% of total	42.58% Avg 0%	0.47 Avg 0%	0m 21s Avg 0%	2,473 100% of total
1 United States	459	459	215	41.96%	0.47	0m 19s	2,159
2 United Kingdom	28	28	12	41.28%	0.43	0m 52s	181
3 Germany	10	10	8	80%	0.80	0m 02s	41
4 India	3	3	3	100%	1.00	2m 31s	24
5 Sweden	3	3	1	33.33%	0.33	0m 32s	31
6 China	2	2	0	0%	0.00	0m 00s	6
7 Japan	2	2	1	50%	0.50	0m 25s	10
8 Saudi Arabia	2	2	0	0%	0.00	0m 00s	8
9 Canada	1	1	0	0%	0.00	0m 00s	3
10 Poland	1	1	1	100%	1.00	1m 22s	7
11 Switzerland	1	1	0	0%	0.00	0m 00s	3

Figure 29: Participants of the Gamified Case Study reflected by country of origin.

Being Human Festival Results:

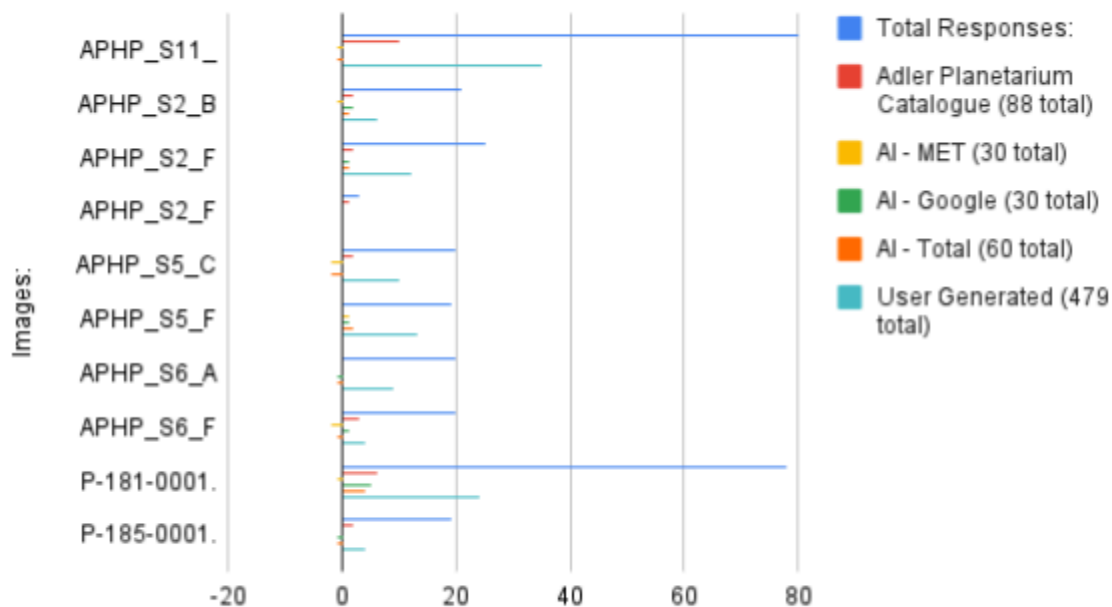


Figure 30: Being Human Festival results for the gamified case study.

Adler Planetarium Member Email Listserv Results

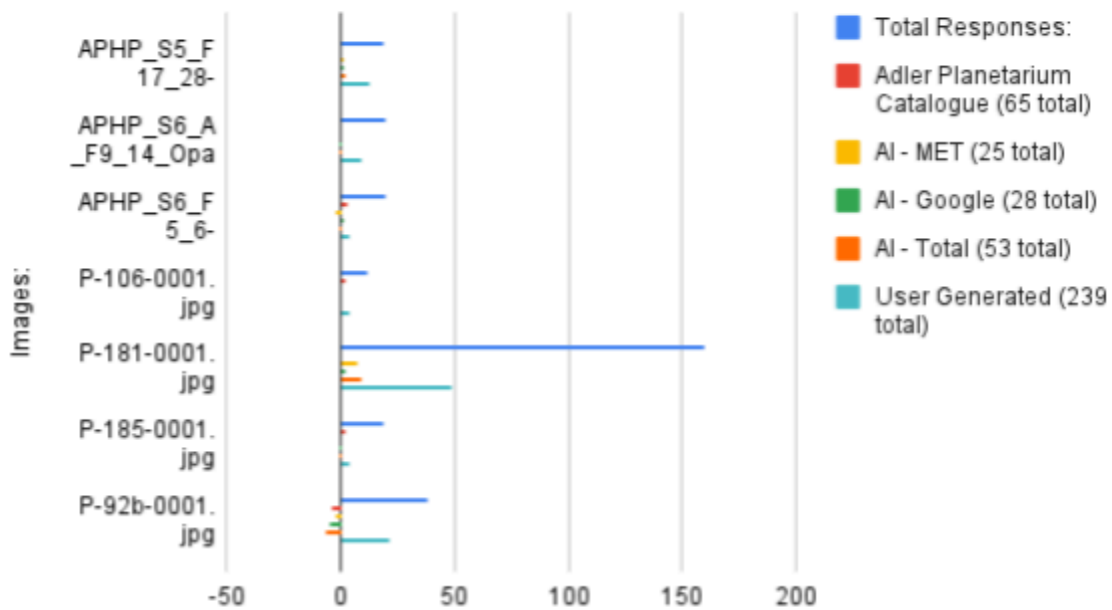


Figure 31: Adler Planetarium Member Email Listserv/Social Media results for the gamified case study.

Being Human Festival and Adler Planetarium Approvals by Percentage

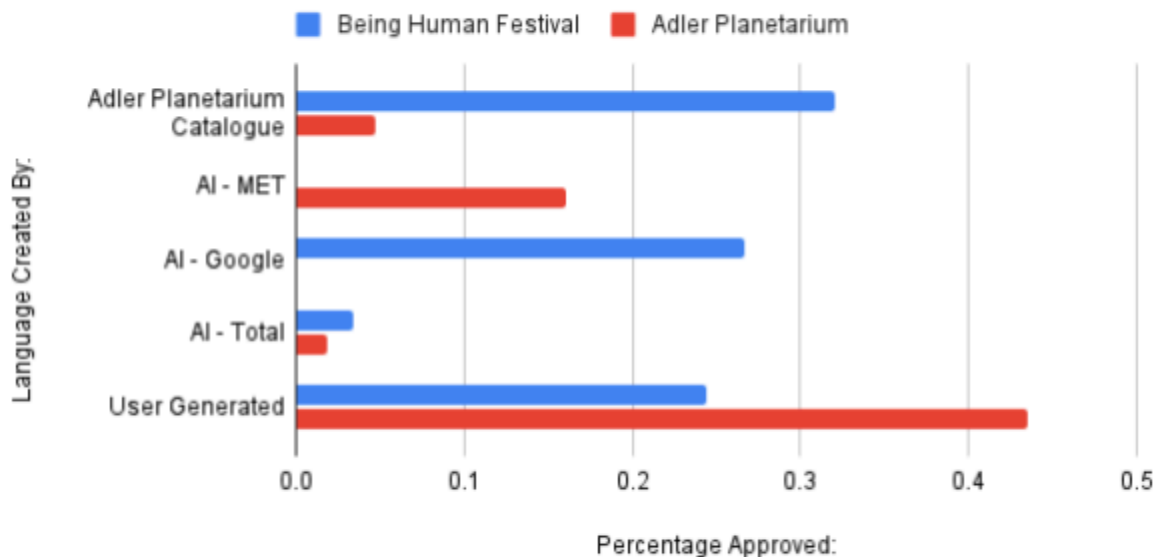


Figure 32: approvals and rejections by percentage for each ontological source for both the Being Human Festival and the Adler Planetarium Member Email Listserv/Social Media

Participants and Comments

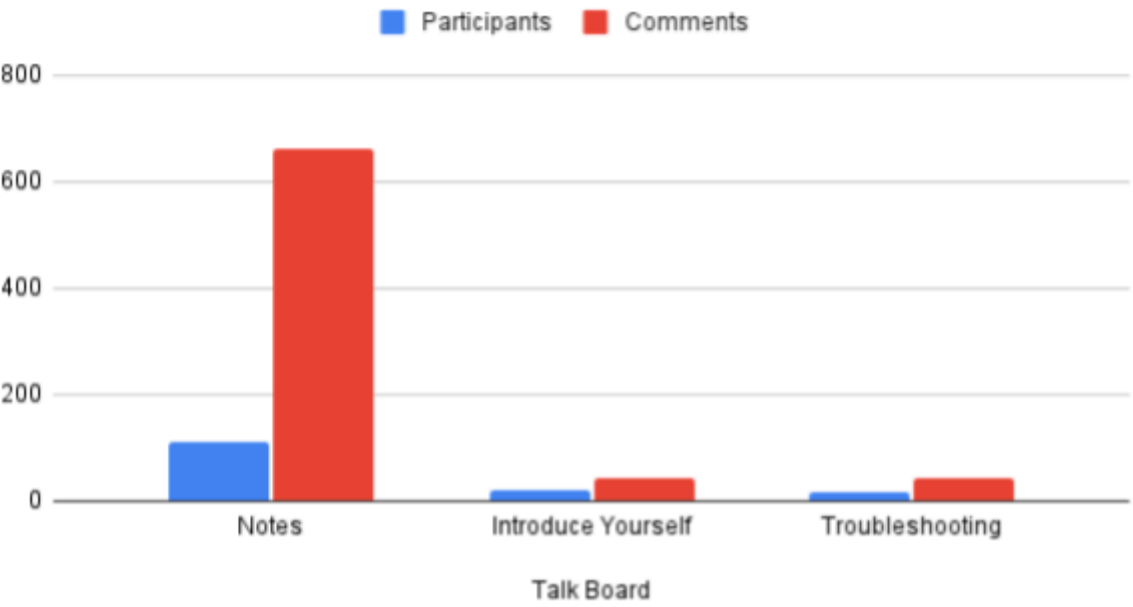


Figure 33: Zooniverse TalkBoard number of participants and comments

Number of Comment Type

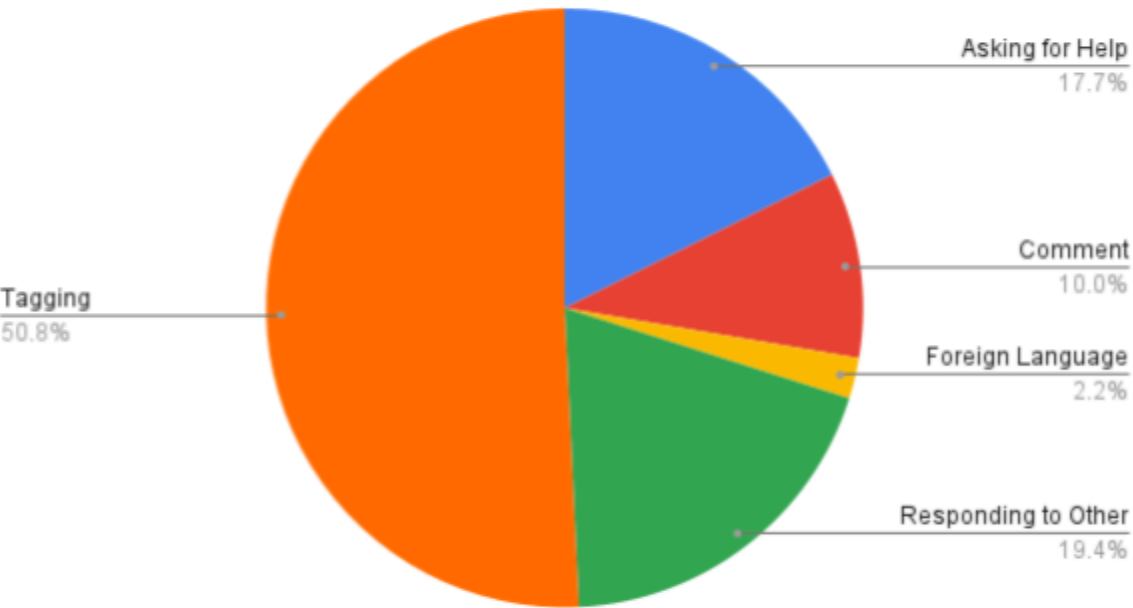


Figure 34: Zooniverse TalkBoard Comment Type Breakdown

Have you previously participated in a Zooniverse Project?

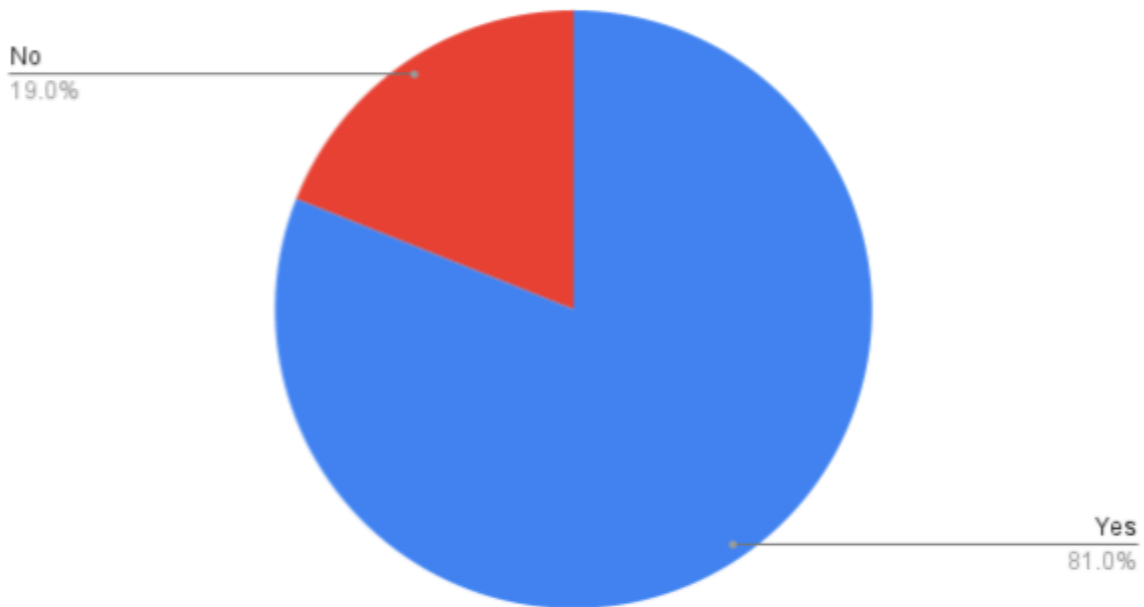


Figure 35: Zooniverse qualitative survey responses for question, "Have you previously participated in a Zooniverse Project?"

After participating in Tag Along with Adler, would you participate in another Zooniverse project centered on Adler Collections?

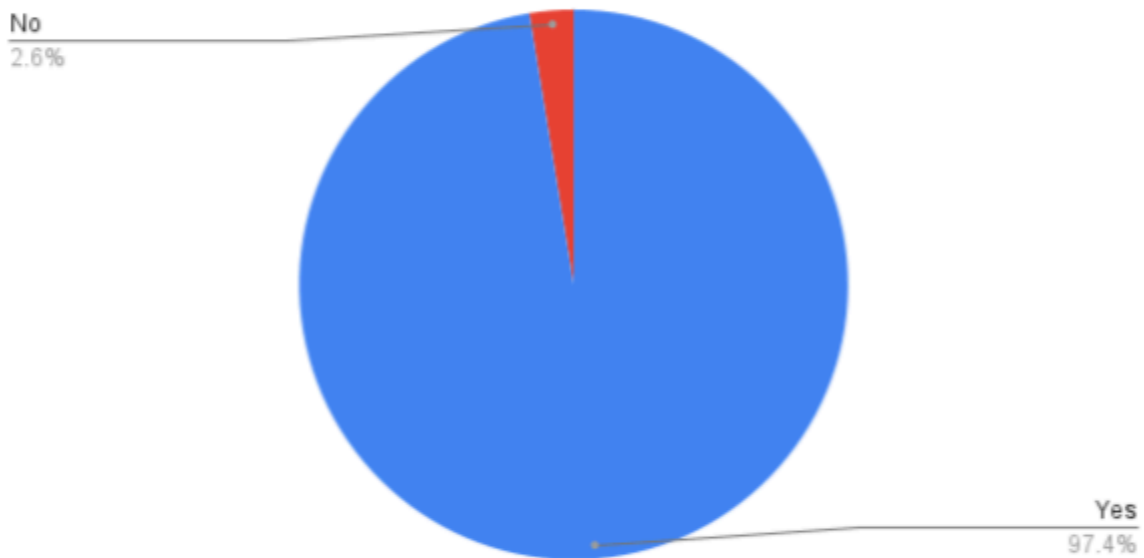


Figure 36: Responses to qualitative survey question, "Would you participate in another Zooniverse project centered on Adler Collections?"

The experience was engaging:

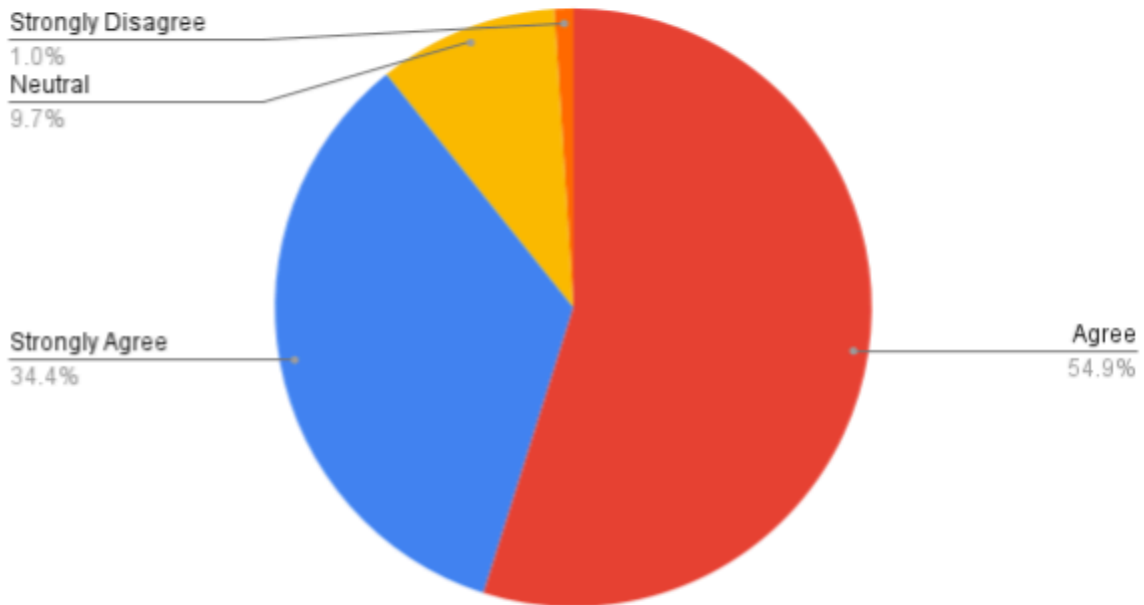


Figure 37: Response breakdown for question asking for ranking of agreement with the statement "The experience was engaging"

The experience was thought provoking:

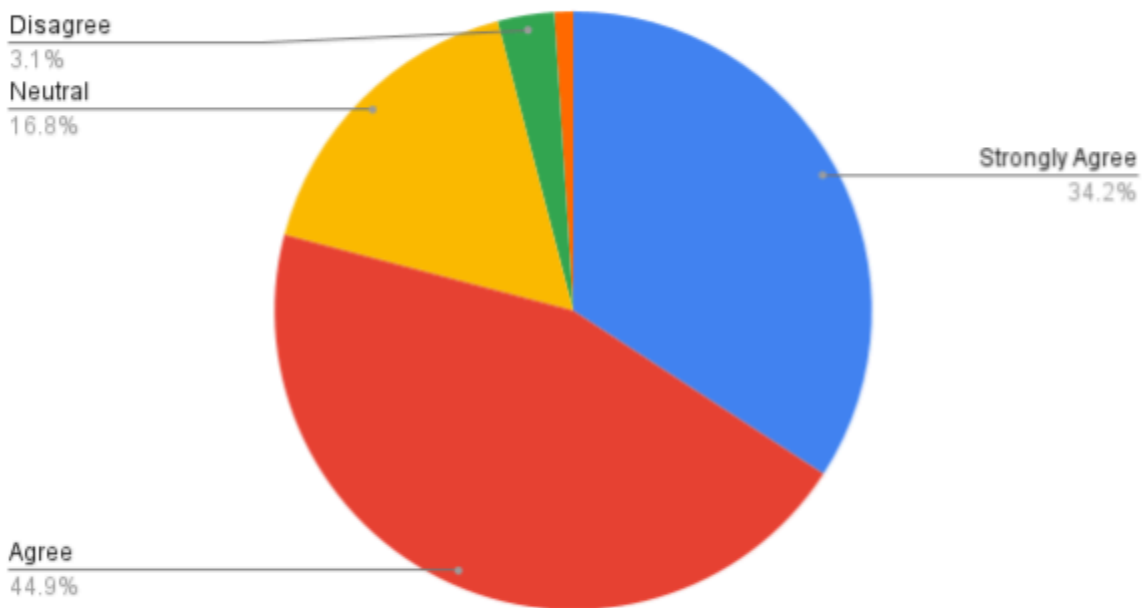


Figure 38: Response breakdown for question asking for ranking of agreement with the statement "The experience was thought provoking"

Please tell us how much you agree with the following statements: The experience was fun

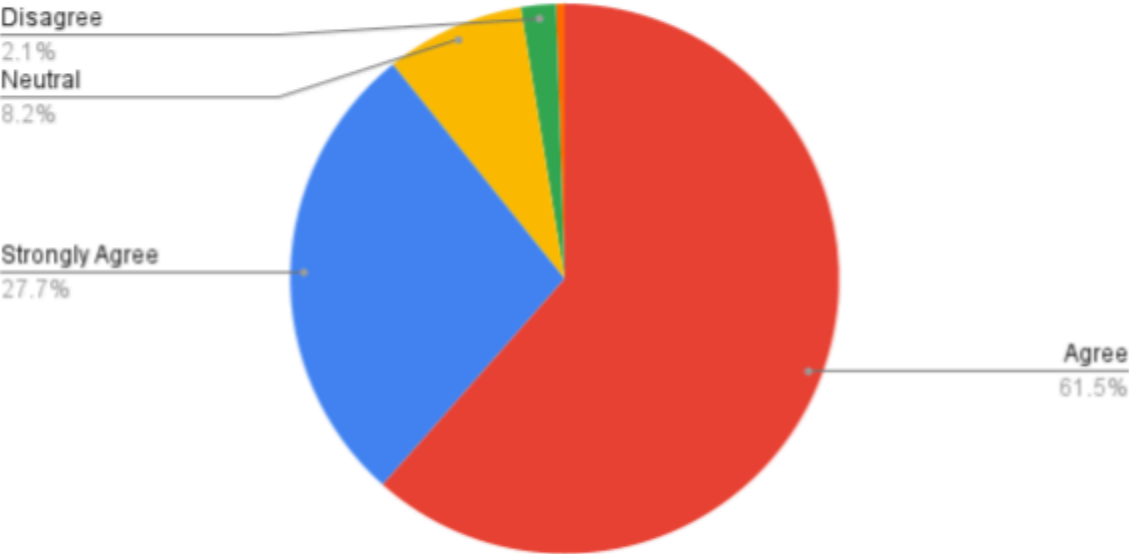


Figure 39: Response breakdown for question asking for ranking of agreement with the statement "The experience was fun"

Classification # vs. Date:

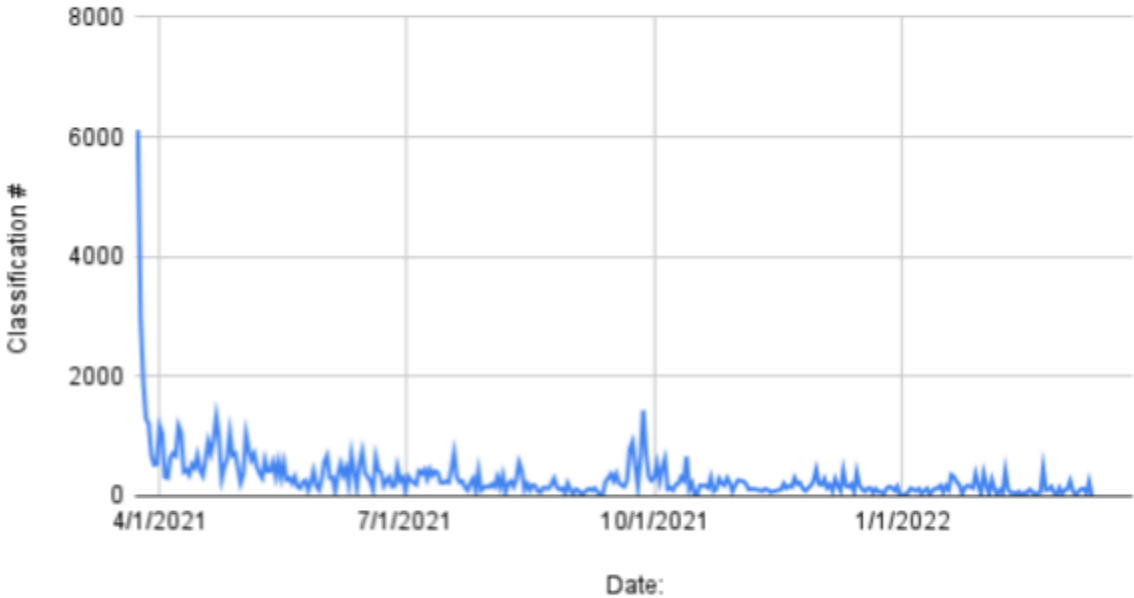


Figure 40: Daily Classification Numbers from March 2022 to March 2023

user_name	workflow_id	created_at	subject_id	Filename:	data.text
WRSunset	16766	2021-08-04 18:30:32 UTC	58032152	P-119-001.jpg	celestial globe, telescope, book cover, Stuttgart

Figure 41: Example of Zooniverse Data Export

user_name	Filename:	data.text
WRSunset	P-119-001.jpg	celestial globe
WRSunset	P-119-001.jpg	telescope
WRSunset	P-119-001.jpg	book cover
WRSunset	P-119-001.jpg	Stuttgart

Figure 42: Example of Zooniverse Data Export formatted for one tag per line.

user_name	workflow_id	created_at	subject_id	Filename:	data.text
WRSunset	16766	2021-08-04 18:30:32 UTC	58032152	P-119-001.jpg	celestial globe, telescope, book cover, Stuttgart
nmeenana	16766	2021-08-05 20:16:55 UTC	58032152	P-119-001.jpg	picture
MjMcNeir	16766	2021-08-06 10:10:21 UTC	58032152	P-119-001.jpg	leather, green, book cover
j_steinhoff	16766	2021-08-07 13:54:45 UTC	58032152	P-119-001.jpg	German, astronomy, globe, telescope
Deejaydubyew	16766	2021-08-09 08:57:41 UTC	58032152	P-119-001.jpg	Blue book cover, Spanish, calligraphy, telescope, globe, map
Tamerlan	16766	2021-08-10 18:32:44 UTC	58032152	P-119-001.jpg	Book title, green book, astronomy, old, Latin, language, old book
not-logged-in-d	16766	2021-08-11	58032152	P-119-001.jpg	book cover

424ce3d312f9a dd17c2		18:27:37 UTC			
smocky2316	16766	2021-08-12 17:56:28 UTC	58032152	P-119-001.jpg	A book describing his creations.
abc1z	16766	2021-08-13 15:27:39 UTC	58032152	P-119-001.jpg	Some early version of telescope
ahirdesh	16766	2021-08-13 15:32:14 UTC	58032152	P-119-001.jpg	book
earthlike	16766	2021-08-13 16:03:57 UTC	58032152	P-119-001.jpg	handbook, Keller, sky guide
not-logged-in-ec 69524d9f2b05b 97346	16766	2021-08-13 16:22:07 UTC	58032152	P-119-001.jpg	Globe celeste poratif,french,Shutz,Stuttg ard,book cover
emmafarrell	16766	2021-08-17 09:14:25 UTC	58032152	P-119-001.jpg	green book cover, italics, telescope, globe, publication place, author, title, French
Reike.	16766	2021-08-17 17:44:27 UTC	58032152	P-119-001.jpg	green, globe, drawing, illustration,
Holly_Pence	16766	2021-08-22 14:29:44 UTC	58032152	P-119-001.jpg	handbook, celestial globe, title page, French, translation
mmariah818	16766	2021-08-22 18:38:07 UTC	58032152	P-119-001.jpg	book cover, globe, astronomy book, drawing, inscriptions, book

Figure 43: Example of Exported Zooniverse tag data for Tag Images Export September 23, 2021, as sorted by the image files.

user_name	workflow_id	created_at	subject_id	Filename:	data.text
2113830	16766	2021-08-25 19:49:53 UTC	58032175	P-57b-0001.jpg	A system of electricity, battery, conductors, inductors, discharge
2113830	16766	2021-08-25 19:50:19 UTC	58032181	P-63d-0001.jpg	A new planetarium, Sun, solar system
aamori1212	16766	2021-09-22	58032152	P-119-001.jpg	stuttgart, german,

		20:59:03 UTC			germany, green, globe, celeste, portrait
aamori1212	16766	2021-09-22 17:16:11 UTC	58032155	P-123a-0001.jpg	french, charles, geometry, figures
aamori1212	16766	2021-09-22 21:00:20 UTC	58032157	P-125c-0001.jpg	observatorium, latin, fence, dome, domes
aamori1212	16766	2021-09-22 17:11:45 UTC	58032158	P-125e-0001.jpg	latin, circle, layers, orbit, planit
aamori1212	16766	2021-09-24 11:26:20 UTC	58032163	P-129-0001.jpg	grey, dark, old, man, scientist, latin, christopher
aamori1212	16766	2021-09-25 01:53:25 UTC	58032167	P-47-0001.jpg	exhibition, russells, bible, psalm, harvard, solar, system
aamori1212	16766	2021-09-24 11:25:20 UTC	58032168	P-48b-0002.jpg	astronomy, southern, hemisphere, constellations, drawing, painting
aamori1212	16766	2021-09-22 21:01:53 UTC	58032169	P-51-0001.jpg	observatory, at, peking, geometry, model, fence, sphere
aamori1212	16766	2021-09-22 17:09:16 UTC	58032170	P-53a-0001.jpg	latin, planets, orbit, lines, circles
aamori1212	16766	2021-09-22 21:08:51 UTC	58032171	P-54-0001.jpg	telescope, grey, drawing, model, design
aamori1212	16766	2021-09-22 20:54:14 UTC	58032172	P-55b-0001.jpg	circle, old, animals, lines, northern, southern, hemisphere, astronomy, constellations
aamori1212	16766	2021-09-27 14:49:22 UTC	58032182	P-63f-0001.jpg	black, white, gray, globe, people, old, books, ladder, model, science
aamori1212	16766	2021-09-24 11:29:59 UTC	58032188	P-65i-0001.jpg	models, model, measurments, planet, sun, old, libra, scorpio, virgo
aamori1212	16766	2021-09-22	58032189	P-65k-0001.jpg	solar, lunar, eclipse,

		17:10:21 UTC		geometry, earth
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Figure 44: Example of Exported Zooniverse tag data for Tag Images Export September 23, 2021, as sorted by the username.

Image Files:	Accession Number:	Tag:	Tag Created by:	Prevalence (User Generated/AI Verified):
P-119-001.jpg	P-119	coats of arms	MET Terms	
P-119-001.jpg	P-119	culture::italian	MET Terms	
P-119-001.jpg	P-119	Text	Google Cloud API	
P-119-001.jpg	P-119	Green	Google Cloud API	37
P-119-001.jpg	P-119	Grass	Google Cloud API	
P-119-001.jpg	P-119	Font	Google Cloud API	30
P-119-001.jpg	P-119	Headstone	Google Cloud API	

Figure 45: Example of Appendix 7, shows object P-119 with AI generated terms, and the prevalence with which users of the “Verify AI Tags” workflow approved these terms.

Image Files:	Accession Number:	Tag:	Tag Created by:	Prevalence (if User Generated):
P-76-0001.jpg	P-76	World	Google Cloud API	88
P-82a-0001.jpg	P-82a	Illustration	Google Cloud API	86
P-156c-0001.jpg	P-156c	Visual arts	Google Cloud API	80
P-98B-0001.jpg	P-98b	men	MET Terms	80
P-76-0001.jpg	P-76	Map	Google Cloud API	78

Figure 46: Example of Appendix 7, tab WOPVerificationTask. Shows AI generated terms, and the prevalence with which users of the “Verify AI Tags” workflow approved these terms.

	A	B	C	D
1	Accession Number:	Image Files:	User Generated Tags:	Frequency of Tag
2	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	Observatory	19
3	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	crowd	9
4	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	people	8
5	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	black and white	3
6	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	building	3
7	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	doane observatory	3
8	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	queue	3
9	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	group	2
10	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	men	2
11	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	Space	2
12	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	telescope	2
13	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	The Doane Observatory	2
14	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	waiting	2
15	APHP.S7.B.F2.15	APHP_S7_B_F2_15_Opac.jpg	1960's	

Fig 47: Example of Appendix 10, "Verify AI Tags" data demonstrated frequency of user generated tags added for each image, as well as whether the tag was already in the Adler catalogue (shown bolded), as well as if it was included by AI taggers: green highlights denotes matching iMet tagger, red highlights denotes matching Google Cloud Vision API.

	A	B	C	D
1	Accession Number	Image Files:	User Generated Tags:	Frequency of Tag
2	P-245	P-245-0001.jpg	man	15
3	P-245	P-245-0001.jpg	astronomer	10
4	P-245	P-245-0001.jpg	astronomy	10
5	P-245	P-245-0001.jpg	Moon	9
6	P-245	P-245-0001.jpg	table	9
7	P-245	P-245-0001.jpg	book	8
8	P-245	P-245-0001.jpg	sun	8
9	P-245	P-245-0001.jpg	stars	7
10	P-245	P-245-0001.jpg	celestial	5
11	P-245	P-245-0001.jpg	drawing	5
12	P-245	P-245-0001.jpg	globe	5
13	P-245	P-245-0001.jpg	Illustration	5
14	P-245	P-245-0001.jpg	hat	4
15	P-245	P-245-0001.jpg	Sky	4

Fig 48: Example of Appendix 11, "Tag Images" data demonstrated frequency of user generated tags added for each image, as well as whether the tag was already in the Adler catalogue (shown bolded), as well as if it was included by AI taggers: green highlights denotes matching iMet tagger, red highlights denotes matching Google Cloud Vision API.

Subject Set	Workflow	Total Tags Added	Tags also in Adler Catalogue	Tags also in iMET Tagger AI	Tags also in Google Cloud Vision API AI
1	Verify AI Tags	17508	2958	132	271
2	Verify AI Tags	16059	2275	118	418
3	Verify AI Tags	15303	2061	244	516
4	Verify AI Tags	14152	2285	354	540
5	Verify AI Tags	16001	1000	300	675
6	Verify AI Tags	17524	2304	323	911
7	Verify AI Tags	16375	2460	280	574

8	Verify AI Tags	16542	2974	230	560
9	Verify AI Tags	15564	1932	372	842
10	Verify AI Tags	7298	1158	252	383
11	Verify AI Tags	12457	1571	356	719
1	Tag Images	18526	2589	194	559
2	Tag Images	22118	2987	138	824
3	Tag Images	19171	2327	553	1239
4	Tag Images	19219	2951	822	1014
5	Tag Images	21355	1350	596	1344
6	Tag Images	20308	2375	561	1425
7	Tag Images	19563	3670	550	1714
8	Tag Images	20775	3301	280	995
9	Tag Images	19306	3203	761	1029
10	Tag Images	18536	2404	599	1017
11	Tag Images	17478	1034	759	1733

Fig 49: Demonstrates the number of tags added by users for each of the subject sets in both of the workflows, along with what number of those tags were already included in the Adler Planetarium catalogue, as well as how many of those tags were also included by AI Taggers both the iMET Tagger and the Google Cloud Vision API Tagger.

Appendices:

Appendix 1: Metadata Project WOP Data Set -

<https://docs.google.com/spreadsheets/d/1oAI0gwtzSYWAJUyUnmdPKWZKQT0VeULzCmEX0w pDPGs/edit?usp=sharing>

Appendix 2: Beta Test Language & Design -

https://docs.google.com/document/d/1LLM_xKG9OlorwxH3IB-xkFyHVAzNPjquNopWAcAHpFc/edit?usp=sharing

Appendix 3: Beta Test Survey Results -

https://docs.google.com/spreadsheets/d/1sOlqW1j8sFVRjQRyGh9vYaKVWrAZnEDY_Ag3K3dm LqE/edit?usp=sharing

Appendix 4: Adler Survey of Visitors and Supporters -- Graphical Key Finding Report - January 8 2019.pdf -

<https://drive.google.com/file/d/1LA60o7XDNx2DIEzCiBohGYuF5nJgBydE/view?usp=sharing>

Appendix 5: Zooniverse Data Exports -

https://docs.google.com/document/d/1SCpAzoFdqqWakJ7QO_lhdbmNZgdQ8wacSPATacS2zB 0/edit?usp=sharing

Appendix 6a_03242021_VerifyAITags_Export -

<https://docs.google.com/spreadsheets/d/1PqsGQZBJf9eyynleoZaO99Mn1eGFhzzvluHhPfcFPd l/edit?usp=sharing>

Appendix 6b_03242021_TagImages_Export -

<https://docs.google.com/spreadsheets/d/1ObWDWmZmowgqzwejF1clxTWvOOzdMVe1ykjzoR 4MT0/edit?usp=sharing>

Appendix 6c_03312021_VerifyAITags_Export -

https://docs.google.com/spreadsheets/d/1TXRSj-d1cHBUqCn21_MrqTS2z4REHh38il_eVFbimA k/edit?usp=sharing

Appendix 6d_03312021_TagImages_Export -

<https://docs.google.com/spreadsheets/d/114bYS2LAQtjng3idL22n3M-lcYoaEqdHeJYGmpmwO 40/edit?usp=sharing>

Appendix 6e_20210416_VerifyAITags_Export -

<https://docs.google.com/spreadsheets/d/18lNf0g5nll0xZT9DeosmSaeBhe5inuby-L0Jppish0/ed it?usp=sharing>

Appendix 6f_20210416_TagImages_Export -

https://docs.google.com/spreadsheets/d/1Jn4mvgqSmpn_b01_Yskhq02XA7cE0OHc1VwzWd61T_k/edit?usp=sharing

Appendix 6g_20210501_VerifyAITags_Export -

https://docs.google.com/spreadsheets/d/1hckp0TqtBljzzaHk3103fTCFs_CtY5H50gigg6wSQXk/edit?usp=sharing

Appendix 6h_20210501_TagImages_Export -

https://docs.google.com/spreadsheets/d/1qzweVQEsLaE5n_-2X-hk6PYTFywal_AntB9_P1EdbxA/edit?usp=sharing

Appendix 6i_20210527_VerifyAITags_Export -

https://docs.google.com/spreadsheets/d/1q2giVRKkSjh36kTrfYcLcbG7Sfm6okBj2C_y3c3hLRI/edit?usp=sharing

Appendix 6j_20210527_TagImages_Export -

https://docs.google.com/spreadsheets/d/1nEFJKJmKxGwkc3MIHWglf3-vnobqorzgZ_vGpBg7ljg/edit?usp=sharing

Appendix 6k_20210625_VerifyAITags_Export -

https://docs.google.com/spreadsheets/d/1XDNKINKdFKoVIQr5C40uWgTNki0NPg_b2lhAvv67b3c/edit?usp=sharing

Appendix 6l_20210625_TagImages_Export -

<https://docs.google.com/spreadsheets/d/1LUW-Hpy4hk-5ACQrcz9qY8K-CJ1zF7ecmF0bOwZpK-o/edit?usp=sharing>

Appendix 6m_20210730_VerifyAITags_Export -

<https://docs.google.com/spreadsheets/d/1N972oAERsnFu5aRiJn1BJv4bGzoJzNQZjOYRxc5O-x0/edit?usp=sharing>

Appendix 6n_20210730_TagImages_Export -

<https://docs.google.com/spreadsheets/d/12CzAd7BrVG64w1ljqE4DUrMRhNSuKEiiTvOy88JNYac/edit?usp=sharing>

Appendix 6o_20210923_VerifyAITags_Export -

<https://docs.google.com/spreadsheets/d/1sv8Ykaqr4-b6tCgL9yFL8O8XxUw303k33Lz0YVIllox0/edit?usp=sharing>

Appendix 6p_20210923_TagImages_Export -

<https://docs.google.com/spreadsheets/d/1ECUFzITq59oB8KWx5olv9JXcndajdyiMUcadxepCgaQ/edit?usp=sharing>

Appendix 6q_20211022_VerifyAITags_Export -

<https://docs.google.com/spreadsheets/d/133RMAeuovF4zrruTGFAqSJcfp9Fzv24kTRQjCVAq1W0/edit?usp=sharing>

Appendix 6r_20211206_TagImages_Export -

https://docs.google.com/spreadsheets/d/1TWOi1qDXNZs01CKWCmwHsYfzttmk0j8ikSJwA_anuOM/edit?usp=sharing

Appendix 6s_20211118_VerifyAITags_Export -

https://docs.google.com/spreadsheets/d/1x_3HY68qsMbT6aBslp7gRCPXxvaHBRYo_JuqE7fw5Fk/edit?usp=sharing

Appendix 6t_20220315_TagImages10_Export -

https://docs.google.com/spreadsheets/d/1feo_j5Tn86TqORuiGekUSRihcSsKKul2eSQzgXUpIZY/edit?usp=sharing

Appendix 6u_20220107_VerifyAITags_Export -

https://docs.google.com/spreadsheets/d/19Tj3KTrCvf992zIir_zSgCBVN4PW_n35_XwfSD7uftQ/edit?usp=sharing

Appendix 6v_20220315_TagImages11_Export -

<https://docs.google.com/spreadsheets/d/1TSYqPNLe7AkN43ZdHubDHYXxeuUJ6mxWG54z89UyA38/edit?usp=sharing>

Appendix 7: Data Management for All Generated Terms -

<https://docs.google.com/spreadsheets/d/1z9j62wRilcb4jivHcPjnPv6Uv7wzPX-ca4Tf7SG2L4/e/dit?usp=sharing>

Appendix 8: Extractor_config_workflow_16765_V84.119.txt

https://drive.google.com/file/d/1w4Ex_WlwGLzxIH_zW1sIZgxWI72HzWI/view?usp=sharing

Appendix 9: TagAlong_SubjectSet-92781.pdf -

<https://drive.google.com/file/d/1tjc0sLvvd7yDq4ACDAWfSwORwo9GO8ut/view?usp=sharing>

Appendix 10: Verify AI Curator Verification Stage -

https://docs.google.com/spreadsheets/d/1WXaPlc17_c8QPRsUalRZ-QgzcrkHutItXpB-dz-6GnE/edit?usp=sharing

Appendix 11: Tag Images Curator Verification Stage -

<https://docs.google.com/spreadsheets/d/1Y3kNosFa8AFOnoSUZHtCkFqXqBKTAGrN9PnOrEU1Lt1Y/edit?usp=sharing>

Appendix 12: Tag Along Metadata Game Survey link:

https://docs.google.com/forms/d/e/1FAIpQLSelZkqRRGzGffmoLM_k4J201oBPWxnLGliMg8kjXAkTI6CsAQ/viewform

Appendix 13: Metadata Project Data Set -

<https://docs.google.com/spreadsheets/d/1TMqkRlvDnjDuCXe7NDhGv23N94bWj18cL-yx7B9cNZU/edit?usp=sharing>

Appendix 14 Examples of Dataset -

https://docs.google.com/presentation/d/1dob9fIVF_Ft9ygRw5GVFGNZuVw-OP9Ggln6ehJk-j3Q/edit?usp=sharing

Appendix 15: Tag Along with Adler User Survey link & Data Set:

<https://docs.google.com/forms/d/e/1FAIpQLSfkmmwyPpciVLBi0vGOkxH3daFw4mw6dkXpidxlpE4DPHjACg/viewform>

https://docs.google.com/spreadsheets/d/1X-YUqiuZJ7FUH_c8g7-96zZtVGcJkH3I4XUS3f6ZY9I/edit?usp=sharing

Appendix 16: Talk Board Comments -

<https://docs.google.com/spreadsheets/d/1AYWVgTLGtCZ4w47DULbOgJtAneZ9I8ld30MiipgE4I8/edit?usp=sharing>

Appendix 17: VideoGame Approvals - Being Human Fest & Adler Marketing -

<https://docs.google.com/spreadsheets/d/1wcASXt9ad8Fel17jSRhvHPSE54JckMQJKm-YkKu5BRI/edit?usp=sharing>

Appendix 18: Interview Responses –

<https://docs.google.com/document/d/1Z8YB0avlrLUioCr67bXbQ3NNk-2JJIZcoBzemIDadS4/edit?usp=sharing>